SWEDEN'S ENVIRONMENTAL

objectives

– no time to lose

AN EVALUATION BY THE SWEDISH ENVIRONMENTAL OBJECTIVES COUNCIL

2008

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The brook was a good one.

It went rushing clear and brown over wads of last year's leaves, through small tunnels of left-over ice, swerving through the green moss and throwing itself headlong down in a small waterfall on to a white sand bottom. In places it droned sharp as a mosquito, then it tried to sound great and menacing, stopped, gurgled with a mouthful of melted snow, and laughed at it all.

Snufkin stood listening in the damp moss. I must have the brook in my tune also, he thought. In the refrain, I think.

A small stone suddenly came loose near the waterfall and raised the pitch of the brook a whole octave.

Not bad, Snufkin said admiringly. That's the way to do it.

From *Tales from Moominvalley* by Tove Jansson

An evaluation by the Swedish Environmental Objectives Council 2008

To the Minister for the Environment

Sweden's Parliament – the Riksdag – has set the goal of handing over to the next generation a society in which the country's major environmental problems have been solved. To guide efforts towards that goal, 16 environmental quality objectives have been adopted, each supported by one or more interim targets. These objectives describe the quality and state of the Swedish environment which the Riksdag judges to be sustainable in the long term. They require the involvement of everyone in our society – from central and local government and the business sector to organizations and individuals.

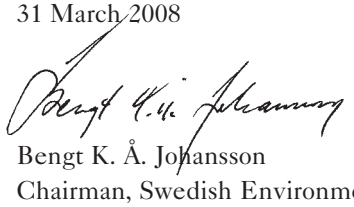
The Environmental Objectives Council provides the Swedish Government with basic analysis for the process of implementing the 16 national environmental quality objectives by undertaking, every four years, an in-depth evaluation of action to achieve them. This is the second such evaluation. The present report also includes, as an important component part, the Council's annual review of progress towards the objectives.

The Council's evaluation shows that, on the whole, trends in the state of the environment are pointing in the right direction. This is not the case as regards the climate objective, however. Nine of the 16 environmental quality objectives are judged to be very difficult or not possible to attain by the target year 2020. In this report, the Council presents several hundred proposals to help meet the objectives. These will cost central government an additional SEK 5–10 billion a year, but the economic benefits to society will be even greater.

Efforts to achieve the environmental quality objectives have developed in an encouraging manner, and have contributed to more effective environmental action across Swedish society. But the progress to date is not enough. There is also a need for firm political resolve, and for further measures. Investments in the environment contribute to the broader welfare of society. They bring benefits in terms of public health, biodiversity, cultural heritage, long-term ecosystem productivity, sustainable use of natural resources and hence long-term economic development. These are the fundamental values that should be at the heart of all environmental efforts in Sweden.

The process of monitoring progress towards, evaluating and implementing the environmental quality objectives can be described as one of Sweden's biggest collaborative undertakings. For it to succeed, considerable commitment is required, which is precisely what has been in evidence in the preparation of this report. I would therefore like to warmly thank everyone who, in one way or another, has played a part in producing *Sweden's Environmental Objectives: No Time to Lose.*

31 March 2008



Bengt K. Å. Johansson
Chairman, Swedish Environmental Objectives Council

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There are two appendices to this report:

Appendix 1. Measures, instruments and other proposals aimed at attaining the environmental quality objectives
Appendix 2. Impacts of the environmental quality objectives

These appendices are published in a separate report: *Sweden's Environmental Objectives: Appendices*, ISBN 978-91-620-1268-7.

Executive summary

Sweden has adopted 16 environmental quality objectives, reflecting an ambitious environmental policy. These goals are to be achieved by 2020. The Environmental Objectives Council's assessment is that more than half of them will be very difficult or not possible to attain within the defined time frame. In several cases, action needs to be taken without delay if the quality of the environment which the objectives describe is to be brought about in the foreseeable future – or perhaps at all.

The prospects of meeting the majority of the environmental quality objectives are very much dependent on changes in the wider world. Trends in Swedish society and internationally, along with climate change, are expected to have far-reaching implications for basically all the objectives.

To attain most of the environmental objectives, patterns of consumption need to be changed and Sweden needs to press for action in international forums. The life-cycle principle is crucial: what we extract from nature should be reused and finally disposed of in a resource-efficient manner, without harm to the natural environment. Priority needs to be given to a general improvement in energy efficiency. And to achieve the aspects of the objectives relating to nature conservation, cultural heritage and human health, greater consideration for the environment and better protection and management are called for.

Will the objectives be achieved?

MOVING IN THE RIGHT DIRECTION, BUT STILL A LONG WAY TO GO

Sweden's Parliament, the Riksdag, has adopted 16 ambitious and far-reaching environmental quality objectives. The long-term goal – to hand over to the next generation a society in which all the major environmental problems have been solved – is one of the most challenging visions for the environment formulated anywhere in the world. In international comparisons, Sweden scores highly when it comes to the state of its environment. Even so, considerable challenges remain. The Swedish people make heavy demands on natural resources. If all the inhabitants of our planet were to use resources on the same scale, it would take another two and a half earths to meet everyone's needs.

The Environmental Objectives Council notes that environmental trends are pointing in the right direction in several of the areas over which Sweden itself has control. However, the pace of the progress being made is not sufficient to achieve the environmental quality objectives by 2020. The overall picture of the prospects of attaining them is thus a negative one: in the summary table in this report, red smileys (indicating objectives that will be very difficult or not possible to reach) figure prominently. The closer we get to the target year for these goals, the less time there is to introduce further measures that could enable us to meet them. In several cases, action needs to be taken without delay if the quality of the environment which the objectives describe is to be brought about in the foreseeable future – or perhaps at all. Urgent measures are called for, not least, by the climate change now under way, which will have far-reaching implications both for the environmental quality objectives and for other goals of our society. The Council takes the view that firm resolve is needed, both nationally and in international cooperation, to achieve Sweden's national environmental quality objectives and secure sustainable development.

The environmental quality objective *Reduced Climate Impact* is judged by the Environmental Objec-

tives Council to be very difficult or not possible to attain. On current trends, global greenhouse gas emissions are expected to rise more rapidly over the next 20–30 years than they have in the last 35. The Council views climate change and its repercussions for other objectives with alarm. The state of our seas, too, is deeply disturbing. Nutrient inputs are declining, but improvements in terms of eutrophication are less clear. The status of cod and eel populations is critical. These are some of the factors behind the Council's assessment that it will be very difficult or not possible at all to achieve the objectives *Zero Eutrophication* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*. For *Sustainable Forests*, some encouraging trends can admittedly be noted, including increases in the amount of dead wood left in forests, numbers of large trees, and areas of mature forest with a large deciduous element. At the same time, forests of very high conservation value are being harvested, and forest resources generally are being intensively exploited. Inadequate regard is being paid to conservation, resulting in damage to the natural features and cultural remains of forest areas. The objective *Sustainable Forests* is considered very difficult or not possible to attain by 2020.

The Environmental Objectives Council judges nine of the 16 environmental quality objectives to be very difficult or not possible to meet. For two objectives, it has revised its assessments since the 2007 progress report. One of these, *A Protective Ozone Layer*, stands out as a goal that is now considered achievable, provided that successful implementation of the Montreal Protocol continues.

The other revised assessment is for *A Good Built Environment*. This objective is now deemed very difficult or not possible to reach, partly because several of the specifications of what it entails will be hard to fulfil on time. In addition, several of the interim targets linked to the fundamental values underpinning the environmental objectives are considered difficult to achieve – in particular, those linked to human health, which is affected by poor indoor environments, and to cultural heritage, with too little being done to identify and protect the cultural assets of built environments.

For the interim targets set under the different environmental quality objectives, the picture is somewhat more encouraging. A number of these targets have already been met. Another 30 or so are judged to be achievable by the target year, although to meet many of them further action will be required.

The Environmental Objectives Council considers it important to bear in mind the international dimensions of the objectives. Many of these goals are very much dependent on what happens in the wider world. In several cases, international as well as national measures will be needed if they are to be attained. This is especially true of *Reduced Climate Impact*, *Clean Air*, *Natural Acidification Only*, *A Non-Toxic Environment*, *A Protective Ozone Layer*, *Zero Eutrophication* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*.

NEW ASPECTS OF OBJECTIVES GIVEN PRIORITY

The Environmental Objectives Council calls for most of the interim targets to be revised and made more stringent. In addition, it proposes 19 new ones, relating for example to emissions from shipping, private water supplies, organic production, and nature in and near urban areas. The Council's proposals in terms of new, revised, unchanged and withdrawn interim targets will reduce the total number of such targets from 72 to 70.

EFFECTIVE MONITORING IMPORTANT

To assess progress towards the environmental quality objectives and the associated interim targets, use is made of indicators. These are based on regular gathering of quantitative and qualitative data from sampling programmes, questionnaire surveys, interviews, voluntary reporting and studies of other kinds. The Environmental Objectives Council believes that steps should be taken to ensure cost-effective and coordinated provision of data for the purposes of environmental monitoring, international reporting and monitoring of progress towards the environmental objectives. Greater use could be made of environmental data collected for international reporting as a basis for follow-up of the objectives.

Why are the objectives proving hard to achieve?

There are several reasons why many of the environmental quality objectives are judged to be difficult to achieve. First of all, as noted earlier, the objectives set are ambitious. Secondly, progress towards them depends to a great extent on developments in the wider world and in the structure of Swedish society. A third, key factor affecting the prospects of reaching the objectives within the defined time frame, i.e. by 2020, is nature's capacity for recovery. And fourthly, many of the measures previously proposed have not been implemented.

PROGRESS DEPENDS ON FACTORS IN SWEDEN AND THE WIDER WORLD

Changes in the structure of Swedish society and progress in international cooperation, for example under conventions, directives and other agreements, will crucially affect the prospects of achieving the environmental quality objectives. The environmental policies of individual countries in Sweden's vicinity will also have a major impact. Factors of particular significance include:

- Economic growth, with ever increasing consumption.
- Continuing growth of the world's population, placing mounting pressure on natural resources.
- Ever growing energy demand, posing the major challenge of developing renewable alternatives.
- Continued growth in all forms of transport.
- Increasingly large towns and expanding regions, coupled with rural depopulation.
- Advances in technology, with the potential to generate new products and services with little or negligible impact on the environment.
- Climate change, affecting progress towards environmental quality objectives other than the climate objective.

NATURE NEEDS TIME TO RECOVER

Time is an important factor in an assessment of whether the objectives will be met. Generally speaking, changes in the natural environment are slow. Consequently, even if a negative trend is reversed, there will be a time lag in nature's response, often making it difficult to bring about the state of the environment described by a given objective by the target date, i.e. 2020.

MEASURES HAVE NOT BEEN IMPLEMENTED

The Council notes that a large number of measures to tackle different environmental problems have already been proposed. Despite these proposals, and often decisions to carry them out, many of the measures in question have not in fact been put into effect. There may be a number of reasons for this phenomenon, variously referred to as an 'implementation deficit' or 'institutional barriers'. One important reason, in all probability, is the conflicts of interest that arise: between developing or exploiting land, water and natural resources for economic gain, and limiting and adapting the ways in which those resources are used. Activities in virtually every policy area are affected, and need to be analysed with respect to synergies and conflicts with measures and instruments to achieve environmental goals. Conflicts will need to be handled, often by means of clear policy decisions. This calls for political courage.

How large is the gap to achieving the objectives?

FOR MANY THERE IS STILL FAR TO GO, BUT UNCLEAR HOW FAR

One of the tasks entrusted to the Environmental Objectives Council has been to propose measures to attain the environmental quality objectives. In many cases, even if the measures recommended are implemented and the interim targets are met, there will still be a 'gap' to achieving the objectives on time. How large this gap is varies from one objective to

another; for a number of them, it may be difficult to quantify. The main source of uncertainty is the difficulty predicting exactly what impacts the suggested actions will have and how effective they will be in a changing world. In several cases, moreover, insufficient knowledge is available. For these reasons, it is impossible to say precisely what needs to be done to reach the objectives. This question should be looked at more closely in the in-depth evaluation planned for 2012.

What action needs to be taken?

To coordinate and guide long-term efforts to achieve the environmental quality objectives, in such a way that they can serve as tools in a transition to a sustainable society, the Government has proposed three action strategies. These strategies describe the key activities giving rise to today's environmental problems and the particular challenges that need to be addressed. The Environmental Objectives Council has used the strategies to arrive at an overall picture of the policy instruments and measures that will most benefit progress towards all the environmental quality objectives.

The three action strategies are:

1. A Strategy for More Efficient Energy Use and Transport (the EET Strategy) – chiefly to reduce emissions from the energy and transport sectors and increase the share of renewable energy.
2. A Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles (the GRK Strategy) – to reduce use of natural resources, curb emissions of toxic pollutants, and promote energy- and material-efficient environmental life cycles.
3. A Strategy for the Management of Land, Water and the Built Environment (the HUM Strategy) – to conserve biodiversity and valuable cultural environments, protect human health, and achieve environmentally sound land use planning and a sustainable built environment.

The Council considers that the process of reviewing and analysing measures and policy instruments in the framework of the three strategies offers significant added value. It provides a clearer overview and a better basis for setting priorities, as well as for identifying synergies and conflicts with other interests in society. In the Council's view, efforts to develop the strategies should continue.

MORE EFFICIENT ENERGY USE AND TRANSPORT

The Environmental Objectives Council supports the Strategy for More Efficient Energy Use and Transport, as further developed by the Swedish Rail Administration, the Swedish Energy Agency, the Swedish Civil Aviation Authority, the Swedish Environmental Protection Agency, the Swedish Maritime Administration and the Swedish Road Administration, including the policy instruments proposed in that context.

The Council considers that powerful policy instruments are needed to change current trends in the transport and energy sectors. To achieve long-term environmental goals, including *Reduced Climate Impact*, more efficient technologies, renewable energy and pollution abatement equipment are not enough. It is also necessary to change people's behaviour. The Council emphasizes in particular that, even if the policy instruments now proposed look as if they will be sufficient to meet the interim targets for 2015 and 2020 covered by the strategy, further instruments will be required to attain the environmental quality objectives themselves.

The Council gives priority to a general increase in energy efficiency. This should be achieved both through specific measures and at a system level.

The Environmental Objectives Council wishes to see greater use being made of renewable and non-depleting energy sources, such as solar and wind. These are the highest priority, followed by biomass, which has considerable potential. Renewable energy is given priority over other carbon dioxide-efficient energy sources that are not sustainable.

The Council believes that, in the shorter term, end-of-pipe abatement technology must be used to reduce

nitrogen and sulphur emissions, with a view to meeting the acidification and eutrophication objectives. This is particularly true in the shipping sector.

The Council emphasizes that such measures could likewise help achieve *Clean Air*, but that for that objective additional action will also be required. As far as air quality is concerned, it is of particular importance *where* emission reductions are brought about. Targeted measures to tackle noise from transport are also needed to meet the objectives.

The Environmental Objectives Council proposes some 50 new or modified policy instruments in the framework of this strategy, with a view to achieving the measures given priority. These proposals identify what issues Sweden should be pursuing internationally, what central government can do and, to some extent, what can be done by local authorities. The aim is to create a good basis for the private and public sectors to act in accordance with the environmental objectives, thereby paving the way for system change. Economic instruments are seen as the main priority, but they need to be supplemented with administrative, information and other instruments.

The policy instruments proposed include:

- Instruments to improve energy efficiency in industry, housing and services; in road transport of passengers and goods; through transport-efficient urban development and infrastructure; and in the aviation, shipping, rail and mobile machinery sectors.
- Instruments to reduce climate impact, by increasing the share of renewable energy in the supply of electricity, heat and transport fuels.
- Instruments to improve abatement of nitrogen oxide emissions from stationary sources, road transport and mobile machinery, and to reduce nitrogen and sulphur oxide emissions from shipping.
- Additional instruments for measures to reduce concentrations of air pollutants by cutting emissions from small-scale burning of wood and from transport.
- Instruments for measures to reduce transport noise.

The strategy sets out the changes to policy instruments that are needed to limit the environmental impacts of the transport and energy sectors, with a view to achieving the environmental quality objectives *Reduced Climate Impact*, *Clean Air*, *Natural Acidification Only*, *Zero Eutrophication* and *A Good Built Environment*. It will also help to meet transport and energy policy goals. The strategy has an international perspective throughout, reflecting the fact that international cooperation will be a major factor in attaining the environmental objectives addressed.

NON-TOXIC, RESOURCE-SAVING ENVIRONMENTAL LIFE CYCLES

The Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles should primarily be designed to help meet the interim targets under the environmental quality objectives *A Non-Toxic Environment*, *A Protective Ozone Layer*, *A Safe Radiation Environment*, *Zero Eutrophication* and *A Good Built Environment*. Several aspects of and interim targets set under *Reduced Climate Impact* and *Good-Quality Groundwater* also fall within its scope.

The Environmental Objectives Council supports the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles and the proposals for policy instruments developed within it. In ongoing efforts to achieve the objectives, the Council believes that the life-cycle principle has a crucial part to play, in the sense that what we extract from nature needs to be reused and finally disposed of in a resource-efficient manner, without harm to the natural environment. In the Council's view, many of the instruments and measures proposed in the framework of the in-depth evaluation can be implemented without further delay.

Several key measures put forward have to do with establishing effective rules and securing good compliance with environmental legislation. Proposals of particular importance relate to waste management, single-household sewage systems and chemicals.

A number of proposals in the strategy are concerned with introducing new regulations and standards to reduce the use of dangerous substances in products. The Council's assessment is that, for the objectives

covered by the strategy that are particularly difficult to achieve, it is essential to change patterns of production and consumption, not only in Sweden, but internationally. It is proposed that Statistics Sweden should be commissioned to develop indicators to measure the environmental impacts of Swedish consumption in other parts of the world.

The Environmental Objectives Council believes that the overall adverse environmental impacts of the food supply chain and the construction sector remain very significant, and that there consequently needs to be a greater focus than before on reducing them. Here, the Council proposes that the central government agencies responsible for the construction, property and civil engineering sector and for the food sector should have a clearer overall responsibility for improving environmental performance. The Council also calls for an increased commitment to promoting resource efficiency, through measures to reduce waste in the food chain. In addition, it wants to see more extensive guidance to supervisory authorities on how the Environmental Code's provisions on conserving raw materials and energy and on reuse and recycling should be applied, in particular in the construction, property and civil engineering sector.

The Council proposes a range of measures which the public sector should implement in order to set an example in the environmental field. In particular, central government, local authorities and county councils need to apply clear environmental criteria when purchasing goods and services.

The Council considers that major gains in efficiency can be achieved through closer coordination between the authorities affected by the strategy. It calls for the desired inter-agency cooperation in the framework of the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles to be made clear by means of a joint brief to a number of central government agencies to develop effective environmental measures, based on the same approach as under the other two strategies. As work on this strategy has progressed, three areas of cooperation have emerged with particular clarity: the regulatory frameworks for products, chemicals and waste; collaboration within the food supply chain; and cooperation in the construction, property and civil engineering sector.

The Environmental Objectives Council believes that, in order to attain the objectives, there is a need for more new knowledge than is being generated at the current pace of work within Sweden's borders. The Council proposes that state funding for capacity building and research should have a clearer focus on helping to build a sustainable society in which the environmental quality objectives are achieved. It also calls on the Government to commission a feasibility study on establishing a knowledge centre whose aim would be to speed progress towards sustainable production and use of chemicals.

MANAGEMENT OF LAND, WATER AND THE BUILT ENVIRONMENT

The Strategy for the Management of Land, Water and the Built Environment is concerned with conserving biodiversity and valuable cultural environments, protecting human health and, through environmentally sound land use planning, achieving sustainability in built development and infrastructure. The strategy chiefly has a role to play in attaining the environmental quality objectives *Flourishing Lakes and Streams*, *Good-Quality Groundwater*, *A Balanced Marine Environment*, *Flourishing Coastal Areas and Archipelagos*, *Thriving Wetlands*, *Sustainable Forests*, *A Varied Agricultural Landscape*, *A Magnificent Mountain Landscape*, *A Good Built Environment* and *A Rich Diversity of Plant and Animal Life*. In addition, it is intended to help achieve elements of the objectives *Reduced Climate Impact*, *Natural Acidification Only*, *A Safe Radiation Environment* and *Zero Eutrophication*.

The Environmental Objectives Council supports the Strategy for the Management of Land, Water and the Built Environment, including the measures and policy instruments proposed by the agencies involved: the Swedish Environmental Protection Agency, the National Board of Housing, Building and Planning, the Swedish Board of Fisheries, the Swedish Forest Agency, the Swedish Board of Agriculture, the National Heritage Board, the National Board of Health and Welfare, the Swedish Energy Agency and the Swedish Road Administration.

The Council believes that, in order to meet the environmental quality objectives, land, water and resources must be used with due consideration for the ecosystems concerned, and taking into account the natural and cultural values of the landscape. Additional measures and new policy instruments are required. The strategy's focus on planning, stewardship and protection creates a good basis for greater sectoral integration and collaboration between business, central government agencies and local authorities. To ensure that the environmental objectives more clearly shape Swedish society, the strategy should be used as a platform for developing methods of valuing ecosystem services, biodiversity and cultural heritage, and for striking strategic balances on different scales in the landscape.

The Environmental Objectives Council also notes that expected changes in climate represent major challenges for the sustainable management of natural resources, land, water and the built environment. To achieve the climate objective, there needs to be a shift to renewable energy. Economic activities and resource use need to be adapted to a changing climate.

The Council highlights the importance of measures relating to planning, environmental stewardship, protection and restoration, and the dynamic links between them. The quality of planning and the degree of care shown in resource use affect what measures will be required to prevent uses with potential adverse impacts. With better environmental consideration and longer-term planning, requirements in terms of both protecting and restoring natural and cultural environments can be reduced.

The Council considers it imperative to develop and improve environmental stewardship in agriculture, forestry and fisheries, and in urban development and the infrastructure sector, to ensure that natural resources, land, water, and natural and cultural assets are used in a long-term sustainable manner.

The Council supports the level of ambition for the protection of natural and cultural environments proposed in the reports on the individual objectives. At present, the need for protection is considerable, and often ongoing management is also required to conserve biodiversity and cultural heritage in the longer term. In addition, there is a need for restoration and re-creation schemes, to recover lost functions or values in the landscape.

The Environmental Objectives Council calls for a strengthening of expertise in environmental and health issues in the context of land use planning. Regional planning needs to be developed so that structural issues can be resolved optimally in terms of the environment and resources. Long-term, environmentally sound planning is needed to define the direction of travel towards sustainable development.

The Council proposes additional central government funding for protection and restoration, and to develop good environmental practice in land use planning. To improve stewardship in agriculture, forestry and fisheries, economic as well as administrative and information instruments are proposed. Here, the Rural Development Programme is important, as is advice in support of voluntary undertakings by different stakeholders.

The Council also considers that more use needs to be made of policy instruments that prevent environmental problems by involving operators and consumers. Attention should be drawn to the importance of consumption for sustainable resource use, partly through targeted instruments to improve environmental awareness in private and public consumption.

RESEARCH RESULTS MUST LEAD TO ACTION

The background reports to the in-depth evaluation have identified a number of gaps in existing knowledge. Where knowledge is in fact available, it also has to be put to work and turned into effective environmental policy measures. Strategic investments in research will improve the prospects of swifter progress towards the environmental objectives. Sweden should learn more from other countries' experience of translating research results into action.

Who is responsible for action for a better environment?

OBJECTIVES HAVE LED TO MORE EFFECTIVE ENVIRONMENTAL ACTION ACROSS SOCIETY

The Environmental Objectives Council's overall assessment is that efforts to achieve the environmental objectives have developed positively, and that they have helped to enhance the sum total of environmental action in Sweden. The process has led to stronger partnerships both between public agencies and, to a certain extent, with the business sector and other stakeholders. Views of sustainable development have evolved, and environmental concerns are now better integrated into society. At the same time, there are calls for even closer coordination and cooperation on environmental issues at every level. The pursuit of the environmental objectives is a major collaborative undertaking which, to be effective, requires a high degree of coordination. The Council accordingly views investments of resources to that end as money well spent, and believes that the necessary coordination should be sought throughout the environmental objectives system.

With regard to follow-up of progress, the division of roles among the agencies with lead responsibility for individual objectives has been developed and improved. Work on the three action strategies has also enhanced cooperation in defining the measures needed to meet the objectives. However, it would be useful to further clarify questions of responsibility for proposing measures, and also for assisting county administrative boards with regional implementation of the environmental objectives.

The special sectoral responsibility for the objectives given to a number of government agencies has been successfully integrated into the environmental objectives system as a whole. The Council sees no need for significant changes in this respect. It does, though, want the Government to review which authorities should have this special responsibility, and to make it clear that it comprises follow-up, development and implementation. The agencies in question should continue to be involved in developing the action strategies.

Although working towards the environmental objectives has enhanced regional cooperation between authorities, and promoted a better understanding of what constitutes sustainable development, the objectives need to be even more clearly integrated into sustainable development policy. The Environmental Objectives Council considers that both county administrative boards and regional development councils should make greater use of regional environmental goals when elaborating regional development and growth programmes and structural fund programmes. It is important to make sure that, at an early stage in business development and infrastructure initiatives, possible impacts on the environment are properly considered. County administrative boards and other agencies of central government need to coordinate their efforts even better, to ensure a more coherent dialogue.

STRENGTHEN REGIONAL IMPLEMENTATION OF THE OBJECTIVES

The Environmental Objectives Council's assessment is that, in many respects, regional action to achieve the environmental objectives has been successful, and that the county administrative boards are a significant driving and coordinating force in that context. Nevertheless, the Council believes there is a need to strengthen joint regional initiatives and to ensure greater support from national agencies. Many authorities and other stakeholders point to inadequate resources as a limiting factor for the contributions county administrative boards are able to make. The Council proposes that the Government should look more closely at ways of improving regional implementation, and of developing the roles, responsibilities and powers of county administrative boards with a view to meeting the objectives.

LOCAL AUTHORITIES COULD GIVE A CLEARER LEAD

The Environmental Objectives Council believes that local authorities have an important part to play

in securing progress towards the environmental objectives. Translated into local goals and measures, national and regional objectives could provide more effective tools for local policymaking. The Council feels that, at present, municipalities are failing to lend sufficient weight to environmental objectives and issues in their policies, and that they could assume greater and clearer responsibility for local initiatives to attain such goals. Many of the measures needed to meet the environmental quality objectives are the responsibility of local authorities, and several of the instruments available, in particular spatial planning and supervision, are also in their hands. Authorities themselves call for improved expert support and guidance to enable them to give effect to the objectives in their areas. Consequently, the Council calls on the Government to clarify questions of responsibility, so that local authorities are able to implement the environmental objectives in an effective and forward-looking manner. Small authorities may need special support to enable them to fully discharge their responsibilities.

BETTER INTEGRATION OF THE OBJECTIVES IN THE BUSINESS SECTOR

In general, Swedish business is engaging increasingly actively with environmental issues, using environmental management systems as its principal tool. However, the Environmental Objectives Council feels that this sector ought to be able to make much greater use of the environmental objectives.

Networks and forums for dialogue on these goals between authorities and companies need to be established and strengthened, to promote a better understanding of the differing basic assumptions shaping environmental efforts in the two sectors. In this way, environmental issues can be taken forward. Experience of using the objectives in environmental management systems could be passed on, both within the business community and to public agencies. Companies could also, to a greater degree, give prominence to the link between 'environment and business', and contribute knowledge and initiatives which demonstrate that systematic attention to the environment makes economic sense, both for businesses and for society at large.

INDIVIDUAL CHOICES MATTER

Individual citizens can make major contributions to attaining the environmental objectives, both as consumers and as shapers of public opinion. To be able to do that, they need to be aware of what the objectives entail and what difference their own actions will make. The Council therefore wants to see even more attention paid to the importance of communicating environmental issues, to put all consumers in a better position to act and live more sustainably. The voluntary activities of environmental NGOs and others are of great significance in creating wider understanding of the various efforts required to meet different environmental objectives. The Council calls for environmental and sustainability issues to be given more space at all levels of education, and for particular attention to be paid to the need for continuing education for teachers in this area.

POLITICAL RESOLVE IS ESSENTIAL

To bring about sustainable development of infrastructure, production and consumption, there needs to be a major reorientation of society, across a wide spectrum of policy areas. The decisions needed to make that happen are not always popular, and the process will require firm resolve at all political levels. Conflicts of interest will have to be addressed, to enable the objectives set by politicians, and ultimately by citizens, to be achieved. It may need to be made clear whether certain objectives, such as those relating to the environment, take precedence over others. Otherwise, resolving the conflicts that arise could prove difficult.

MAKE MORE OF THE OBJECTIVES INTERNATIONALLY

Progress towards Sweden's environmental objectives will depend to a large degree on solutions reached at an international level. Many problems can only be tackled on the basis of international agreements.

More use could be made of the national environmental quality objectives in international cooperation and at the EU level, both as drivers of the action taken and as an approach to tackling environmental issues.

The Environmental Objectives Council's assessment is that the interim targets can define the direction of environmental efforts in Sweden, while also speeding the transition to sustainability beyond the country's borders. The Government could make greater use of the environmental objectives as a starting point for negotiations, in the EU and internationally. The Council takes the view that interim targets associated with the objectives should as far as possible be set on the basis of international agreements, although they can also go further.

The environmental objectives have very significant international dimensions. In many cases, their achievement will only be possible if steps are taken to reduce emissions and other environmental impacts in other countries. At the same time, production and consumption in Sweden affect the environments of other nations. Key concerns here are to avoid exporting environmental problems; to appreciate that Swedish environmental initiatives to meet the objectives can also offer a competitive advantage internationally; and to change consumption patterns, both in Sweden and abroad. The Council calls for a study of ways of making visible the objectives' international dimensions and incorporating them in the environmental objectives system.

At the international level, Sweden should underscore the importance of its approach of integrating the environmental objectives into all policy areas, through sectoral responsibility and regional and local authorities. In particular, it should seek to promote such sectoral integration within the EU. The Council calls on the Government and government agencies to inform others about Sweden's system of environmental objectives in a variety of contexts, and above all in conjunction with the Swedish EU Presidency in autumn 2009.

OBJECTIVES REPRESENT THE ENVIRONMENTAL DIMENSION OF SUSTAINABLE DEVELOPMENT

The overarching environmental policy goal of Sweden's Parliament and Government is to hand over to the next generation a society in which the country's major environmental problems have been solved. The environmental quality objectives, adopted by the Riksdag with broad, cross-party support, represent the environmental dimension of sustainable development, and are formulated on the basis of the environmental pressures which people and nature can withstand. They define the state of the Swedish environment which efforts in this area should have as their goal. The environmental quality objectives, and the associated interim targets, are thus the ultimate statement of priorities for action to safeguard the environment in Sweden, and that action should be geared to attaining them. The objectives should guide environmental efforts, both in different sectors of society and at various levels in the public sector.

How much will it cost?

BENEFITS WILL OUTWEIGH THE COSTS

The Environmental Objectives Council makes the assessment that the economic benefits of taking action to achieve the environmental quality objectives, as proposed in this report, will, overall, outweigh the costs. The benefits are often difficult to quantify, but the estimates that have been made, in both economic and qualitative terms, suggest that implementing the proposed measures will be economically efficient. Assuming that these environmental investments strengthen the economy, long-term growth will be greater than it would have been if the money spent on them had been saved. A number of studies show that the costs associated with failing to act, on the other hand, will be very high.

On top of the just over SEK 8 billion a year which measures to attain the environmental objectives currently cost central government, the additional action proposed will entail another SEK 5–10 billion in annual state spending, depending on how policy

instruments are designed. Over and above that, there will be a cost to other sectors of SEK 10–15 billion. The total bill to the economy for the new proposals will thus end up at around SEK 20 billion.

At present, local authorities and companies spend some SEK 30 billion a year on environmental protection, in addition to the SEK 8 billion invested by central government. The overall annual cost to the economy of efforts to meet the environmental objectives thus currently stands at almost SEK 40 billion. The combined cost of existing and proposed measures is accordingly estimated at some SEK 60 billion, or around 2% of GDP. That corresponds to roughly the revenue already being raised by environmental taxes.

DEVELOP IMPACT ASSESSMENTS

The Environmental Objectives Council proposes that resources should be made available to develop models that can form a basis for high-quality impact assessments in the environmental sphere. The Council also considers that the relevant agencies' expertise in environmental economics and, specifically, analysis of the cost-effectiveness and economic impacts of measures to achieve a better environment needs to be strengthened. This should be done to ensure that the information on which decision-making related to the environmental objectives is based better meets the formal requirements of the budget process.

CHAPTER 1.

The Environmental Objectives Council's brief

1.1 Terms of reference for the evaluation

This is the Environmental Objectives Council's second in-depth evaluation of the environmental quality objectives. It is intended to provide the basic analysis required for the Swedish Government's in-depth evaluation of the system of environmental quality objectives and for the Government's Environmental Objectives Bill. The first evaluation, *Sweden's Environmental Objectives: A Shared Responsibility*, was presented to the Government in February 2004 and formed a basis for Government Bill 2004/05:150. It provided an initial picture of how the process of implementing the objectives was developing.

In the Swedish Environmental Protection Agency's appropriation directions for 2006, the Environmental Objectives Council was entrusted by the Government with the task of submitting the analysis needed for the Government's second in-depth evaluation of the environmental quality objectives. According to the terms of reference, this analysis was to include proposals for new and revised interim targets and for measures to achieve the objectives. The proposals put forward were to be accompanied by an appraisal of their economic, environmental and social impacts. The analysis for the in-depth evaluation was to be coordinated with the preparation of a background report for 'Checkpoint 2008', a review of Sweden's climate objectives and climate strategy, which were adopted by the Riksdag in its climate policy decision of 2002. Such 'checkpoints' are to occur at four-yearly intervals. The Council's analysis for the in-depth evaluation of the environmental objectives was to be submitted to the Government by 1 April 2008.

It is the Environmental Objectives Council's intention that the present report should provide added value in relation to the background material on which it is based. The latter consists primarily of evaluations of the individual objectives and reviews of the three action strategies. The Council's report sets out to answer the following questions:

- Can the environmental quality objectives be achieved by 2020? What does achievement of these objectives in fact entail?
- Will the new and revised interim targets, policy instruments and measures now being proposed by the Council be sufficient to reach the objectives? If not, how far short of the objectives will they leave us? How large is the 'gap'?
- How effective are the efforts being made to achieve the environmental objectives, and what benefits and costs to society do they entail?

1.2 Guide to the reader

The conclusions and proposals set out in this report are based chiefly on the background reports from the agencies represented on the Environmental Objectives Council. In addition, conclusions from development projects funded by the Council have been used. Other background material has also been drawn on to a certain extent. No references are given in the text to the various reports commissioned by the Council; only where other material has been used will specific references be found.

The Environmental Objectives Council stands behind the whole of this report, which – in terms of its assessments, conclusions and proposals – is to be read independently of the evaluations of individual objectives. The proposals presented here do not correspond in every respect to those put forward in the background reports. This is because:

- The Council has made an overall assessment of the proposals for new and revised interim targets. As a result, the wordings of targets presented here do not entirely agree with those found in the reports on individual objectives.
- The Council has similarly made an overall assessment of the measures and policy instruments put forward in the background reports. This report presents the proposals judged to be most effective in achieving the environmental quality objectives. A full list of proposed measures can be found

in Appendix 1, which is published in Swedish Environmental Protection Agency Report 1268.

- Included as an integral part of this report is the Council's annual review of progress towards the environmental quality objectives. In certain cases, new data or new circumstances have arisen in the course of this review, affecting the assessments made of the prospects of success, compared with those set out in the background reports. The most recent assessment is thus to be found in the present report and on the Environmental Objectives Portal.

For more detailed information on each of the environmental quality objectives, readers are referred to the reports on the individual objectives, some of which are provided with summaries in English. Those reports describe trends in the environment and the background to and reasons for the revised and new interim targets proposed. They also evaluate action to achieve the objectives, and propose policy instruments and measures to attain the interim targets and environmental quality objectives, with accompanying impact assessments. All the background material for the present report can be found on the Environmental Objectives Portal, www.miljomal.nu.

In all, this report is based on some 7,000 pages of text, which have been analysed and combined into a single, comprehensive assessment.

1.3 How the Council works

The Environmental Objectives Council was established by the Government on 1 January 2002 to promote consultation and cooperation in implementing the environmental quality objectives laid down by the Riksdag. The Council's functions are defined in the Government's instructions to the Environmental Protection Agency:

'The Environmental Objectives Council shall

1. on an annual basis, review, assess and report to the Government on overall progress towards the environmental quality objectives and on regional efforts to attain them,
2. prepare and submit the analysis required as a basis for the Government's recurring in-depth evaluation of efforts to achieve the environmental objectives, including an economic assessment of those efforts, analysis of any conflicts of goals, and impact-assessed proposals for cost-effective measures and policy instruments,
3. assume responsibility for overall information on the environmental objectives and progress towards them,
4. promote overall coordination of the regional application of the environmental quality objectives,
5. allocate necessary funding for monitoring of progress towards the environmental quality objectives, environmental monitoring, and some reporting at the international level, and
6. consult with the authorities concerned and provide them with the guidance they need for their reporting on the environmental objectives.'

(Ordinance 2006:1151)

The members of the Council are appointed by the Government for a specific term and consist primarily of heads of government agencies responsible for particular objectives or sectors. One county governor is also included. A maximum of 18 members are appointed. In addition, the Environmental Protection Agency may appoint up to six experts (representing local authorities, county councils, environmental organizations and the business sector), who assist the Council in its assessments. The Agency has appointed five such experts. The Council is served by a Secretariat based at the Environmental Protection Agency.

Implementing the environmental objectives is one of Sweden's biggest collaborative endeavours. A good deal of coordination is needed to arrive at overall assessments of the prospects of attaining the objectives and of the additional action required. To support this coordination, the Environmental Objectives Council has established two working groups.

Representatives on these groups are chosen by the Council's members and experts.

Through a process of consultation and guidance, the Council receives from the relevant agencies the information it needs to report to the Government in line with its obligations. The agencies with lead responsibility for individual objectives or broader, cross-cutting issues related to the objectives, along with most of the agencies with special sectoral responsibility for the objectives and the county administrative boards, are required by their instructions or appropriation directions to report on their work on the environmental objectives in accordance with guidelines from the Council.

These guidelines set out what the background reports from lead agencies, special sectoral agencies and county administrative boards are to contain. They also indicate the procedures to be followed in terms of collaboration and reporting dates. An important element in the overall process has been the further development of the three action strategies, which a number of agencies have been jointly commissioned to undertake. The Environmental Protection Agency is responsible for administrative coordination of the Strategy for More Efficient Energy Use and Transport and the Strategy for the Management of Land, Water and the Built Environment. In addition, it has sole responsibility for the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles, although here the work has been undertaken in collaboration with other relevant authorities. Work on the three action strategies has been organized in different ways. In accordance with the guidelines, the results have been reported to the Environmental Objectives Council. These strategies are described in Chapter 6.

One of the Council's working groups, the Progress Review Group, considered and commented on the basic material for this comprehensive assessment of the environmental objectives and progress towards them. On three occasions during that process, meetings were held at which the group was expanded to include additional participants from Council organizations and sectoral agencies. In addition, a number of seminars and workshops were arranged to consider issues specific to particular objectives or strategies.

1.4 Lessons learnt from the 2004 in-depth evaluation

Following the in-depth evaluation of 2004, the Swedish National Audit Office conducted an audit of the process of reporting on the environmental objectives. In addition, the Environmental Objectives Council itself commissioned an external evaluation of the procedures involved. The National Audit Office found that, in certain key respects, reporting on the objectives fell short of the guidelines for follow-up laid down by the Riksdag and the Government. It identified inadequacies in the way the drivers of environmental problems were described. The Office also noted the lack of an overall description of measures to achieve the objectives and of the costs involved, an overall assessment of what initiatives would be most effective in attaining the objectives, and estimates of the effects on the national economy and government finances. Furthermore, it pointed out that existing reporting did not provide a sufficient basis for developing scenarios and forecasts. The National Audit Office made recommendations to both the Government and the Environmental Objectives Council as to how reporting could be improved, among other things in terms of the overview it provided, estimates of what different measures would cost the state and the wider economy, and analysis of possible conflicts between the environmental quality objectives and other policy goals adopted by the Riksdag. The Office also took the view that the status of the Council and its real scope to coordinate reporting needed to be reviewed. The Environmental Objectives Council's own external evaluation, too, pointed to a need for a closer look at the Council's organizational position and staffing, to establish whether any changes were necessary to facilitate further development of the processes involved. This was to be done with a view to striking an appropriate balance between aims and resources.

In all essential respects, the recommendations of the National Audit Office and the external evaluation were followed in preparations for the present in-depth evaluation. The functions of the Environmental Objectives Council were clarified with respect to the content of the reports to be submitted. The reporting required of the various agencies was defined more precisely in appropriation directions and instructions, especially as regards costs and impact assessments. When the background reports for the present evaluation were commissioned, emphasis was placed on their putting forward impact-assessed measures and associated policy instruments for achieving the objectives, and on their specifically considering synergies and conflicts between environmental quality objectives and other goals of society. The resources available for the evaluation were enhanced with the appointment by the Environmental Protection Agency of coordinators for the three action strategies.

1.5 How the evaluation was carried out

Evaluations of the individual environmental quality objectives were undertaken in different ways at the various agencies concerned. These ranged from an approach based on broad involvement of other parties, in the case of the objectives *Sustainable Forests* and *A Safe Radiation Environment*, to a method of working confined chiefly to the lead agency in question. All the reports on specific objectives were sent out for consultation over the period May–August 2007. The choice of the summer months for the consultation exercise has attracted criticism, as has the circulation of a large body of material at the same time. It has been suggested, moreover, that the reports from the agencies with special sectoral responsibility for the objectives should also have been consulted on.

The evaluations of individual objectives are generally very thorough as far as follow-up of the state of the environment is concerned. Most of them, however, lack evaluations of the effectiveness of action to implement the objectives in society as a whole. The Council's Secretariat has drawn attention to shortcomings in the reports and requested certain additional information. Unfortunately, there has not been time to obtain all the supplementary material needed to fill the gaps, for example in the form of better impact assessments and appraisals of synergies and conflicts between environmental quality objectives and other policy goals.

The Environmental Objectives Council has coordinated the in-depth evaluation of the environmental quality objective *Reduced Climate Impact* with the basic analysis for the review of Sweden's climate policy (Checkpoint 2008), in the sense that the latter has also served as the basic analysis for the environmental quality objective. The measures proposed in the checkpoint report have been incorporated into the Strategy for More Efficient Energy Use and Transport. The Council proposes the introduction, under *Reduced Climate Impact*, of an interim target for the medium term that is in line with the Climate Committee's proposals.

As part of the background material for the Environmental Objectives Council's report, trend analyses and futures studies were used as a tool for assessing the prospects of achieving the environmental quality objectives. To give everyone concerned access to the same basic forecasts, a reference scenario was elaborated. This describes what the future is expected to look like if current trends and policies remain substantially unchanged. In addition, four exploratory scenarios were developed in the form of a 'scenario cross', as a complement and balance to the reference scenario forecasts. These scenarios were based on two different dimensions: 'degree of regulation', and the relative strength of 'ligatures' (local allegiances or bonds) and 'options'. Trends in society and the wider world varied along these two dimensions, from a low to a high degree of regulation and from strong 'ligatures' to a strong preference for 'options'. Further information on this scenario approach can be found in the report *Att använda scenarier – förslag till långsiktigt miljömålsarbete* (Using scenarios – proposals for long-term progress towards the environmental objectives, in Swedish), from the Royal Institute of Tech-

nology in Stockholm. Using scenarios has proved a valuable mental exercise, encouraging more open thinking about the future, which is important when it comes to identifying, for example, what measures need to be implemented. The method has been used in different ways in the evaluations of individual objectives. The intention was for the scenario-cross approach to be used primarily by the agencies with lead responsibility for objectives and in the development of the action strategies.

1.6 Evaluation methods and futures studies

During 2008 the Environmental Objectives Council will be commissioning a review of the present in-depth evaluation exercise. A comprehensive assessment of the sum total of efforts to attain Sweden's environmental quality objectives, undertaken on a single occasion, demands considerable time and resources. At the same time, it generates a large and detailed body of data that provides an overall picture of the prospects of meeting the objectives. Before the Council's next in-depth evaluation, which is probably to be submitted in 2012, there is cause to review the methods to be used in carrying it out.

In the evaluations of the environmental quality objectives performed to date (reported in 2004 and 2008), the agencies responsible have focused on assessing the state of the environment in relation to the objectives. To provide a fuller picture of the chances of reaching the objectives, this approach needs to supplemented with evaluations focusing more on what society as a whole is doing to achieve them. For the purposes of the next in-depth evaluation, moreover, it is important to look beyond 2020, as the current assessment is that many of the environmental quality objectives will not be met by that date. It is thus all the more important to use futures studies as a basis for the evaluations, and to clearly define responsibilities for such studies within the agencies concerned, to ensure that the necessary resources and expertise are made available for them.

CHAPTER 2.

The environmental objectives in a changing world

2.1 A world in flux

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that massive action is required, both nationally and in international cooperation, to meet Sweden's national environmental quality objectives and achieve development that is sustainable in the long term. In a range of areas, current trends must be reversed. Combating climate change, which has a bearing on all the objectives, is particularly urgent.

▶ **THE COUNCIL SHARES** the conclusion drawn by the Swedish Commission on Climate and Vulnerability that the country needs to start adapting to climate change without delay. A government appropriation for climate adaptation should be set up to support large-scale, costly initiatives. The Council intends, on a comprehensive basis and with the environmental quality objectives as the starting point, to analyse and report on how climate change will affect the environment.

▶ **THE COUNCIL CONSIDERS** that regularly updated monitoring of developments in Swedish society and the wider world, which can be jointly used by government agencies responsible for the various environmental objectives and sectors, is required in the process of implementing the objectives.

Structural changes in society are affecting Sweden's chances of meeting all the environmental quality objectives. The world's population continues to grow. People are increasingly settling in urban areas; this entails regional expansion and, at the same time, depopulation of rural areas. An accelerating rise in consumption is tending to shift more towards services and 'experiences', at least in the Western lifestyle. All modes of transport show continuing growth, but future IT systems may affect this trend to some extent. Along with the transport sector's increased energy needs, the energy supply of the future and the question of which energy sources we can use are the great challenge. Here, no definite trends are discernible today, although major initiatives to develop renewable options are in progress. That climate change has an impact on primary sectors is clear in agriculture, forestry and fishing alike. Environmental issues in the business sector are heavily influenced by legislation on chemicals (REACH, the EU chemicals management system). Another key factor is the potential for eliminating dependence on fossil fuels. New technologies that are making rapid inroads into our lives will also affect the way ahead. One example is nanotechnology, which will probably have numerous applications in the interfaces of physics, chemistry, biology and medicine. Growing interest in environmental technology and eco-friendly products, too, should affect developments.

The globalization process now under way involves threats but also opportunities for Swedish society, the Swedish environment and the environmental quality objectives. The potential outcome if current trends persist is crucial for every objective. The question of how to reverse certain trends is particularly important. The Environmental Objectives Council's assessments of whether the objectives can be met are based on existing forecasts and trends regarding the directions the environment and society are taking. But unexpected developments in the surrounding world may have major consequences that affect Sweden's prospects of fulfilling its objectives. It is hard to predict how the wider world will change and how this change will affect our progress towards the objectives. Futures studies therefore need to be used on a larger scale. Exploratory scenarios may serve as tools for influencing how society develops.

The effects of climate change are affecting all the environmental quality objectives. The Council shares the conclusion of the Swedish Commission on Climate and Vulnerability that the country needs to start adapting to climate change immediately. A government appropriation for climate adaptation could be set up to support large-scale, costly initiatives. The Council also considers that lead agencies for the environmental quality objectives should be given the task of analysing and reporting on a comprehensive basis, with the environmental quality objectives as the starting point, on how climate change will affect the environment.

Environmental issues and the contexts in which they are discussed have been progressively broadened. In a range of areas, it is becoming harder to grasp what the relevant factors are, what changes are taking place and what the effects of these factors and changes may be. Scenario techniques have been used in work to attain the environmental objectives, to identify trends in a few areas and developments with a particular bearing on our prospects of achieving the objectives. Here, the Council describes its overall view of changes in society and the wider world that are relevant to the objectives. These are dealt with more thoroughly for the various objectives in the separate evaluations and collectively, in terms of the various action strategies, in Chapter 6. To broaden and consolidate its view, the Council has used data from, first, the scenarios presented by the United Nations Environment Programme (UNEP) in its latest assessment of the worldwide state of the environment, *Global Environment Outlook: environment for development* (GEO-4), and, second, the Swedish Environmental Advisory Council's report *Tillväxt och miljö i globalt perspektiv* (Growth and the environment in a global perspective).

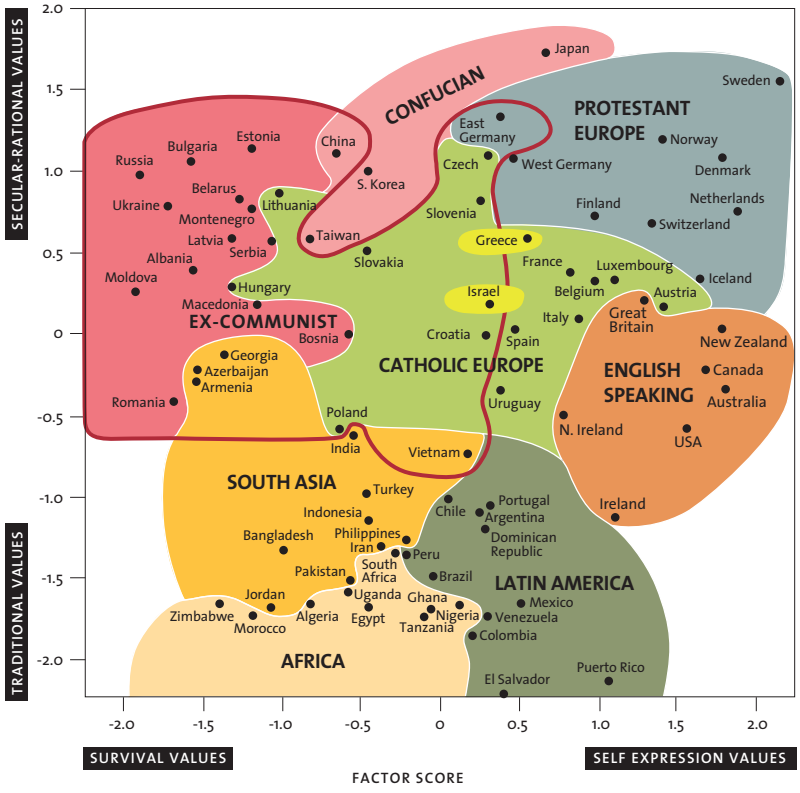
2.1.1 THE ENVIRONMENTAL DIMENSION OF SUSTAINABLE DEVELOPMENT

Globally, in the EU and for Swedish policy, sustainable development is the overarching aim. The definition of sustainable development used by the United

Nations is contained in the Brundtland Commission's 1987 report *Our Common Future*: 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

One precondition for sustainable development is that every political decision should be such as to balance economic, social and environmental repercussions in a long-term perspective. This kind of integrated approach rests on an understanding that environmental protection is the foundation of a sound economy and social justice. What is good for people and the environment is also, in the long run, good for the economy. The environmental quality objectives define the environmentally sustainable dimension of sustainable development. The Swedish Environmental Advisory Council's conclusion from its future-oriented study is that nature's capacity to provide us with the services that are in demand now and in the future will fail. The question is then whether there are ways of making the interplay between our species and the environment more workable, so that prosperity can continue to grow without erosion of the biological subsistence base for future generations. Is it possible, sufficiently fast, to bring about the massive increase in efficiency and develop the new solutions that are required? Justice and morality in relation to the environment and sustainable development are vital issues. In a growing number of contexts, reference is made to the environmental impact caused by our Western lifestyle and consumption in the parts of the world where production is increasingly taking place. One effect of this is that the rich nations export their environmental problems when environmentally destructive production expands in the developing countries.

FIGURE 2.1 Cultural map of the world showing that Sweden has the most independent and secularized population in the world



SOURCE: INGLEHART-WELZEL CULTURAL MAP OF THE WORLD (WWW.WORLDVALUESSURVEY.ORG)

According to this cultural world map, Sweden's position is extreme by global standards. It is characterized as the country in the world that has the most critical, questioning population, where citizens are driven by the desire for self-expression. According to Inglehart and Welzel, transnational variations of value shifts can be explained, broadly, in two dimensions. One is traditional values versus 'secular-rational' values: this reflects the contrasts between societies where religion and traditional family patterns are important and those where they are less important, societies with secularized, non-authoritarian (rational) values, which have a diametrically opposite view.

The second dimension is connected with the transition from an industrial to a post-industrial society. There, the polarization is between survival values and self-expression values. The priorities shift from an emphasis on economics and material values to a greater emphasis on quality of life and self-expression.

2.1.2 ECONOMIC GROWTH AND SHIFTING VALUES

Economic trends are affecting the prospects of achieving the environmental quality objectives. According to UNEP, there has been a tremendous surge in economic growth worldwide over the past 20 years. Growth forecasts indicate that the global economy may treble or quadruple in size during the next half-century. Economic development in China, India, Brazil, South Africa and Mexico is extremely rapid, and China's economy is expected to become the world's largest between 2025 and 2035. To a high degree, economic development and the rise in prosperity have been attained at the expense of ecosystems. If development is not combined with sustainable management of the ecosystems on which it is based, our social and economic well-being will also be affected.

According to Inglehart and Welzel's study, almost every society that has attained industrialization subsequently develops into a knowledge society. A society of this kind then moves in a direction from survival values to more emphasis on self-expression values. In the increasingly globalized world, the Western lifestyle is becoming accessible to a growing number of people, and this boosts growth. Simultaneously, Western society is undergoing a value shift towards an economy with more emphasis on services and 'experiences' – and it is not self-evident that this entails less resource consumption.

2.1.3 DEMOGRAPHIC TRENDS

The swelling global population is one of the key reasons for the increasing pressure on natural resources. The world now has three times the population it had at the beginning of the 20th century. In the past 20 years, the rise has continued – from 5 billion in 1987 to 6.7 billion in 2007. But there are wide variations from one continent to another, with the most rapid growth rate in Africa and West Asia while there is demographic stagnation in Europe. Despite this continuing global rise, there is nonetheless a slowdown in the annual growth rate, from 1.7% to 1.1% in the past decade. Europe's population is steadily ageing, and the population of Sweden is expected still to total just over 9 million in 2020, as it does now.

By year-end 2007, for the first time in history, more people worldwide were living in urban than in rural areas. In Sweden, densification of towns and cities, especially their centres, has been a planning trend in recent years, and one that looks set to persist. The largest cities and a few university towns have seen the most rapid population growth and are experiencing the heaviest development pressure. Well-managed urban areas may constitute part of the solution for bringing about sustainable development and enabling more environmental quality objectives to be met. At the same time, urban densification means that other regions are being depopulated and are characterized by stagnation or decline. This affects the objectives that depend on thriving rural areas and on natural assets and cultural values.

'Eco-refugees', i.e. people obliged to leave their homes because of environmental change, are a growing and increasingly clear trend. The UN estimates that in the mid-1990s, 25 million people worldwide had to flee from environmental degradation, and that close to 200 million inhabit risk zones. Natural disasters and the impact of environmental destruction on local ecosystems are among the primary reasons why people need to leave their homes. With climate change, the pressure on Sweden to receive eco-refugees will grow.

2.1.4 EXPANDING TRANSPORT DEMAND AND LONGER PRODUCT CHAINS

The Environmental Advisory Council's study stresses problems relating to long product chains from raw material to end consumer. Movements of raw materials and products are becoming larger in the globalized world. A growing number of products are manufactured in Asia, especially China. Raw materials are sourced around the world, and to an ever increasing extent from Africa. Not unexpectedly, these longer transport chains are affecting developments in the volume of transport. The Advisory Council's extrapolations indicate major

challenges in the future if trends for production and consumption, resource access and environmental impact continue unchanged.

The forecasts made to assess whether the environmental quality objectives will be met include increases in transport of people and goods alike, in all modes of transport. Concurrently, technology is being developed that affords ways to reduce emissions. But the anticipated increase in transport operations will offset the fall in emissions stemming from technological development. The growth of road transport is expected to continue, and shipping in and around Swedish waters has expanded rapidly and is expected to keep on increasing. A new forecast for the development of rail transport up to 2020 includes the estimate that total rail travel will increase by 50% by 2020, and air passenger transport is expected to expand globally by an average of 4.9% a year over the next 20 years. Companies in the modern transport industry currently face their biggest challenge ever, and there are many unanswered questions. Which fuels are most efficient? Which energy sources will be available in the future? Which engine systems are demanded by the customers? Solving one environmental problem does not necessarily mean that other problems are solved as well.

The transport industry is affected by the globalization of companies' production. Markets are increasingly international and product manufacturing is tending to be relocated in countries with low production costs. At present, we are seeing a rapid exodus of production to Asia and eastern Europe. One result of this is that transport activity is increasing. The continued 'containerization' of transport, too, contributes to the expansion of the transport sector worldwide. Simultaneously, advances in the IT and telecoms sectors are very rapid and there is no indication that the rate of innovation will slow down. Accordingly, developments in Internet and other services and in IT may come to counteract the expansion of transport and bring about a decrease in travel and other efficiency improvements that may yield large environmental gains.

2.1.5 INCREASED ENERGY NEEDS

Globally, demand for energy is expected to treble by 2050. One major challenge is to achieve a reduction in emissions of greenhouse gases and, at the same time, meet a rapid global increase in demand for energy. Achieving efficient energy use and developing renewable energy sources are crucial means of meeting the environmental quality objectives. According to the Swedish Energy Agency's long-term forecast for 2025, given present-day policy instruments combined with various assumptions, the supply of fossil fuels, biofuels and wind power is expected to increase, while hydroelectric power and waste heat will decrease slightly. No nuclear reactors are assumed to have been decommissioned by 2025. Renewable energy sources, such as biofuels, solar power and wind power, are expected to continue to represent a small proportion of the global energy supply. Simultaneously, demand for biofuels is rising markedly in large parts of the EU owing to the objectives adopted in European climate and energy policy.

Bioenergy can replace fossil energy sources, thereby mitigating the greenhouse effect, but cultivation of biofuels also requires resources in the form of land and water. Demand for forest biofuel has been met through more efficient use of by-products both from the forest industry and manufacturing and from forests in the form of felling debris ('lop and top'). The basic scenario drawn up for the in-depth evaluation assumes that the forest industry's needs of raw materials will not decrease and that the use of biofuels for energy production will increase. The forest industry considers the use of forest raw materials to be a vital issue for the future. Will these materials suffice and what will they be used for? The switch in society's energy supply from fossil fuels to other options has already prompted many discussions in the forest industry concerning the potential future role of forest raw materials as fuel.

The world's rainforests are being felled at an alarming rate, mainly because of the growing need for agricultural land. Simultaneously, forests and standing timber stocks in the temperate zones have increased, Sweden being no exception. In recent years, however, felling has been greatly stepped up

in Sweden as well, to a level now substantially higher than when the environmental quality objective *Sustainable Forests* was adopted. The continued increase in demand will probably improve the economic prospects of further intensifying forestry. The report issued by the Commission on Oil Independence in June 2006 states that it should be possible to increase forest growth by 15–20% in the long term through more efficient management, including fertilization and intensive forestry on part of the area.

2.1.6 PRIMARY SECTORS AND CLIMATE CHANGE

Many scenarios indicate massive future climate change with a heavy impact on, in principle, all the environmental quality objectives. The climate change currently under way may come to affect both agricultural production and biodiversity in the farmed landscape. A higher average temperature and increased precipitation are expected to influence the range of crops grown, the duration of the growing period and the damage to animals and crops that arises. Adapting land use to a changed climate may even conceivably affect biodiversity more than the climate change as such. Many people believe this to be true of biodiversity trends in Swedish forests. Longer growing seasons combined with the same or increased annual precipitation will probably result in more rapid forest growth. Over the next 30 years, an increment of some 4–12 million cubic metres of annual growth on forest land is expected as a result of climate change. Denser forests may come to require increased initiatives to preserve biodiversity.

Major ecosystem stressors, in such forms as escalating claims on biological resources, may be expected in the decades ahead. As the United Nations' 2005 Millennium Ecosystem Assessment shows, 'ecosystem services' are not being used sustainably and the capacity of ecosystems to produce bioresources and ecosystem services is being increasingly eroded. Many local and regional systems are thus increasingly vulnerable. Nature's capacity to recover and retain its quality is impaired when the system is subjected to disturbances. The Environmental Advisory Council is questioning what will happen to humankind, at the top of the food chain, if the whole food web below us is thinned out. Another question is whether society has the capacity to withstand such changes. According to UNEP, more than 1.3 billion people worldwide depend on fishing, forestry and agriculture for their livelihoods. These occupations account for nearly half of all job opportunities in the world. The challenge lies in using these resources sustainably. Demand for bioenergy from the farm and forestry sectors may generate new job opportunities, but biofuels also compete with traditional products from these industries. How these primary sectors develop in the future will affect prospects of achieving most of the environmental quality objectives. Most of all, it will affect *Natural Acidification Only*, *Zero Eutrophication*, *Flourishing Lakes and Streams*, *A Balanced Marine Environment*, *Flourishing Coastal Areas and Archipelagos*, *Thriving Wetlands*, *Sustainable Forests*, *A Varied Agricultural Landscape*, *A Magnificent Mountain Landscape* and *A Rich Diversity of Plant and Animal Life*.

Globally, changes in the habitats of plants, animals and other organisms have been the primary cause of biodiversity loss in the past 50 years. These changes are often associated with clearing of rainforest for farming purposes or replanting of old pasture land. The system of environmental objectives includes several objectives aimed at creating or preserving areas of high quality in terms of biodiversity. Examples are *Sustainable Forests*, *Flourishing Lakes and Streams*, *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*, *Thriving Wetlands*, *A Varied Agricultural Landscape* and *A Magnificent Mountain Landscape*. In the scenarios of farming trends up to 2020 issued by the Swedish Board of Agriculture, the conclusion is that the environmental load from agriculture will most probably decrease while, at the same time, natural and cultural assets become harder to preserve. Regarding cultural values, further structural rationalization may have an adverse impact, with continued pressure to improve land consolidation in the agricultural plains of southern and central Sweden and farms in forested areas becoming sparser.

The fishing industry and fish as a resource are of considerable importance to the global population.

Fish consumption per head has risen worldwide, and there are ample indications that the trend will continue and demand for fish will rise by 30% in the next two decades. Fish is an important protein source, especially for populations in the developing countries, and a dietary staple for more than 2.6 billion people. The ongoing overfishing in the world's oceans and along coasts thus poses a great threat to the whole global population. According to UNEP, the situation for several commercially important fish stocks has been critical for several years. In Sweden, the numbers of commercial fishermen and fishing boats are tending to decline, and this may help to reduce overfishing. On the other hand, the prospects of preserving and developing the cultural heritage assets associated with the fishing industry will then deteriorate. For many coastal and archipelago areas, commercial fishing is a necessary element in the preservation of their value as cultural heritage.

With rising prosperity, meat consumption increases. This in turn boosts the need for farmland and input goods for the increased animal production. Emissions of greenhouse gases and eutrophying substances increase with growing meat production and consumption. The challenge of developing effective ways to 'close the organic loop' by returning nutrients to farm soils remains.

2.1.7 THE CONTRIBUTION OF TECHNOLOGICAL DEVELOPMENT

Technological development is one of the most powerful global factors. Development in various technological fields will continue to exert a crucial influence on global society and economic trends. Here the challenge, above all, is to devise new technology, products and services, with little or negligible environmental impact, in the 'green sector'. In the long term, the aim must be to switch as far as possible from an economy based on fossil raw materials to a biobased economy.

Environmental technology is a vital instrument for attaining the national environmental quality objectives. In Sweden, as elsewhere in the world, technology, methods and systems are being developed to meet the increased requirements – products and services, reliable energy supply, transport etc. – of modern society. To ensure environmentally sustainable development at the same time, it is important to consider environmental and sustainability aspects at an early stage. Government agencies responsible for issues relating to the environmental objectives therefore have a key role, not only in demanding and promoting the use of eco-friendly technology, but also in calling attention to and regulating its opposite. Promotion of all kinds of environmental technology can be combined with promotion of the products and ancillary services that, in a broad sense, are needed to bring about greater use of good environmental technology, although this lies beyond the scope of purely technical and practical solutions. What is needed includes the following:

- An overall system view and life-cycle approach, and the methods, services and products needed to support the same.
- Development and application of policy instruments – legal (legislative and regulatory frameworks), economic and information instruments.
- Education and training, measures to promote participation, and adaptation and quality assurance of the new technology.

Global chemicals production is rising sharply. In about 50 years, production has grown from less than 10 million tonnes to more than 400 million tonnes a year. The countries with the highest production growth rates are in Asia and Latin America. The OECD calculates that global chemicals production will increase by 85% between 1995 and 2020. This expansion not only relates to consumables but also entails land and water areas being claimed for buildings and infrastructure, and for the production of energy and raw materials. Competition for land in geographically attractive areas will probably be intensified, and this may result in conflicts over the land available. Connections between consumption, resource use and environmental problems are probably unclear to many people. The questions of how land can be used most efficiently and what is most

suitable from a sustainability point of view therefore need to receive more attention.

2.1.8 Pursuit of environmental objectives as a competitive factor

In the environmental sector, Sweden's comprehensive system approach and life-cycle perspective is a strength. Pursuit of environmental objectives is an example of a public-sector innovation in environmental policy where Sweden has advanced further than other countries (according to UNEP). Nevertheless, this work needs to be developed further, and new knowledge will be needed for the objectives to be attainable. Efforts also need to be broadened so that businesses and consumers can take part and contribute on a larger scale.

A nation's educational level and knowledge potential are an important competitive factor in a globalized world. For the national environmental quality objectives to be met, it is desirable for the state to provide increased support for research, development and innovative know-how. The in-depth evaluation of efforts to attain the environmental objectives shows that the knowledge required to achieve them is still lacking. Knowledge of how research findings can be rapidly converted into effective environmental policy and proposals for action needs to be enhanced. Research and knowledge concerning implementation are highly important, as is research that supports international negotiations in the environmental sphere.

Government agencies should continue to make it known that a good environment and excellent environmental know-how in the public and private sectors alike are key competitive factors. A strong public sector in cooperation with a dynamic business sector that sees the environment as a strategic means of competition will afford comparative advantages on an international market. A nation representing a healthy environment in which ecosystem services are protected and where cities and towns, the countryside and nature offer the inhabitants a good quality of life will have competitive advantages in the struggle for scarce future resources for growth, such as new business ventures and well-trained experts.

Sweden has the capacity to keep developing a creative, innovative approach in the public sector, thereby enabling private enterprise to develop new system solutions, and the goods and services of the next generation, for sustainable social development. By extension, the Swedish model can contribute best practice and lead the way in changing consumption and production patterns.

If Swedish environmental thinking and knowledge in the public sector are exported to other parts of the world, it can help those countries to improve their environment and achieve their own environmental objectives more rapidly. This would also make attaining the Swedish objectives easier, since a substantial share of the environmental burden in Sweden is international in origin. It is also probable that such export of public-sector environmental knowledge would make a positive contribution to Swedish companies' own export potential. It should, for example, be fully possible to develop new competitive advantages by combining the public sector's systematic efforts in pursuit of the environmental objectives with the technical and business skills of Swedish private enterprise. In particular, this applies to integrated system solutions and infrastructure services in the municipal sector and system skills for optimally using biomass resources and making energy use more efficient. In these respects, there is ample scope for combining environmental gains with economic development in the private and public sectors alike, both in Sweden and abroad.

2.1.9 Research and development that affect progress towards the environmental objectives

There are several possible ways in which environmental policy and other policy areas can work together. In R&D, the synergic effects of work on the in-depth evaluation of progress towards the environmental objectives are clear. Since R&D efforts are crucially important to innovation and competitiveness, the Government has provided

additional funds for Swedish university research. The Government will present a Research and Innovation Bill during 2008. In Sweden, higher education institutions carry out most research in the public sector, while research institutes also play a key part. For its supply of knowledge, implementation of the environmental objectives depends on the existence of expertise in research, synthesis and investigation at Sweden's higher education institutions and research institutes. These are also key bridge builders and gatekeepers for international research and, as such, have a significant role in monitoring international knowledge development in areas with a bearing on progress towards the objectives. Research institutes do not have such a salient role in Sweden as in other countries, but they too are important suppliers of knowledge, notably through the part they play in collaborating with the business sector.

Since environmental issues are usually cross-frontier in nature, international cooperation on the knowledge and research side is crucial. A strengthening of the environmental dimension in research institutes generally is desirable. The EU's importance to Sweden will grow, and European research collaboration is set to expand. It is vital for Sweden to participate actively in this work and join in influencing developments in the EU. For Swedish research, the ability to compete for research funds in the EU is increasingly significant. In the longer term, international work outside the EU will be even more important. International projects like the IPCC, the Stern Report and the Millennium Assessment Report illustrate ways of working that will serve as models for the global pursuit of knowledge in the years ahead.

In the context of the Swedish environmental objectives, government agencies are the purchasers of new research-based knowledge for attaining these objectives. This aspect should be taken into account in the agencies' knowledge and research strategies. The Environmental Protection Agency's new strategy in this area, for example, is designed to strengthen the Agency's capacity to produce new research-based knowledge and transform it into effective action to develop environmental policy. This will enable the Agency to sharpen the tools at its disposal, such as economic and legal instruments, supervisory activities and environmental monitoring and management, and to develop new instruments with a view to systematic innovation.

2.1.10 NEED FOR GLOBAL AND FUTURES STUDIES

It is necessary to be prepared for, and to understand, the changes in the wider world that will affect Sweden's scope to attain the environmental quality objectives. For this reason it is imperative to monitor, in a structured and systematic way, the factors, in Swedish society and globally, that affect the prospects of meeting these objectives. It would facilitate and enhance the effectiveness of efforts to this end if data were available as a basis for common starting points that agencies responsible for the various objectives and sectors could use more to carry out assessments and draw up robust, cost-effective proposals for measures and instruments. The in-depth evaluation to be presented in 2012 will need to look beyond 2020, since most environmental quality objectives are judged not to be achievable within the time frames laid down.

Futures studies are increasingly being used as a basis for sound proposals in various decision-making processes. The purpose of developing scenarios is that they should serve as tools for influencing social development and provide support for the most rational, cost-effective decisions, which take both known and unknown parameters into account. In the process of evaluating fulfilment of environmental objectives and proposing new measures and instruments for meeting them, it is strategically important to analyse how the work is progressing in relation to probable global developments, but also to other conceivable but less probable courses of events. This enhances the chances of attaining the environmental quality objectives, even if developments are in a direction that deviates from what is expected. The public sector's surveillance of international trends and use of futures studies need to be developed. Assignments of this kind should be included

in the agencies' instructions from the Government, as individual agency responsibilities, but also as a common task: that of contributing and organizing joint resources for collecting, processing and disseminating knowledge in the public sector.

2.1.11 THE ENVIRONMENT AS A SECURITY ISSUE AND CHANGED DECISION-MAKING STRUCTURES

Changes in institutional and political systems greatly affect Sweden's scope for achieving the environmental quality objectives. It is already noticeable how energy supply issues connected with the climate challenge are affecting political power relationships in the world. The Swedish Defence Commission and the American defence headquarters, the Pentagon, have cited global environmental change and the greenhouse effect as two of the gravest threats to security.

In Sweden, proposals from the Committee on Public Sector Responsibilities could result in changes in the decision-making structure at regional level that may affect the county administrative boards' work in pursuit of the environmental objectives. The organization of municipal government, too, may come to affect efforts to that end. There are trends indicating that decisions on environmental issues are being increasingly shifted to international forums and to the EU. Simultaneously, the regions are becoming stronger. This reduces the central government agencies' scope for directly affecting progress towards the environmental quality objectives, which in turn has a bearing on how we work towards the objectives. In the scenarios drawn up in conjunction with this in-depth evaluation, one clear conclusion was that the greater the scope for government by regulatory means, the easier it is for the agencies responsible for Sweden's environmental objectives to carry out their work.

CHAPTER 3.

Coordinated action to achieve the environmental objectives

Sweden's Parliament – the Riksdag – decided in 1999 to adopt a number of environmental quality objectives, with a view to achieving a better environment. The aim was and is to be able to hand over to the next generation a society in which the major environmental problems have been solved. Through these objectives and the system built up around them, Sweden's efforts to safeguard the environment have been structured and made more effective. In the Environmental Objectives Council's view, the coordination and cooperation which implementation of the objectives involves should be sustained and developed.

The environmental objectives system is made up of several components which together form a structure for an effective division of responsibilities for the environmental issues to be addressed. While such a system needs to be comprehensive and encompass the different areas of society important in working towards a better environment, it should also be easy for individuals and organizations to understand and apply in their own spheres of activity.

To judge how efforts to attain the national and regional environmental objectives are progressing, there needs to be a coordinated and quality-assured system for the provision of data. The data supplied form a basis for assessments of goal achievement by the agencies responsible for the objectives. Collection of data also serves as a basis for indicators that can be used to communicate in an accessible way the various pressures on and resulting states of the environment. Indicators illustrating progress towards the environmental quality objectives and associated interim targets are presented on the Environmental Objectives Portal, www.miljomal.nu.

Sweden's system of environmental objectives has attracted considerable attention internationally. One aspect that has been widely noted is sectoral responsibility – the fact that different sectors are assigned and assume responsibility for environmental issues in their particular areas of activity. This chapter provides an overall picture of the structure and different elements of this system.

ENVIRONMENTAL ACTION OR ACTION TO ACHIEVE THE ENVIRONMENTAL OBJECTIVES?

Is there a difference between 'action to achieve the environmental objectives' and other action to safeguard the environment, such as environmental monitoring, supervision and international environmental cooperation? This question has been considered in a number of contexts, including a research programme at Linköping University entitled 'Assessment of Environmental Goal Achievement under Uncertainty' (ENGO, 2003–7). That programme looked at how the environmental objectives are communicated within the environmental objectives system, i.e. in and between government agencies and organizations. The Environmental Objectives Council takes the view that there is no real difference between environmental action in general and action to achieve the environmental objectives. The overarching environmental policy goal of the Government and the Riksdag is to hand over to the next generation a society in which the major environmental problems facing Sweden have been solved. The environmental quality objectives, adopted by the Riksdag with broad, cross-party support, represent the environmental dimension of sustainable development, and are formulated on the basis of the environmental pressures which people and nature can withstand. They define the state of the Swedish environment which environmental efforts should have as their goal. The objectives and associated interim targets are thus the ultimate statement of priorities for action to safeguard the environment in Sweden, and that action should be geared to attaining them. The objectives should guide environmental efforts in different sectors of society.

The conclusion reached by the Environmental Objectives Council is that the process of working towards the environmental objectives has helped to establish important partnerships for, and to significantly improve, environmental efforts throughout society. From several quarters, especially the county administrative boards, it has also been suggested that the Council could play a stronger and more active coordinating role in this context.

3.1 The environmental objectives system

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a study to clarify the relationship between the fundamental values underpinning the environmental objectives and responsibility for the broader, cross-cutting issues related to the objectives. Such an inquiry should explore the possibility of simplifying the system of environmental objectives. It should also consider the Swedish Energy Agency's proposal to introduce *Energy* as a new cross-cutting issue, and examine how the international dimensions of the objectives can be made visible, followed up and evaluated within the environmental objectives system. In addition, in the same context, the possible impacts of any changes to the system need to be considered.

▶ **THE COUNCIL PROPOSES** that the sentence 'This environmental quality objective is intended to be achieved within one generation' should be deleted from the five objectives which include it. This is because the Council's interpretation is that the quality of the environment expressed in the objectives is to be brought about by 2020 in the case of all the objectives, not just the five in which this intention is expressly stated. *Reduced Climate Impact* represents an exception, however; here, the stated quality of the environment is to be achieved by 2050 as a first step. The Council also proposes that interim targets with target years of 2013 or earlier should be replaced with the new targets proposed no later than the beginning of 2011.

▶ **THE COUNCIL CONSIDERS** that there are advantages in one government agency having responsibility for administrative coordination of an action strategy, and the other agencies concerned having a joint responsibility for that strategy.

▶ **THE COUNCIL PROPOSES** that the Government should consider introducing a division of responsibilities for the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles corresponding to that in place for the other action strategies.

3.1.1 FUNDAMENTAL VALUES AND CROSS-CUTTING ISSUES

Underlying all action to achieve a better environment in Sweden are five 'fundamental values'. With these values as a starting point, the environmental quality objectives, specifications of what they entail, and interim targets have been formulated. The fundamental values are also intended to underpin proposals for new interim targets and measures to attain them. The five values are:

1. Human health.
2. Biodiversity and the natural environment.
3. The cultural environment and cultural heritage.
4. Long-term ecosystem productivity.
5. Wise management of natural resources.

To ensure that due account is taken of these values in efforts to implement the environmental objectives, the system of objectives includes three broader, cross-cutting issues related to the objectives, as a complement to the environmental quality objectives themselves. Originally there were four such issues, but one of them, *The Natural Environment*, for which the Swedish Environmental Protection Agency was responsible, was dropped with the introduction in 2005 of the environmental quality objective *A Rich Diversity of Plant and Animal Life*.

The three remaining cross-cutting issues are:

- *Human Health*, for which the National Board of Health and Welfare is responsible.
- *The Cultural Environment*, with responsibility entrusted to the National Heritage Board.
- *Land Use Planning and Wise Management of Land, Water and Buildings*, which is the responsibility of the National Board of Housing, Building and Planning.

According to Government Bill 2000/01:130, responsibility for these cross-cutting issues includes working with the agencies with lead responsibility for individual objectives to develop suitable indicators for the issues concerned and, in general, working to achieve the objectives in the same way as the lead agencies.

As part of the present in-depth evaluation, the National Heritage Board and the Board of Health and Welfare have reviewed and defined more clearly their roles as agencies responsible for cross-cutting issues. The National Heritage Board interprets its responsibility for the cultural environment and cultural heritage as involving:

- Continuous monitoring of the state of the cultural environment.
- Developing indicators to measure progress towards objectives and targets with respect to the cultural environment.
- Supporting and guiding county administrative boards.
- Supporting and guiding environmental and sectoral agencies in their work on cultural environment and cultural heritage issues.

The National Board of Health and Welfare takes the view that its responsibility for one of the cross-cutting issues provides an opportunity for broad coordination of work on health matters in the context of the environmental objectives. The Swedish Energy Agency, too, sees possibilities in such an overall responsibility, and proposes the introduction of *Energy* as a new cross-cutting issue.

The National Heritage Board and the Board of Health and Welfare have reviewed the various reports submitted for the in-depth evaluation in terms of how cultural heritage and health issues are addressed. Both agencies believe that more attention could be paid to these cross-cutting issues in the efforts to implement the objectives which the lead agencies for particular objectives and the sectoral agencies describe in their reports.

There are a number of uncertainties as to how the fundamental values and cross-cutting issues can and should be used in follow-up of the environmental objectives. As the fundamental values form the basis for formulating interim targets and measures, they should also have a part to play in reviewing progress towards and evaluating those targets and measures. There are both gaps and overlaps between the values and issues. The Environmental Objectives Council is

therefore of the opinion that a study should be carried out to clarify the relationship between the two, and responsibility for them. The possibility of simplifying the environmental objectives system, for example by replacing responsibility for the cross-cutting issues with a coordinating responsibility for the fundamental values, could be considered. Such a study should form part of a wider inquiry set up by the Government, which should also cover the Energy Agency's proposal to introduce a new cross-cutting issue, *Energy*, and examine how the international dimensions of the objectives can be made visible, followed up and evaluated within the environmental objectives system. In addition, in the same context, the impacts of any changes to the system need to be considered.

3.1.2 ENVIRONMENTAL QUALITY OBJECTIVES

The Riksdag decided in 1999 that Swedish efforts to achieve a better environment should be based on 15 environmental quality objectives. Since then, a further objective has been added: *A Rich Diversity of Plant and Animal Life*. For each of the 16 environmental quality objectives there is a government agency with lead responsibility at the national level. The process of working towards these objectives has now been under way for almost ten years.

The further into the time horizon for the environmental quality objectives we get, the more important it becomes to define the precise target year for achieving them. The Environmental Objectives Council's interpretation of the Riksdag's decision about reaching the objectives within one generation is that they should be met by 2020, with the exception of *Reduced Climate Impact*, which is to be achieved by 2050 as a first step. Five of the objectives include the sentence: 'This environmental quality objective is intended to be achieved within one generation'. The Council proposes deleting this from the objectives concerned, since all the objectives (apart from *Reduced Climate Impact*) are to be attained in the space of a generation. The sentence might otherwise be misleading, giving rise to a discussion about whether the other objectives are not intended to be met on that time scale.

The environmental quality objectives are followed up and evaluated, new and revised objectives and targets are proposed, and measures to achieve them are decided on and implemented on a systematic, ongoing basis.

Many consider the environmental quality objectives to be visionary in their wording and therefore difficult or impossible to achieve in practice. At the same time, being able to determine when an objective has been attained has become increasingly important in the assessments undertaken. In its most recent Environmental Objectives Bill (2004/05:150), the Government wrote that the objectives needed to be interpreted in the in-depth evaluation performed in 2008. The Council has therefore reviewed the wordings of the environmental quality objectives and the specifications of what they entail, as set out in various government bills. As a result, some of the specifications and, in certain cases, the wordings of objectives have been adjusted. The revised specifications define the implications of the environmental quality objectives, in terms of what needs to be accomplished by the target year. For the objective to be judged to be achieved, all these specifications must be met.

There has also been discussion about whether it is the quality of the environment described in an objective, or the basic conditions for fulfilling the objective, that must be brought about within a generation. The Environmental Objectives Council's interpretation is that it is the quality of the environment, defined as far as possible by the specifications of the objective, that is to be achieved by 2020 (2050 as a first step for *Reduced Climate Impact*). In many cases, this means that it will not be possible to attain the objective by 2020. In some cases, the conditions for achieving the environmental quality stated in the objective can be created by 2020, but not the environmental quality as such. This may be because, although action has been taken, the environment will need longer than this to recover. Another reason may be that the measures being introduced in Sweden are not sufficient to bring about the quality of the environment described, since many of the objectives are also dependent on action being taken internationally. Environmental quality objectives expressing a high level of ambition are important, however, in ensuring that vigorous efforts are devoted to achieving them.

It has been pointed out on several occasions that the environmental quality objectives are framed in national terms, and that the system's interim targets and measures are generally concerned with what is happening within Sweden's borders. In its background report to the in-depth evaluation in 2004, Friends of the Earth Sweden suggested extending the environmental objectives system to include a new objective: *Limited/Reduced Environmental Impacts in Other Countries*. The Environmental Advisory Council also addresses this issue in its report *Tillväxt och miljö i globalt perspektiv* (Growth and the environment in a global perspective), in which it points to a need for an overarching goal of reducing the international social and environmental costs of Swedish consumption and production patterns and investments. Such a goal needs to include a social dimension. It is possible, but not certain, that the environmental objectives system is an appropriate context for a goal of this kind. This question has similarly been raised during the preparation of the present in-depth evaluation.

The Environmental Objectives Council therefore recommends that the proposed inquiry into the environmental objectives system should also take in the question of how the international dimensions of the objectives can be made visible, followed up and evaluated within the system. In addition, it should examine ways of reducing or preventing, as far as possible, any adverse effects of Swedish measures and instruments to achieve the environmental quality objectives on the environments of other countries. Its terms of reference could, furthermore, include a study of how Sweden's efforts to implement these objectives might contribute to positive trends in the global environment.

3.1.3 INTERIM TARGETS

To identify and highlight the aspects of the environmental quality objectives that are to be given priority over the next 5–10 years, one or more interim targets have been adopted for each objective. Some of these targets are seen as milestones on the way to the environmental quality objective concerned, while others represent one part of the objective.

The interim targets are aimed primarily at officials in the public sector, decision-makers in business, and political representatives on boards and committees responsible for areas linked to the environmental objectives. But they should also be comprehensible to interested members of the public. The Government has stated that interim targets should be realistically achievable, but nevertheless ambitious, and that proposals for new ones should be elaborated on the basis of the five fundamental values.

The current revision of the interim targets has been guided by the following basic principles, to avoid too large a number of such targets and to ensure that they provide a basis for defining priority areas of environmental action:

- The interim targets and the environmental quality objective, including its specifications, should be clearly linked and should be seen as an integral whole.
- The interim targets should give priority to areas of environmental action that will enhance the

prospects of achieving the environmental quality objective.

- Each environmental quality objective should be viewed holistically, and any gaps arising because only certain areas are highlighted by interim targets should be identified.

Wherever possible, the interim targets now proposed by the Environmental Objectives Council have 2015 or 2020 as their target year, although in some cases another year is justified. To allow implementation of the objectives to proceed as smoothly as possible, the interim targets should extend to 2015. The thinking behind this is that the Council's next in-depth evaluation, with proposals for new targets and measures, is scheduled for 2012, which will mean a Riksdag decision in 2013/14. At that point, targets with deadlines falling in the period 2010–13 will seem of little relevance.

Several of the existing targets have a target date of 2010 or earlier. The Council proposes that interim targets with target years of 2013 or earlier should be replaced with the targets now put forward no later than when the current target year has passed.

In the case of interim targets whose target year has passed, and which have not been revised and given a new target date, the Environmental Objectives Council will continue to review progress in conjunction with its annual report. Targets that were met on time will be found on the Environmental Objectives Portal and will continue to be monitored, but only every four years as part of the in-depth evaluation. Interim targets that were not met by their target year will also be found only on the Portal, and will be followed up every year until they are achieved, in conjunction with the annual report.

The Council's aim has been that new and revised interim targets should be worded according to the following criteria, laid down by the Government. They should

- be clear and accessible, and worded in such a way as to be easy to communicate to users in public agencies, but also in society at large,
- be capable of being monitored in the short and long term, and be explicitly time-bound,
- form part of a comprehensive structure, and
- be capable of serving as a basis for regional and local efforts to safeguard the environment and achieve the objectives.

Fleshing out these criteria, the Council has sought to ensure that the proposed interim targets

- are specific, measurable, accepted, realistic and time-bound, and describe a desirable future state;
- describe an effect, result or level of environmental quality;
- do not refer to measures or policy instruments;
- do not include concepts that are difficult to interpret, or value words;
- do not consist of several components (bullet points). Where necessary, the meaning of the target should be made clear by specifications, as with the environmental quality objectives. These specifications should be seen as a clarification of what the interim target entails. For the target to be judged to be met, the specifications should be fulfilled;
- contain only one target year per interim target;
- serve to guide national, regional and local efforts. Where necessary, they should be worded in such a way that they can be applied at the regional and local levels;
- can be followed up on the basis of the most cost-effective data series, e.g. data used for international reporting.

It is important that the interim targets are clear and easy to communicate. Consequently, they should not include several elements and target years. It should be made clear how progress towards a target is to be monitored and how it is to be determined whether the target has been met. An interim target should therefore consist of a brief, descriptive set of words that is easy to communicate, together with specifications where relevant, which will be used to follow up and evaluate the target. These specifications flesh

out the meaning of the target and – just as with the environmental quality objectives – must be met before the target can be considered to be achieved.

The county administrative boards, whose job it is to regionalize the national interim targets, will find it easier to deal with a simply worded target that expresses an effect. On the basis of the national specifications, they will then be able to define their own priorities and specifications for their regional objectives.

To enable the interim targets to be communicated in a variety of contexts, they have up to now been assigned numbers within each of the environmental quality objectives. With targets now being reworded and new ones being introduced, such numbers could be confusing. The numbering system is therefore to be dropped, and henceforth the short names of interim targets will be used to identify them. The Council has reviewed these names and attempted to give them a uniform structure. Short names of targets occur in many contexts, and should also be used for regional environmental goals that are identical to or express the regional component of a national interim target.

In Government Bill 2004/05:150, the Government expressed the view that interim targets should be realistically achievable, but nevertheless ambitious. It also wanted the basic analysis for its next in-depth evaluation to include a summary of the proposed measures judged necessary to achieve the environmental quality objectives and interim targets.

One issue discussed during the preparation of this in-depth evaluation has been whether the interim targets developed and measures proposed should be those required to achieve the environmental quality objective concerned, or those considered to be realistically deliverable. The Environmental Objectives Council has interpreted its brief as being to propose measures which can in fact lead to the environmental quality objectives being attained. Possible economic or other obstacles must then be assessed at a subsequent stage in the process.

Proposals for measures are often linked to particular interim targets. It is important, therefore, that these targets do indeed express a level that will help to reach the environmental quality objective in question. The problem is that the objectives are so ambitious that, in several cases, it is difficult to set targets which are both capable of being achieved and will result in successful attainment of the objective by 2020. In a number of cases, therefore, targets and measures are proposed which will not in fact lead to the quality of the environment described by the objective being achieved. A 'gap' then arises.

3.1.4 REGIONAL ENVIRONMENTAL OBJECTIVES

Regional environmental objectives are adopted by the county administrative board concerned or, in the case of the environmental quality objective *Sustainable Forests*, by the Swedish Forest Agency. Most of them have their basis in the national interim targets, translated into regional terms. These regionalized national targets have been supplemented with county-specific goals relating to issues seen as being of particular significance for the county in question. In certain cases, county boards have adopted county-specific objectives with no national counterpart. All the regional objectives, however, form a regional component of the national environmental quality objectives. Application of the national objectives at the regional level is the responsibility of the county administrative boards, except in the case of *Sustainable Forests*, for which the Forest Agency has been entrusted with regionalization and regional monitoring. All the counties of Sweden have in fact developed and adopted regional objectives. Coordinating the regional application of the environmental quality objectives is one of the functions of the Environmental Objectives Council.

It is difficult to sum up how closely the regional objectives agree with the national ones. Often, when objectives have been translated into regional terms, account has been taken of the differing situations in individual counties, with regard to natural conditions, settlement structure, key economic activities and so on. They may also have been adapted to make them more relevant to local authorities and businesses, following a dialogue with the stakeholders concerned.

Close agreement between environmental objectives at different levels has a number of advantages, making it easier, for example, to monitor and compare environmental trends and action taken to achieve the objectives. The Council therefore recommends the county administrative boards and the Forest Agency, in future regionalization of the objectives, to make systematic use of the national interim targets and employ the same target years, yardsticks and definitions, unless they judge them to be irrelevant to the county or region concerned. Any deviations should be justified. Each national agency with lead responsibility for an environmental quality objective should coordinate and support regionalization of its objective in a dialogue with county administrative boards and, where possible, assist for example with expertise and provision of data relating to the objective. Efforts to this end should be stepped up. Coordination of the regionalization process between counties also needs to be improved. When revising regional objectives, county boards should apply the recommendations adopted by the Environmental Objectives Council for revision of the national interim targets.

3.1.5 THREE ACTION STRATEGIES

The environmental objectives system includes three action strategies, whose basic concern is to bring together cost-effective measures, both short- and long-term, capable of helping to achieve several environmental quality objectives or interim targets at once, along with other policy goals. Government Bill 2004/05:150 strengthened the role of these strategies within the system by giving a number of government agencies joint responsibility for further developing them and reporting to the Environmental Objectives Council. For two of the strategies, the Environmental Protection Agency was made responsible for administrative coordination. The Agency had previously been assigned responsibility for the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles.

The three action strategies, and the agencies concerned, are as follows:

- A Strategy for More Efficient Energy Use and Transport (EET): the Swedish Environmental Protection Agency (responsible for administrative coordination), Swedish Road Administration, Swedish Energy Agency, Swedish Rail Administration, Swedish Civil Aviation Authority and Swedish Maritime Administration.
- A Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles (GRK): the Swedish Environmental Protection Agency (lead agency, as stated in its instructions from the Government), Swedish Chemicals Agency, Swedish Radiation Protection Authority, National Board of Housing, Building and Planning, Geological Survey of Sweden and, to a certain extent, the National Board of Health and Welfare.
- A Strategy for the Management of Land, Water and the Built Environment (HUM): the Swedish Environmental Protection Agency (responsible for administrative coordination), Swedish Forest Agency, Swedish Board of Agriculture, National Heritage Board, National Board of Housing, Building and Planning, Swedish Board of Fisheries and National Board of Health and Welfare.

As an important part of the present in-depth evaluation, the agencies entrusted with developing the three action strategies were asked by the Environmental Objectives Council to identify, in the evaluations of individual objectives and the various sectoral reports, the policy instruments and measures they judged necessary to achieve the environmental quality objectives and interim targets relevant to their respective strategies. As far as possible, they were also to make an overall economic impact assessment of the measures included in each strategy. In addition, they were asked to shed light on possible conflicts and synergies between the environmental quality objectives and goals in other sectors and policy areas. The agencies involved in the three different strategies had differing starting points and therefore arrived at somewhat different results. The Council nevertheless regards joint positions of this kind as a major step forward in the process of implementing the environmental objectives. Such collaboration

improves the prospects of more effective action to that end.

In the light of the work done on the action strategies for the present evaluation, the Council considers there to be advantages in one government agency being entrusted with administrative coordination of a strategy and having a joint responsibility for it together with the other agencies concerned. It is therefore of the opinion that the Government should consider introducing, in the instructions or appropriation directions of the agencies in question, a division of responsibilities for the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles similar to that in place for the other strategies. The Government should also review which agencies are to be entrusted with joint responsibility.

3.1.6 Special sectoral responsibility for the environmental objectives

Many sectors of society have an important part to play in working towards the environmental objectives. Eighteen government agencies have been assigned a 'special sectoral responsibility' for action to achieve them. This responsibility broadens implementation of the objectives, and helps to monitor and develop efforts in the sectors concerned. Further discussion of this special sectoral responsibility will be found in section 4.2.

3.1.7 Coordinating role of the Environmental Objectives Council

The Environmental Objectives Council was established to promote consultation and cooperation in implementing the environmental quality objectives adopted by the Riksdag. It provides an important forum for collaboration, in which the organizations represented can discuss and agree action that will benefit Sweden's environment as a whole. The Council is keen to see this role maintained and developed. The county administrative boards, in their evaluations, describe the Council as an effective coordinating body, and have said that they would welcome a stronger role for it.

The functions of the Council are set out in the Government's instructions to the Environmental Protection Agency. They are:

1. on an annual basis, to review, assess and report to the Government on overall progress towards the environmental quality objectives and on regional efforts to attain them,
2. to prepare and submit the analysis required as a basis for the Government's recurring in-depth evaluation of efforts to achieve the environmental objectives, including an economic assessment of those efforts, analysis of any conflicts of goals, and impact-assessed proposals for cost-effective measures and policy instruments,
3. to assume responsibility for overall information on the environmental objectives and progress towards them,
4. to promote overall coordination of the regional application of the environmental quality objectives,
5. to allocate necessary funding for monitoring of progress towards the environmental quality objectives, environmental monitoring, and some reporting at the international level, and
6. to consult with the authorities concerned and provide them with the guidance they need for their reporting on the environmental objectives.

3.1.8 Follow-up and evaluation of the objectives

The Environmental Objectives Council submits an annual report to the Government, providing an overall assessment of the prospects of achieving the national environmental quality objectives. The report describes what has happened in the past year, what progress is being made towards the objectives and whether the pace of that progress is sufficient. It also touches in general terms on major causes of the environmental problems to be tackled – the driving forces, in Swedish society and the wider world, affecting the chances of reaching the objectives. This annual review provides a basis for the Government's report to the Riksdag on progress towards the objec-

tives, and also forms part of the background material for the Budget Bill.

Every four years, the Council submits the basic analysis required for the Government's in-depth evaluation of efforts to achieve the environmental quality objectives. The present report is the second of its kind. It is based on background reports from all the lead agencies for individual objectives and cross-cutting issues, from county administrative boards, from agencies with special sectoral responsibility for the objectives, from the Council's experts and from the agencies responsible for the three action strategies.

In November 2006, for the first time, the county administrative boards presented their assessments of implementation of the regional environmental objectives directly on the Environmental Objectives Portal. The boards would welcome better feedback on these regional appraisals, and would like to see them used in the reports and evaluations of national lead and sectoral agencies.

3.1.9 THE COUNCIL'S INFORMATION ROLE

One of the Environmental Objectives Council's responsibilities is overall information on the objectives and progress towards them. This broadly defined information role creates certain difficulties, however: how is it to be discharged? The Council has adopted an information and communication strategy, which seeks to spell out its responsibilities as clearly as possible and to facilitate cooperation in this area. The Council considers that its role with regard to information and communication is primarily a coordinating one, and that its task is to inform people in broader terms about the environmental objectives system as such.

The most important and readily accessible channel for information about the environmental quality objectives and efforts to achieve them is the Environmental Objectives Portal. It provides an overview of progress towards the objectives, including presentations of indicators and assessments relating to regional goals. A large amount of other information with a bearing on implementation of the objectives is also to be found there. In March 2008 the Portal received some 2,300 visitors a day. Judging from an evaluation carried out among visitors in spring 2007, the Portal is greatly appreciated and is used largely as a tool for disseminating information and coordinating efforts to reach the objectives. From several quarters, there are calls for the indicator presentations to be developed and improved.

The Council's reports, too, reach a wide audience in Swedish society, and also internationally, as they are translated into English. These reports are adapted for the web and are also available as PDF files on the Environmental Objectives Portal.

In the follow-up process, 'smileys', i.e. happy, sad or neutral faces, are used to illustrate and communicate whether the environmental quality objectives and interim targets are expected to be achieved by the target years set. These symbols are a considerable simplification of the assessments reached for the different objectives and targets. In the Council's view, they are a highly effective way of communicating what progress is being made.

While the large number of red smileys for the environmental quality objectives paints a gloomy picture of the overall situation, in the case of several objectives the state of the environment is in fact improving. The pace of improvement is too slow, however, and for some of the goals it will be difficult or not possible to bring about the desired state of the environment by 2020. As the target year for the environmental quality objectives approaches, moreover, there will be less and less time to introduce further measures that will result in the objectives actually being met. Consequently, the overall picture of the prospects of attaining the objectives is a discouraging one, with a number of red smileys. To indicate whether the measures and initiatives being taken are having an effect, the smiley table includes trend arrows, showing whether trends in the environment are positive, negative or unclear. Smileys are also used to summarize assessments relating to the interim targets. Here, a more positive picture emerges, as several interim targets are judged to be achievable and some of them have already been met.

3.1.10 ALLOCATION OF FUNDING BY THE COUNCIL

Another role of the Environmental Objectives Council is to distribute funding from Allocation 34:2 ('Environmental monitoring etc.'), for environmental monitoring and monitoring of progress towards the objectives. As far as the natural environment is concerned, the environmental monitoring programme is the main provider of data for follow-up of the objectives. In addition, monitoring of the environment with regard to other environmental issues is being undertaken or developed by a variety of environmental and sectoral agencies. On the whole, this monitoring is not covered by the funding distributed by the Council. Environmental monitoring funded under Allocation 34:2 also has to provide data for other reporting purposes. Funds for follow-up of progress towards the objectives are used chiefly to develop the environmental objectives system. Funding can be applied for by the agencies and organizations linked to the Council. The Council has laid down guidelines for the allocation of funds and takes a policy decision each year setting priorities for the work to be undertaken.

3.1.11 COORDINATING BODY FOR COUNTY ADMINISTRATIVE BOARDS

Sweden's county administrative boards play an important part in both regional and national efforts to attain the environmental objectives. Their responsibilities include translating the national goals into regional terms, supporting regional and local action, and producing basic data for these purposes. The environmental quality objective *Sustainable Forests* and the interim targets associated with it are regionalized by the Swedish Forest Agency. The county boards and the Forest Agency report annually on how work on the regional objectives is progressing. They do so via the Environmental Objectives Portal, in accordance with the Environmental Objectives Council's guidelines.

The county administrative boards have established a joint Regional Monitoring System (RUS), whose principal tasks are to develop indicators and coordinate the collection of data for regional follow-up of the national environmental quality objectives. RUS also performs a key coordinating role when it comes to regionalization and development of the objectives and action to achieve them. Every year the Council arranges a regional environmental objectives conference in association with RUS, to strengthen cooperation among regional authorities and between regional and national agencies.

3.2 Indicators and data flows

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL CONSIDERS** that the Government should make it easier for public agencies to gain access to existing data as a basis for planning and decision-making. Steps should be taken to ensure cost-effective and coordinated provision of data for the purposes of environmental monitoring, international reporting and monitoring of progress towards the environmental objectives. In addition, the Council sees a potential to make greater use of environmental data collected for international reporting.

▶ **THE COUNCIL PROPOSES** that the Government should examine the possibility of a greater degree of core rather than fee-based funding for the production of data by the National Land Survey, Statistics Sweden and other agencies.

▶ **THE COUNCIL PROPOSES** a review of which environmental and sustainability indicators should be available and in which systems. This should be done with a view to clarifying the aims of the different sets of indicators and promoting more efficient data collection, updating and use of the relevant indicators in each set.

3.2.1 FOLLOW-UP OF THE OBJECTIVES

Every year the Environmental Objectives Council makes an assessment of how efforts to achieve the environmental quality objectives and associated interim targets are progressing. This follow-up of the environmental objectives is presented in an annual report, *de Facto*, and on the Environmental Objectives Portal. The Council's assessment is based on the reports it receives from the lead agencies for the different objectives. Its annual report is used by the Government as background material for the budget process, and is also widely distributed to public agencies, organizations and education providers. One of the tools used by the lead agencies to assess progress towards the objectives and targets is indicators. These are based on regular gathering of quantitative and qualitative data from sampling programmes, questionnaire surveys, interviews, voluntary reporting and studies of other kinds.

Environmental objectives indicators

The environmental objectives indicators are to be seen as an aid to the annual follow-up process. To create a comprehensive set of indicators, each lead agency selects the factors it considers important in monitoring progress towards a given interim target or environmental quality objective. These factors can reflect different aspects of the target or objective and the state of the environment, based on the DPSIR approach developed by the European Environment Agency (EEA) from an OECD model. The aim is to illustrate what is happening in a cyclical perspective and, ideally, to shed light on an environmental problem from several different angles. A given indicator may reflect one or more of the different components involved: driving forces (D, the activities behind the problem), pressures (P, the factors causing it), state (S, the state of the environment), impacts (I, what happens in the environment/the consequences) and responses (R, the action taken to reduce the problem). The indicators used make no claim to offer an exhaustive picture of the state of the environment, environmental trends, or action to achieve the objectives.

Indicators at the regional level

The Regional Monitoring System (RUS) set up by the county administrative boards plays an important part in the creation of indicators. It has developed national indicators with a regional resolution, permitting, in several cases, comparisons between counties and to some extent between municipalities. However, several county boards refer to problems of data quality. There are often discrepancies between data obtained from the municipal or county level and those broken down from the national level. As a result, two different presentations of the same indicator may appear in different contexts, with an accompanying risk of confusion and lack of credibility. Several boards have, in addition, developed indicators at the county level to allow more effective follow-up of county-specific environmental objectives, i.e. those with no national counterpart.

Indicators at the local level

With support from the Environmental Objectives Council, the Swedish Association of Local Authorities and Regions undertook a project in 2004–6 to develop environmental indicators at the local level ('Environmental indicators – in support of action for a better environment'). The project, involving participants in 15 municipalities, resulted in the identification of some 70 different indicators. To make for clearer monitoring and comparisons, priority was given to a set of 20 headline indicators. At present, local data for a few indicators are available on the Environmental Objectives Portal. It should be possible to include some of the proposed local indicators on the Portal, but as a breakdown of national and regional indicators. In one or two cases, a national counterpart to a proposed indicator may need to be established and identified as an environmental objective indicator by the lead agency concerned.

The county administrative boards emphasize the important role of local authorities with regard to indicators. They see local indicators as a good way for authorities to demonstrate their commitment and their capacity to achieve local environmental goals. Many county boards point to a need to establish more indicators of this kind, preferably by breaking

down a greater number of existing indicators to the municipal as well as the regional level.

3.2.2 DATA PROVISION AND ENVIRONMENTAL MONITORING

The system of indicators is founded on national, regional and, in certain cases, local data. Data produced within the environmental monitoring programme are used for a variety of purposes: international reporting, official statistics, and tracking progress towards the environmental objectives. Collection of data relating to the natural environment is funded to a large extent from the Swedish Environmental Protection Agency's environmental monitoring allocation (34:2).

Other data are also used to follow up the objectives. A large proportion of them originate from the activities and monitoring programmes of the environmental and sectoral agencies. Producing data is expensive, and the funding for supplementary monitoring of the natural environment is generally provided from the appropriations of the agencies concerned.

The National Heritage Board is responsible for developing strategic, long-term monitoring of the cultural environment, and has drawn up a national programme for this purpose. However, no long-term funding is available at the national or regional level for the operation of this programme, adversely affecting the provision of data on the cultural heritage aspects of the environmental objectives.

It is important, therefore, to ensure that all environmental monitoring is planned and financed on a long-term basis.

The Environmental Objectives Council considers it important, moreover, for agencies with lead responsibility for objectives or cross-cutting issues related to the objectives to be given access to data already being produced for other purposes, so that such data can also be used to monitor progress towards the environmental objectives. This applies to data generated by both lead and sectoral agencies. All information produced with funding from the Council's budget should be available free of charge to both authorities and the general public. The National Board of Housing, Building and Planning, in its background report, stresses that access to data and statistics relevant to planning and decision-making should not involve a prohibitive cost when the data in question have been collected by public agencies. A study should be made of the possibility of a greater degree of core rather than fee-based funding for the production of data by the National Land Survey, Statistics Sweden and other agencies.

Between 2005 and 2007, the Environmental Protection Agency carried out a review of the national environmental monitoring programme. The aim was to improve coordination between follow-up of the objectives and monitoring of the natural environment, allowing more effective use to be made of environmental monitoring data to track progress towards different environmental quality objectives. As implementation of the objectives progresses, this work must continue. The Environmental Objectives Council notes a growing need for monitoring linked to the marine environment, climate effects and biodiversity.

Up to now, the Environmental Protection Agency's environmental monitoring programme has generated data relevant to 15 of the 16 environmental quality objectives. Regarding *A Safe Radiation Environment*, a parallel programme of environmental monitoring is run by the Swedish Radiation Protection Authority. In 2005–7 changes were made in the programme areas Freshwater, Seas and Coastal Areas, Health-related Environmental Monitoring, Toxic Substances Coordination, Air, and Agricultural Land. This process is continuing, with Landscapes the next area to be reviewed. In 2007 the county administrative boards began an overhaul of regional environmental monitoring programmes, which is expected to be completed in late 2008/early 2009.

Arrangements for provision of data and monitoring of the environment are constantly being developed. The following are just a selection of the improvements in data provision under way for the purpose of following up the environmental quality objectives:

- Regional monitoring of the liming programme is carried out by the county administrative boards and is intended to guide detailed planning of the measures carried out. Since 2005, a major project has been under way to deposit regional liming data with a national data host and assure their quality (*Natural Acidification Only*).
- The Radiation Protection Authority is developing an environmental monitoring programme for electromagnetic fields, primarily to track trends in human and environmental exposure over time (*A Safe Radiation Environment*).
- HELCOM and OSPAR, two conventions relevant to the Baltic and the Skagerrak and Kattegat respectively, have an important role to play in providing data for environmental monitoring and follow-up of the environmental objectives, and for the associated indicators (*Zero Eutrophication*).
- To coordinate data from the county administrative boards' inventories of watercourses, the Environmental Protection Agency, the water authorities, the Swedish Rail and Road Administrations and the Swedish Forest Agency were involved in 2007 in developing a database for habitat mapping. Its contents will facilitate follow-up and evaluation of pressures on and measures carried out in watercourses (*Flourishing Lakes and Streams*).
- In 2006 the Jönköping County Administrative Board developed a joint database of state-funded freshwater restoration measures for the Swedish Board of Fisheries and the Environmental Protection Agency (*Flourishing Lakes and Streams*).
- To monitor the ecological impacts of dam removal, the Västernorrland County Administrative Board is initiating a monitoring programme in conjunction with the demolition of the Kuba Dam on the river Nätraån (*Flourishing Lakes and Streams*).
- Monitoring of quality changes in meadow and pasture land was launched in 2006 as part of the National Inventory of Landscapes in Sweden (NILS). Given the slow pace of such changes, and the fact that NILS operates on a five-year cycle, it will be some time before any clear results emerge (*A Varied Agricultural Landscape*).
- The National Board of Health and Welfare has proposed a monitoring system for indoor environments (*A Good Built Environment*).
- The Environmental Protection Agency has been commissioned by the Government to develop and establish a system to follow up the environmental quality objective *A Rich Diversity of Plant and Animal Life*, in consultation with the Swedish Forest Agency and the Swedish Board of Agriculture. It presented its report in December 2007 (*A Rich Diversity of Plant and Animal Life*).
- The National Heritage Board has been commissioned by the Government to develop a long-term, strategic monitoring programme for the cultural environment. Its remit also includes proposing future monitoring arrangements related to the environmental objectives (*The Cultural Environment*).
- As from 2006, the Environmental Protection Agency is extending national data hosting contracts relating to water in the framework of the environmental monitoring programme. These contracts are being supplemented to include regional data, and steps are being taken to assure the quality of those data.
- Every year the county administrative boards, through the Regional Monitoring System (RUS), carry out a regionally based gap analysis of environmental objectives indicators and data for follow-up of the objectives. This analysis supports the work being done by RUS to improve indicators and data provision, and to develop new indicators and data on which to base them. This is being undertaken largely in collaboration with the national agencies with lead responsibility for the objectives.

The proposals for improving data provision are wide-ranging, covering everything from air pollution indicators and air quality monitoring, via additional environmental monitoring initiatives at the regional level and improved statistics and knowledge generation relating to chemicals, to uniform standards and methods for the measurement of biodiversity. These

proposals can be found in Appendix 1 (published separately).

Provision of data for follow-up of the environmental objectives could be better coordinated, and in several cases data could be used for multiple purposes. Contracts to supply data for use at the national level could be supplemented to provide data for the regional and, in many cases, the local level as well. Improved coordination, for which national lead agencies should have a special responsibility, will make for more efficient data management and create a better basis for uniform, high-quality data.

3.2.3 INTERNATIONAL REPORTING PROVIDES DATA FOR FOLLOW-UP OF OBJECTIVES

Under various international agreements and EU directives, Sweden has undertaken to regularly report data on environmental pressures and/or states. The aim of this reporting is, on the one hand, to allow the European Commission to check that member states are complying with directives in different areas and, on the other, to permit the Commission and international organizations alike to monitor progress towards objectives set at the international level or commitments made by member states (e.g. on emission reductions). In most cases, the same issues are being monitored both at the EU or international level and within the environmental objectives system. These issues include climate change, air quality, acidification, the ozone layer, eutrophication, toxic pollutants, waste and biodiversity.

Data collection is very costly and resource-intensive. However, the data sets produced for international reporting are so large that greater use could be made of them in tracking progress towards the environmental objectives, depending on what precisely needs to be monitored. It should also be possible to modify existing data collection arrangements to make them more useful for follow-up purposes.

Here are two examples of how data collection has been or is to be adapted to meet needs in terms of follow-up of the objectives:

- Data for reporting under the EU's Waste Statistics Regulation are collected every two years. In conjunction with the collection of these data in 2007, the Environmental Protection Agency asked the food industry questions about the handling of food waste that were specially designed to assist in monitoring progress towards an interim target under *A Good Built Environment*.
- Under the Convention on Long-Range Transboundary Air Pollution, Sweden is required to report air pollutant emissions every five years, averaged over 50×50 km grid squares. In collaboration with the county administrative boards (RUS), the Environmental Protection Agency has built on this reporting and, beginning with the data for 2006, emissions will be reported at both the county and the local authority level for some 20 different air pollutants and greenhouse gases. The data will thus provide a basis for regional and local follow-up of environmental objectives.

3.2.4 MONITORING ENVIRONMENTAL PERFORMANCE IN THE BUSINESS SECTOR

In the spring of 2007, IVL Swedish Environmental Research Institute Ltd. prepared a report for the Confederation of Swedish Enterprise presenting a set of environmental indicators relevant to Sweden's business sector. The aim was that the indicators should reflect the scale of the sector's contribution to various environmental problems and how it has changed over time. The report includes a retrospective survey of developments since 1970.

The IVL report reveals major differences between environmental areas, and between industries and sectors of society, in terms of what statistics are available. According to the report, this is to the detriment of companies since, without good data, it is difficult for both them and the authorities to measure the effects of the action they take and to set the right priorities for the future. Over and above this report for the Swedish business sector as a whole, a number of individual industries, such as chemicals and forest products, produce annual statistics on a

wide range of environmental issues. These could be developed further for use in tracking progress towards the objectives.

3.2.5 Environmental objectives indicators in relation to other indicator systems

A number of different systems of indicators are used by public agencies in Sweden for reporting and monitoring purposes. The Environmental Advisory Council, for instance, has presented a set of 'green headline indicators' of ecologically sustainable development, which for many years have been used by the Government in its annual budget statement. Several of these indicators are among those to be found on the Environmental Objectives Portal.

In addition, with the assistance of Statistics Sweden, 87 indicators of sustainable development have been elaborated. Of these, 12 have been chosen as headline indicators, covering six different areas. These are intended to provide an overall picture of sustainable development in Sweden. As far as the ecological dimension of sustainability is concerned, two of the six areas are particularly important in relation to the environmental objectives – Environment and Climate, and Sustainable Consumption and Production Patterns. Under the heading of Environment and Climate there are 16 indicators, including two headline indicators. Ten of these are also being used to monitor progress towards the environmental quality objectives and are presented, in full or in part, on the Environmental Objectives Portal.

The existence of different systems often leads to duplication of effort on the part of the agencies whose job it is to update indicators and interpret results of measurements. These agencies have to produce and interpret data in different contexts, and to ensure that they do not send out inconsistent signals about the state of the environment or the various factors affecting it. The Environmental Objectives Council proposes a review of which environmental and sustainability indicators should be available in which systems. This should be done with a view to clarifying the aims of the different sets of indicators and promoting more efficient data collection, updating and use of the relevant indicators in each set.

3.2.6 Developing the system of indicators

The Environmental Objectives Council has overall responsibility for promoting and coordinating development of the system of indicators presented on the Environmental Objectives Portal, www.miljomal.nu. The Regional Monitoring System (RUS) plays an active role in the development and updating of this system, by updating existing indicators in a coordinated fashion and proposing new ones called for by county administrative boards to monitor and communicate regional objectives. National lead agencies and RUS could collaborate more closely in updating these indicators.

Some counties express the view that the division of roles between county administrative boards and the Swedish Forest Agency is unclear. It is pointed out that the Forest Agency has not been given a specific brief to assess progress towards the objectives at the regional level. The Council proposes that it should be clearly stated in the Agency's appropriation directions that it is responsible for developing regional goals related to the environmental quality objective *Sustainable Forests*, for revising those goals, and for monitoring and reporting on progress towards them.

The creation of suitable indicators for more effective follow-up of the revised and new interim targets should be made a priority. The Council sets aside funds every year for indicator development.

There are currently around 100 indicators on the Environmental Objectives Portal. The aim should be to have one indicator per national interim target. With too many indicators, it may be difficult to see the wood for the trees, and to tell which indicators are important in tracking progress towards the objectives. If it is made clearer which of them are crucial in monitoring a given target or objective, this danger can be avoided to some extent. The Council considers that the present number of indicators is manageable and sufficient. The quality of the data used

and the ease with which a given indicator can be communicated need to be kept under regular review. In 2008 the Council is making development and review of the indicators on the Portal a priority.

3.2.7 COMMUNICATIVE FUNCTION OF THE INDICATORS

The indicators on the Environmental Objectives Portal play a key part in follow-up of the environmental quality objectives and interim targets by the relevant national agencies. But they are also important in communicating the objectives to interested members of the public and to political assemblies. To create understanding for the environmental measures decided on at different levels in society, it is also necessary to demonstrate what effects those measures have in the environment. The Environmental Objectives Council's aim is that all the indicators on the Portal should be informative and easy to understand. In some cases, an indicator serves as a direct measure of progress towards the interim target concerned, and is then very important in following up that target. In others, the indicator reflects only a limited aspect of what the target describes, and it is then less significant a factor in monitoring progress and may perhaps be more important in other communicative contexts. However, it should be made easier for visitors to the Portal to see which of the indicators are used directly in follow-up of the objectives, to increase the transparency of that process. It should be clear which indicators (of impacts, driving forces or other parameters) are significant in determining whether or not the goal in question will be met on time.

The collaboration that takes place between the county administrative boards, through RUS, in monitoring progress towards the objectives is generally regarded as beneficial. It has resulted in a common system of indicators that are comparable from one county to another, has promoted consensus and shared definitions, and represents an approach that could be emulated in other areas of the boards' activities. Updating of indicators and assessment of progress towards the objectives are working well. Cooperation between RUS and the national agencies should continue to be developed and improved.

3.2.8 INTERNATIONAL INDICATORS

Several international bodies have selected a number of environmental indicators to illustrate trends in the environment and the factors affecting it. The Organization for Economic Cooperation and Development (OECD), the United Nations Environment Programme (UNEP) and the European Environment Agency (EEA) each have a 'core set of indicators' that is continuously updated. It is important for the Swedish environmental objectives system to be brought more closely into line with these international schemes, in order to cater as far as possible for the needs of users in terms of a complete system of indicators to compare developments at the international, national, regional and local levels.

CHAPTER 4.

The environmental objectives – a challenge for the whole of society

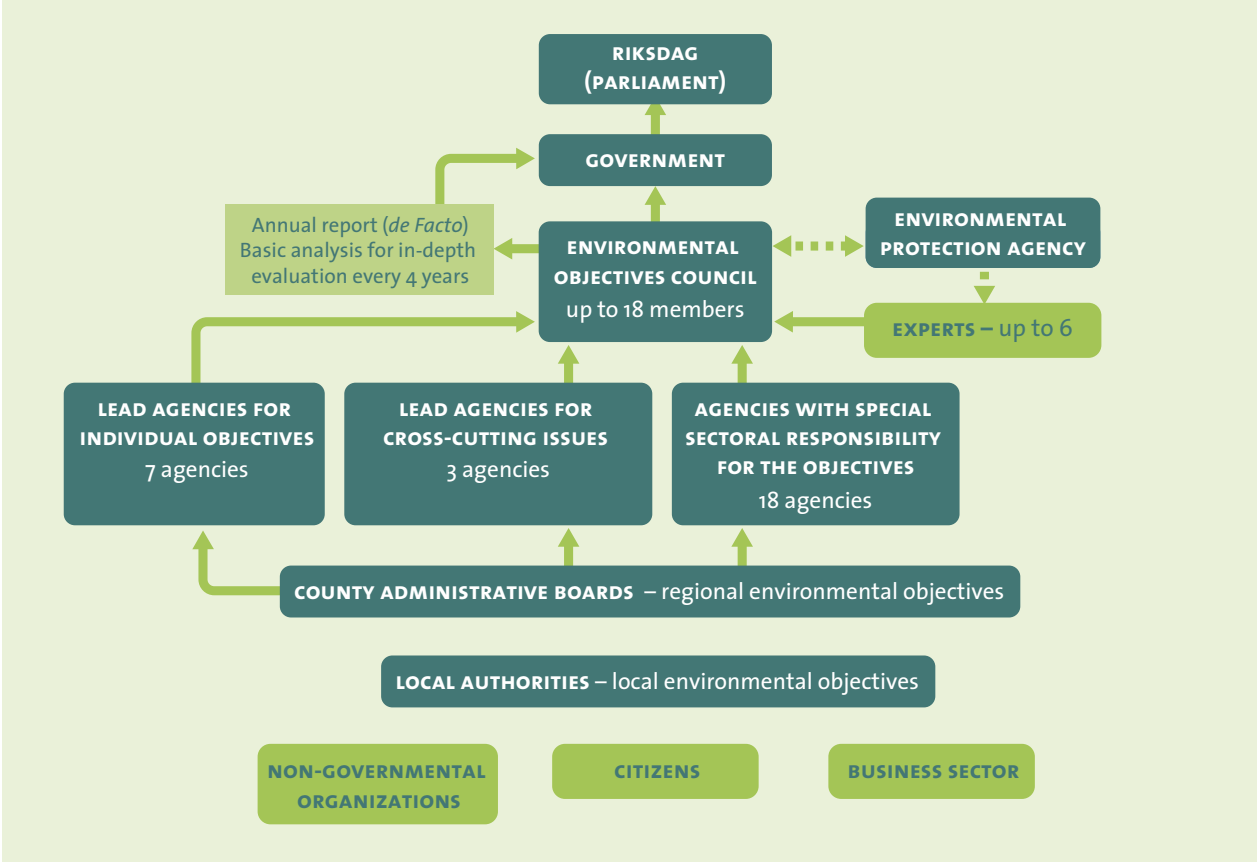
The Environmental Objectives Council's overall assessment is that efforts to achieve Sweden's environmental quality objectives have developed positively, and that they have promoted more effective coordination of the sum total of environmental action in the country. The pursuit of these objectives is a major collaborative undertaking which, to be effective, requires a high degree of coordination and cooperation. The process has led to stronger partnerships both between public agencies and, to a certain extent, with the business sector and other stakeholders in society. A more holistic view of sustainable development has evolved and environmental concerns are now better integrated into society. At the same time, there are calls for even closer coordination and cooperation on environmental issues at every level. Coordination takes time and requires resources. The Council accordingly views investments of resources to that end as money well spent, and believes that the necessary coordination should be sought throughout the environmental objectives system.

Sectoral responsibility – the principle that all sectors of society have a responsibility for the environment – has for the last 20 years been a crucial element in the implementation of environmental policy in Sweden. The basic premise is that environmental problems cannot be solved by traditional environmental agencies alone. In its bill 'Environmental Policy for the 1990s', the Government established the principle that every sector of society has a responsibility for the environment in its particular sphere of activity. Each sector must see to it that new environmental problems are avoided and, as far as possible, existing ones solved. This responsibility rests on both the government agencies and the industries concerned. Since its introduction, sectoral responsibility has progressively evolved, not least in agriculture, forestry and fisheries. The idea is also reflected in Sweden's Environmental Code.

With regard to follow-up of progress towards the environmental objectives, the division of roles among the agencies with lead responsibility for them has subsequently been developed and enhanced. Further improvements are necessary, however, when it comes to proposing measures and assisting county administrative boards with regional implementation of the objectives. The special sectoral responsibility for the objectives given to a number of government agencies has been successfully integrated into the environmental objectives system as a whole, and the Council sees no need for significant changes in this respect. The Government should, though, review which authorities are to have this special responsibility, as well as making it clear that it comprises follow-up, development and implementation. The agencies in question should continue to be involved in developing the action strategies.

Greater dialogue is needed between national authorities and the regional and local levels, to enhance understanding of one another's roles and develop closer cooperation. The environmental objectives need to be more clearly integrated into sustainable development policy. County administrative boards and other agencies of central government should coordinate their efforts more effectively, to ensure a more coherent approach in this dialogue. In many respects, regional action to achieve the environmental objectives has been successful. It has been pointed out that the county boards need more resources for this work, and also more support from national agencies. In the Council's view, there is cause to look more closely at ways of improving regional implementation, and of developing the roles, responsibilities and powers of county administrative boards with a view to meeting the objectives.

Local authorities have an important part to play. Translated into local goals and measures, national and regional environmental objectives could provide more effective tools for local policymaking. The Environmental Objectives Council feels that, at present, municipalities are failing to lend sufficient weight to environmental concerns in their policies, planning and supervision. They could assume greater and clearer responsibility for the objectives, using the important instruments available to them. Many of the measures needed to meet the environmental quality objectives are the responsibility of local authorities. Authorities themselves, however, call for improved expert support and guidance to enable them to give



Responsibility for achieving the environmental quality objectives is shared by the whole of Swedish society. It extends from the individual citizen's personal responsibility to Riksdag decisions on the overall direction of policy, expressed in the environmental quality objectives and the interim targets associated with them. This diagram shows the different bodies and groups involved in working towards the objectives.

effect to the objectives in their areas. The Council proposes that the Government should clarify questions of responsibility, so that local authorities are able to implement the environmental objectives in an effective and forward-looking manner. Small authorities may need special support to enable them to fully discharge their responsibilities.

In general, Swedish business is engaging increasingly actively with environmental issues, using environmental management systems as its principal tool. However, the Council feels that this sector ought to be able to make much greater use of the environmental objectives. In its opinion, networks and forums for dialogue on these goals between authorities and companies need to be developed, to promote a better understanding of the differing basic assumptions shaping environmental efforts in the two sectors.

Consumers and individual citizens can make major contributions to attaining the environmental objectives. To be able to do that, they need to be aware of what difference their own choices will make. The Council therefore wants to see even more attention paid to the importance of communicating environmental issues, to put all consumers and citizens in a better position to act and live more sustainably. The voluntary activities of environmental non-governmental organizations (NGOs) and others are of great significance in creating wider understanding of

the efforts required to meet different environmental objectives. The Council calls for environmental and sustainability issues to be integrated and given more space at all levels of education, and for particular attention to be paid to the need for continuing education for teachers in this area.

More use could be made of the national environmental quality objectives in international cooperation and at the EU level, both as drivers and as an approach to tackling environmental issues. The Government could, for example, make greater use of the objectives in international negotiations. The Swedish Presidency of the EU in autumn 2009 is an important context in which to inform others of Sweden's system of environmental objectives. Internationally, Sweden should underscore the importance of its approach of integrating the environmental objectives into all policy areas, through sectoral responsibility and regional and local authorities. In particular, it should seek to promote such sectoral integration within the EU.

4.1 The lead agencies' role in achieving the objectives

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that, as regards follow-up of progress towards the environmental objectives, the division of roles among the agencies with lead responsibility for them has been developed and enhanced. However, responsibility for proposing measures needs to be made clearer. More could be done to assist county administrative boards with regional implementation of the objectives.

4.1.1 RESPONSIBILITIES OF LEAD AGENCIES

The Government has designated seven central government agencies as lead agencies for one or more of the national environmental quality objectives. The Swedish Environmental Protection Agency is responsible for ten of the objectives, while the National Board of Housing, Building and Planning, the Swedish Chemicals Agency, the Swedish Radiation Protection Authority, the Geological Survey of Sweden, the Swedish Forest Agency and the Swedish Board of Agriculture are each responsible for one. In addition, the National Board of Health and Welfare, the National Heritage Board and the National Board of Housing, Building and Planning are lead agencies for the three broader, cross-cutting issues related to the objectives: *Human Health*, *The Cultural Environment* and *Land Use Planning and Wise Management of Land, Water and Buildings*. Responsibility for the environmental objectives is written into the Government's instructions to each of these nine agencies.

The role of a lead agency includes a responsibility to coordinate, monitor, evaluate and lend impetus to efforts to achieve the environmental quality objective in question. In the case of many of the objectives, responsibility for certain interim targets rests, in turn, with bodies other than the lead agency. The apportionment of responsibilities in the framework of each objective is decided by mutual agreement among the agencies concerned.

In the previous in-depth evaluation, the Environmental Objectives Council stressed the importance of a clear division of roles when it comes to monitoring progress and proposing measures to meet the interim targets. Since then, significant improvements have been achieved in these respects. However, responsibility for proposing measures could be made even clearer. There is often a lack of coordination between key players in achieving a given objective or target, both between those at the national, regional and local levels and between different agencies and stakeholders at the same level. Sometimes the division of responsibilities is also unclear where several agencies have adjoining responsibilities and none of them has clearly assumed a coordinating role.

Another major responsibility of the lead agencies is to assist the Government in international environmental cooperation and within the EU, since many of the conventions and directives adopted in those contexts have a considerable bearing on the environmental objectives. Their role also includes assisting

regional authorities responsible for the objectives with the regional application of national interim targets. This is made clear by a decision in principle of the Environmental Objectives Council, stressing the national lead agencies' responsibility for coordinating and supporting regional adaptation of the targets in a dialogue with county administrative boards. The latter have called for better guidance from the national agencies for regional implementation of the environmental objectives, in the form of basic data, comments on boards' assessments and, where relevant, proposals for changes to regionalized objectives. Up to now, the support given to county boards by national lead agencies has varied widely.

Each of the lead agencies must itself decide how its resources can most effectively be used, striking a balance between the desire for more support for regional implementation of the objectives and the simultaneous need to work at the EU level and in international forums.

4.1.2 COORDINATION BETWEEN NATIONAL AGENCIES STEPPED UP

Responsibility for monitoring progress towards environmental quality objectives and interim targets, and proposing measures to achieve them, is shared by several authorities, under the direction of the lead agency concerned. Consequently, many coordination and collaboration groups have been set up, to ensure that this work is undertaken as effectively as possible. Here are just a few examples of the numerous coordinating arrangements that have been created.

Groundwater coordination

In the case of objectives and targets related to water, it is particularly evident that responsibility is shared by a large number of public agencies. As regards groundwater, the Geological Survey of Sweden (SGU), as lead agency for the environmental quality objective *Good-Quality Groundwater*, has overall responsibility and assists other authorities with expertise and basic data for assessments and reporting. Other agencies with powers relating to issues relevant to progress towards this objective include the Environmental Protection Agency, the National Food Administration, the National Board of Housing, Building and Planning, the county administrative boards, including the water authorities, the Swedish Chemicals Agency, the Swedish Board of Agriculture, the Swedish Road Administration, the National Board of Health and Welfare, the Swedish Geotechnical Institute (SGI), the Swedish Rescue Services Agency and the Swedish Forest Agency. SGU has a responsibility to inform other central government bodies about groundwater as a receptor and about the potential impacts of different types of activities. The Environmental Protection Agency issues regulations and guidelines on water protection areas, and thus plays a decisive role in securing progress towards the interim target for the protection of water-bearing geological formations. Targets relating to drinking water, too, are a joint responsibility of several national agencies, including the Board of Health and Welfare and the Food Administration, depending on whether private or municipal water supplies are involved.

Marine coordination

For the interim targets under the environmental quality objective *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*, too, responsibility for follow-up is shared by several national agencies. The Environmental Protection Agency is the lead authority, while the Swedish Board of Fisheries, the National Heritage Board, the National Board of Housing, Building and Planning and the Swedish Maritime Administration are responsible for specific targets. In addition, concerted efforts are under way to implement a national marine environment strategy. At the Government's request the Environmental Protection Agency, in consultation with 15 other authorities, has developed an overall plan of action for the marine environment, comprising 30 practical measures that are intended to complement the wide range of activities already in progress in this area. They include improved access to marine data and designation of an agency with responsibility for offshore waters. Furthermore, the heads of 16 agencies have established a coordination group for marine environment issues, which is among other things seeking to eliminate any obstacles to implementing the action plan and to

handle difficulties arising over other issues linked to the marine environment.

It is argued that one reason why the state of the marine environment is not improving is that responsibility for it is so fragmented, both nationally and internationally. Within Sweden, regulation of the sectors that use the sea is spread over different ministries and agencies, and a similar fragmentation exists in the EU. Nor is work in this area coordinated at the local and regional levels. This is partly due to a lack of coherent municipal and regional planning of the coastal zone, resulting in exploitation of coastal areas and a dwindling proportion of undisturbed shoreline in the vicinity of major urban centres. Thus, coordination also needs to be improved when it comes to site protection, coastal planning and management.

Coordination relating to *Sustainable Forests*

To help implement the environmental quality objective *Sustainable Forests*, the Swedish Forest Agency has set up a national sectoral council, a broadly representative advisory body with members drawn from the forest industry, NGOs, the public agencies concerned, funders of research and other organizations. This council participates in discussions of environmental and sectoral objectives relating to forests and in follow-up and evaluation of those objectives. There are also five regional and 43 local sectoral councils with corresponding functions.

Supervisory responsibility for the interim target concerning protection of the cultural heritage of forest areas is currently shared between county administrative boards, which are responsible for ancient monuments under the Heritage Conservation Act, and the Forest Agency, with responsibility for other forest cultural heritage under the Forestry Act. There are currently troublesome shortcomings in coordination between these agencies, partly explaining the poor progress achieved towards this target. The division of roles, as defined in the two pieces of legislation, is judged by the authorities to be sufficiently clear, but for forest owners it often means having to contact two different agencies, which may be perceived as an unnecessary complication. Coordination between the bodies concerned must be improved if the interim target is to be met.

Division of responsibilities for *A Good Built Environment*

As lead agency for this environmental quality objective, the National Board of Housing, Building and Planning has an important part to play in securing progress towards it. The Board's responsibility for the areas of housing, building and planning closely reflects the main concerns of the objective. For several of the issues within its scope, however, other national agencies have a clearer expert responsibility: the Environmental Protection Agency where waste is concerned, for example, and SGU with regard to natural gravel. A partnership has therefore been developed between the Board of Housing, Building and Planning and those agencies to monitor and evaluate progress.

In other areas covered by the objective, too, national authorities other than the Board of Housing, Building and Planning have responsibilities and powers. They include the Environmental Protection Agency, the National Board of Health and Welfare, the Swedish Road Administration, the Swedish Rail Administration and the Swedish Civil Aviation Authority, with regard to noise; the National Heritage Board, concerning built environments of cultural heritage value; and the Swedish Energy Agency, as regards energy use in buildings.

Collaboration is already under way on these issues, but it could be developed further, to lend better support to efforts at the local and regional levels. To pave the way for this, it is important that roles and responsibilities are clear.

Coordination of health-related issues

Within the scope of the cross-cutting issue *Human Health*, a number of authorities have differing responsibilities. The National Board of Health and Welfare, which is the lead agency for this issue and has a coordinating function, chairs a collaboration group. Within this group, agencies responsible for the environmental objectives of most significance for human health, together with the National Institute of Public Health, the National Food Administration and the Swedish Association of Local Authorities and Regions, discuss health issues of common

concern related to the objectives. In some cases, the division of roles is unclear, for example regarding noise. Here, several agencies have differing responsibilities in adjoining fields, and none of them has clearly assumed a coordinating role. Environment and health are closely related. The Environmental Objectives Council wishes to see health issues given more prominence in follow-up and evaluation of the environmental objectives.

The Swedish Radiation Protection Authority (from 1 July 2008, the Swedish Radiation Safety Authority) coordinates questions with a bearing on the environmental quality objective *A Safe Radiation Environment* and relating to radiation in general. Active and broad-based inter-agency collaboration is in progress in the areas of ultraviolet radiation and electromagnetic fields. It is proposed that the agencies concerned should be given a formal remit to continue their preventive efforts to reduce human exposure to UV radiation.

4.2 Agencies with special sectoral responsibility for the objectives

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the special sectoral responsibility for the environmental objectives given to a number of government agencies has worked well, and that no significant changes should be made in this respect. The Council wants it to be made clear that this is a threefold responsibility, comprising follow-up, development and implementation in the sectors concerned. In addition, the Council considers that, as far as possible, the goals for the environment that are adopted in different sectors of society should be coordinated and/or in line with the environmental quality objectives.

▶ **THE COUNCIL PROPOSES** that the Government should review which authorities are to have special sectoral responsibility for the environmental objectives, since some agencies have several different responsibilities within the environmental objectives system. The consequences of any changes must be studied.

4.2.1 SPECIAL SECTORAL RESPONSIBILITY FOR THE OBJECTIVES – A BACKGROUND

In its bill 'Environmental Policy for the 1990s', the Swedish Government established the principle that every sector of society has a responsibility for the environment in its particular sphere of activity. Each sector must see to it that new environmental problems are avoided and, as far as possible, existing ones solved. This responsibility rests on both the government agencies and the industries concerned. Since its introduction, sectoral responsibility has progressively evolved, not least in agriculture, forestry and fisheries.

To make clear the environmental responsibilities of certain public agencies, in 1998 the Government gave 24 agencies a 'special sectoral responsibility for ecologically sustainable development'. This required the agencies in question to carry forward efforts to achieve ecologically sustainable development in their particular sectors. In parallel with this special sectoral responsibility, work began to be done to implement the environmental quality objectives and introduce environmental management systems at most of the agencies concerned.

In Government Bill 2004/05:150, the existing sectoral responsibility was linked more clearly to the environmental objectives. To underline the connection between the special sectoral responsibility for ecologically sustainable development and efforts in pursuit of the environmental quality objectives, the designation was changed to 'special sectoral responsibility for action to achieve the environmental objectives' (abbreviated here to 'special sectoral responsibility for the environmental objectives').

The nine central government agencies currently assigned lead responsibility for individual objectives, or for cross-cutting issues related to the objectives, are expected to work with organizations and companies in the sectors concerned to attain the environmental quality objectives and take account of the cross-cutting issues. Special sectoral responsibility complements the work of the lead agencies by making 18 authorities (including some of the nine just mentioned) responsible for promoting progress towards the relevant objectives in their respective sectors.

The agencies which, according to their instructions or appropriation directions, have a special sectoral responsibility are as follows: the Swedish Rail Administration, the National Board of Housing, Building and Planning, the Swedish Energy Agency, the Swedish Board of Fisheries, the Swedish Armed Forces, the Swedish Board of Agriculture, the Swedish Consumer Agency, the Swedish Civil Aviation Authority, the Swedish National Agency for School Improvement, the Swedish Agency for Economic and Regional Growth (Nutek), the National Heritage Board, the Swedish Forest Agency, the Swedish Rescue Services Agency, the Swedish International Development Cooperation Agency (Sida), the Swedish Maritime Administration, the Swedish Road Administration, the National Food Administration and the Medical Products Agency.

In the bill, the Government defines what it means by a 'sector'. A sector, in this context, means the regular sphere of activity of an agency, as described by the governance documents defining its area of responsibility, such as instructions from the Government, appropriation directions, government bills etc. According to Government Bill 2004/05:150, special sectoral responsibility for the environmental objectives includes:

- Taking steps to ensure that the agency and stakeholders in the sector concerned integrate environmental issues into their activities, so as to reduce the sector's adverse impacts on the environment, enhance its beneficial impacts, and hence contribute to meeting the environmental quality objectives as a component part of sustainable development. The agency in question is thus to take forward environmentally sustainable development in the sector.
- Engaging in a dialogue with lead agencies concerning measures to achieve specific targets and objectives and, where relevant, regarding the provision of data to monitor progress towards the environmental quality objectives.
- Reporting to the Environmental Objectives Council every four years on the discharge by the agency of its special sectoral responsibility for the objectives. (The first reporting date for these agencies was 28 February 2007.)

In Government Bill 2004/05:150, the Government points out that specific tasks and approaches and the contents of reports must be guided by the activities of the agencies in question, on the basis of a dialogue between those agencies, the Environmental Objectives Council and the Environmental Protection Agency. The aim is that this special sectoral responsibility should as far as possible be integrated into and complement other efforts to implement the environmental quality objectives. Subsequent to the bill mentioned, a number of the sectoral agencies concerned have been given a joint brief to develop relevant elements of the three action strategies and to report to the Environmental Objectives Council in accordance with its guidelines.

4.2.2 SPECIAL SECTORAL RESPONSIBILITY – HOW DOES IT WORK IN PRACTICE?

For the government agencies given special sectoral responsibility for the environmental objectives, that responsibility means different things. A common way of carrying it out is to link up stakeholders within the sector concerned, support them in their environmental efforts and, at the same time, give a lead on issues related to the objectives. Several authorities say that they have incorporated this sectoral responsibility in their regular activities, and that it already forms a natural part of their overall role.

Despite this optimism on the part of many of the agencies reporting, there are several who see problems with the existing system. Above all, it seems to be difficult to define the sectors for which authorities are responsible, and to find indicators to measure how sectoral responsibility is contributing to the progress made. Is sectoral responsibility the sole preserve of central government, or should it have an impact outside that sphere? How far does a given sector extend? Nutek, the Swedish Consumer Agency, the National Heritage Board and others feel that natural boundaries to their respective sectors are not easy to define. Some agencies take the view that they are not in a position to influence the whole of their sector, e.g. Nutek in relation to companies in general. To address this problem, Nutek and certain

other bodies have chosen to set out, in their submissions to the in-depth evaluation, how they have defined their sectors. The fact that these agencies are unable to influence all areas of their sectors remains a problem, however.

A few agencies refer to the national character of the environmental quality objectives. This is identified as a problem for sectoral agencies with a markedly international role, such as Sida, and for those dealing with environmental problems that are largely international, such as the Civil Aviation Authority and the Consumer Agency. In this context, the question is whether most sectors are not in fact affected by international environmental problems and, in turn, affect other countries through their activities. Although this problem is not easily solved, the sectoral agencies' reports highlight a need for guidelines on how international issues are to be tackled.

Other comments made in the reports concern the link between special sectoral responsibility and the cross-cutting issues related to the objectives. The National Board of Health and Welfare is currently responsible for the cross-cutting issue *Human Health*, but has no sectoral responsibility. In line with this, the National Heritage Board expresses a wish to be responsible for the cultural environment solely as a cross-cutting issue, and to be relieved of its sectoral responsibility. The Swedish Energy Agency considers that energy should also be recognized as a cross-cutting issue in this context. Its argument is that energy issues affect all of the environmental objectives to some degree, having a bearing both on emission- and natural resource-related objectives and on questions such as consumption and health.

As a positive example of how sectoral responsibility can be handled, the Swedish Armed Forces have adopted special sectoral objectives in order, as they put it, to 'create transparency in authorities' environmental efforts'. The aim is not only to create measurable goals, but also to unite stakeholders within the sector – in this case, other authorities. Another way of fleshing out sectoral responsibility is to work with it at a regional level.

4.2.3 SECTORAL RESPONSIBILITY – HOW CAN IT BE DEVELOPED?

The agencies' reports to the Environmental Objectives Council make it clear that there are several ways of interpreting, and also discharging, sectoral responsibility for the objectives. This is not necessarily a problem, as all sectors operate on different terms. The sectoral agencies do not, in general, see any need for a radical redefinition of their responsibility. Many of them seem to have been given a push forwards by having it. Several also say that they now have a structure for their environmental activities and wish to continue those efforts, and that it is therefore important for the Government to further clarify what sectoral responsibility entails.

Certain problems associated with sectoral responsibility since it was introduced appear to remain, but by and large this responsibility seems to have found its place and to have benefited from being linked to the environmental objectives, rather than, as before, to ecologically sustainable development. The Environmental Objectives Council is consequently not proposing any significant changes to the existing responsibility. There may be cause, however, to review which authorities should have sectoral responsibility for the objectives, given that some agencies have several forms of responsibility within the environmental objectives system.

Since 2006, the instructions of the agencies in question have included references to their having a special sectoral responsibility for the environmental objectives. At present, the implications of this responsibility are described in somewhat varying terms; in several cases, it is stated that the agency is to coordinate, support and lead efforts in its sector. The Environmental Objectives Council considers that elements of agencies' terms of reference relating to sectoral responsibility should be the same for all the authorities concerned, with a consistent wording appearing in their appropriation directions or instructions. However, this should not prevent certain sectoral authorities being given a more specific remit, depending on the character of their particular sector. The Council believes that the description of sectoral responsibility set out in Government Bill 2004/05:150 best clarifies

what is involved, but that the wordings there, too, could be developed and made more precise as this responsibility evolves. In the Council's view, it is important to make it clear that sectors have a threefold responsibility, comprising:

- Follow-up of progress in integrating environmental concerns into the sector, and of the sector's impact on the environment (the concern is not with progress towards environmental objectives or regarding the state of the environment, but rather with more general trends in the sector).
- Development (continuing to develop environmental efforts within the sector).
- Implementation (engaging in a dialogue with lead agencies on appropriate measures, and helping to ensure that measures are implemented in the sector).

Sectoral responsibility is not just about monitoring what has been done in a given sector; the agency entrusted with this role is also expected to lend impetus to and develop efforts within the sector. It should be made clear that a sector not only includes the government agency concerned, but also private, voluntary and other public stakeholders in the area in question. Furthermore, the agency should not need to have all the necessary policy instruments in its own hands. It can also make proposals to the Government concerning the instruments needed to get to grips with problems in its sector. Since much of the work required to achieve the environmental objectives rests on the sectors that have been assigned a sectoral responsibility, the role of the relevant agencies should also include implementing measures which they identify as necessary for this purpose. Adaptation of the environmental quality objectives to the environmental action under way in the sector, for example through the development of sectoral goals based on them, should be encouraged.

Goals relating to the environment have been adopted in a number of policy areas. One of the more specific goals under the overall objective for transport policy, for example, falls in this category. The existence of several different types of environmental goals aimed at a particular sector is unfortunate and can cause confusion as to which of them are to apply. The Environmental Objectives Council considers that, as far as possible, the goals for the environment that are adopted in different sectors should be coordinated and/or in line with the environmental quality objectives.

4.3 Regional implementation of the objectives

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that, in many respects, regional action to achieve the environmental objectives has been successful, and that the county administrative boards are a significant driving and coordinating force in that context. Working towards the objectives has enhanced regional cooperation between authorities and with the business sector and other stakeholders, and promoted a deeper understanding of the concept of sustainable development. Nevertheless, the Council believes there is a need to strengthen joint regional initiatives. Many authorities and other stakeholders point to inadequate resources as a limiting factor for the contributions county administrative boards are able to make to progress towards the environmental objectives.

▶ **THE COUNCIL CONSIDERS** that both county administrative boards and regional development councils need to make greater use of regional environmental goals when elaborating regional development and growth programmes and structural fund programmes. It is important to make sure that, at an early stage in business development and infrastructure initiatives, possible impacts on the environment are properly considered.

▶ **THE COUNCIL PROPOSES** that the Government should look more closely at ways of improving regional implementation, and of developing the roles, responsibilities and powers of county administrative boards with a view to meeting the environmental objectives.

4.3.1 REGIONAL COORDINATION

The county administrative boards have regional responsibility for all the environmental quality objectives apart from *Sustainable Forests*, for which responsibility at that level rests with the Swedish Forest Agency. The boards' role is to coordinate regional implementation of the objectives, regionalize the national objectives, and monitor and promote progress towards the objectives in their counties. This involves collaboration with many different stakeholders in the counties concerned.

The pursuit of the environmental objectives is a major collaborative undertaking, with contributions from a wide range of stakeholders. At the regional level, there are many partners with an important role to play in this process, and several county administrative boards are involved in collaborative endeavours in their areas, relating for example to business development, energy, sustainable transport, regional 'Building/Living' dialogue projects, the distributive trades and rural development.

The five water authorities are of major significance for several of the environmental quality objectives. They coordinate the work being done in their respective districts and adopt environmental quality standards, management plans and programmes of measures, which in various ways affect the use of land and water in these areas. The regional offices of central government agencies, such as the Swedish Road and Rail Administrations, are also key partners in efforts to achieve the objectives. Regional energy offices address energy issues at the regional

level and provide coordination and support to local authority energy advisers. In the area of public health and environmental medicine, the county councils are important partners when it comes to the health aspects of the environmental objectives. Regions, regional development councils and regional associations of local authorities are, for the counties concerned, vital partners in several areas relevant to the objectives. County museums, with their role in generating and disseminating knowledge, for example about the cultural heritage values of the built environment, likewise have an important part to play.

County administrative boards also collaborate in many different ways with local authorities. They arrange meetings, for example, with environmental objectives coordinators or other local council officials, and provide data and many other forms of support. Cooperation between municipalities and county boards needs to be developed still further, with regard to goals, follow-up, practical measures and coordination, although this is a need which the boards often feel they have difficulty meeting and finding resources for to the extent that is required.

The national lead agencies and agencies with special sectoral responsibility have an important role to play in regional implementation of the objectives. County administrative boards would like to see closer collaboration with the lead agencies. They propose that the latter should be given more responsibility for coordinating measures, at the regional as well as the national level. To maximize the benefits of regional initiatives, these should, to a greater extent than at present, be jointly designed by county boards and national lead agencies.

Several of the national agencies also draw attention to a lack of follow-up of the many different measures undertaken by county administrative boards, and also to inadequate monitoring of the efforts of other stakeholders at the county level.

Furthermore, county boards point out that the Environmental Objectives Council's coordinating responsibility for overall action to attain the objectives could be strengthened, and consider that the Council should have an enhanced and more active role in this collaboration. They also see a potential to develop and strengthen their own role as coordinating bodies – but to be able to do that, they will need more resources. The boards' resources to implement measures that are not driven by national assignments or funding are generally regarded as quite inadequate to allow such measures to be undertaken in an effective manner. County administrative boards have above all highlighted a need for more cultural heritage expertise in day-to-day implementation of the objectives, a need that is not met with current levels of staffing. The Environmental Objectives Council shares the boards' view, as it is at the regional and local levels that much of the work needed to achieve the objectives is carried out.

4.3.2 Regional implementation and sustainable development

Sustainable development is one of the goals specifically identified in the county administrative boards' appropriation directions. The environmental objectives, combined with action programmes describing how they are to be attained, are crucial in the pursuit of that goal. Integrating the environmental objectives into other processes and activities, such as development and growth programmes, structural fund programmes and land use planning, is one of the most powerful means of ensuring that the objectives have an impact.

In many counties, lead responsibility for regional development issues, including regional growth programmes, has been transferred to regional development councils, and with it responsibility for regional development programmes and strategies. In the counties concerned, the role of the county administrative board is one of coordination in relation to other central government bodies in the county. In particular, its task is to coordinate the interests of the state in various planning processes linked to land use planning. In most cases, in other words, the final appraisal of what is to be included in a regional development programme is no longer made by the county administrative board.

In the context of regional development and growth, the conflict of goals between regional economic interests and the environmental objectives is clear and not easy to handle. The Environmental Objectives Council therefore considers it imperative to ensure that the balance struck between the various dimensions of sustainability (economic, social and environmental) in the overall appraisal of regional development programmes is guided by high-quality impact assessments, undertaken in the light of the regional environmental objectives.

In the report of the Committee on Public Sector Responsibilities it is recommended that the proposed elected regional authorities should take over the county administrative boards' responsibility for applying, fleshing out and pursuing the national environmental quality objectives at the regional level. The Committee believes that this would help to integrate the objectives into regional development planning and strengthen the links between regional action to achieve the objectives and regional development efforts.

There are pros and cons to this suggestion. If the proposal to transfer responsibility for regional implementation of the environmental objectives (with the exception of monitoring of progress) to new regional authorities is put into effect, it will represent a major change. A separate analysis needs to be made of how this should be accomplished from the standpoint of resources and skills, so as not to adversely affect the regional implementation process.

4.3.3 WHAT COUNTY ADMINISTRATIVE BOARDS ARE DOING TO ATTAIN THE OBJECTIVES

Action to achieve the environmental objectives at the regional level has in many respects been successful. The county administrative boards find it inspiring to work with the objectives, and have great confidence in the Swedish system of environmental objectives as a platform for systematic, long-term environmental efforts at the national, regional and local levels. The structure of objectives and targets, measures, follow-up and evaluation creates conditions for effective action to safeguard the environment. In many regards, moreover, trends in the state of the environment are moving in the right direction. On the other hand, judging from the regional assessments of progress, successful attainment of most of the regional environmental goals remains a long way off – that is to say, the situation is the same as at the national level. The pace of progress is not sufficient, and there are many problem areas. The implementation process therefore needs to be developed further and given greater impetus. In particular, efforts to design and introduce measures must be stepped up.

The county administrative boards wish to see further initiatives taken, and believe that the necessary process of transition needs to gather momentum. As well as integrating the environmental objectives into regular activities, it is necessary to launch entirely new measures. Some of the measures included in the regional action programmes are the responsibility of county boards themselves, which accordingly need to develop their own work in this area. The role of driving implementation of all the other measures, for which other stakeholders are responsible, is a much more difficult one. Several boards identify a need to clarify their roles and responsibilities, particularly with regard to measures.

County administrative boards have made varying progress and have differing approaches to implementing measures in this context. In some cases, relatively well-developed networks and collaborative arrangements exist, and often special funding is set aside, more or less clearly, for environmental objectives projects. County boards and other regional bodies have important policy instruments at their disposal that could be put to more effective use in pursuit of the objectives. Legal instruments, such as permitting and supervision, guidance to supervisory authorities, processing of applications under the Environmental Code, and application of the Planning and Building Act (1987:10) and the Heritage Conservation Act (1988:950), are crucial to achieving the environmental objectives. Economic instruments too, such as EU support, agri-environment payments, local nature conservation programmes, climate investment programmes and energy efficiency and conversion grants, could be used. Environmentally driven

business development holds considerable potential and should be given higher priority in efforts to attain the objectives at the national and regional levels.

Many of the national lead agencies, along with other authorities, environmental NGOs and county administrative boards themselves, single out land use planning as a key factor in achieving the environmental objectives. At present, county boards are required to examine local authority planning primarily with respect to four 'grounds for intervention': areas of national interest, health and safety, matters of concern to more than one municipality, and environmental quality standards. Through an active dialogue with municipalities on their comprehensive and detailed development plans, boards are able to convey a wide range of views relating to sustainable development. There are many shortcomings, however, in existing planning. Comprehensive plans could be more effective in guiding development and become an even more significant factor in local authority implementation of the objectives. For that to happen, there is often a need for better basic data, but also to give greater prominence to longer-term interests and the regional perspective.

Information is another of the policy instruments available to county administrative boards. The latter have a central part to play when it comes to information and communication relating to regional implementation. Most of them compile state of the environment reports reviewing progress towards the environmental objectives, and hold regular regional conferences and seminars. A good deal of information about the objectives is to be found on boards' websites, and in many counties newsletters on the subject are published. The environmental objectives are also discussed in connection with regular visits to local authority leaders. Several boards have published information material specifically aimed at businesses and schools. However, the Environmental Objectives Council sees a potential to develop regional communication activities and make them more effective, for example through greater cooperation and sharing of experience among counties and closer coordination with national agencies.

4.4 The role of local authorities

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that a more developed dialogue is needed between the local and regional levels and the national level. This will enhance understanding of one another's differing roles in implementing the environmental objectives, and allow the objectives to be handled more clearly and effectively as part of a policy for sustainable development.

▶ **THE COUNCIL BELIEVES** that local authorities have an important part to play in securing progress towards the environmental objectives. Translated into local goals and measures, national and regional objectives can provide tools for local policymaking. The Council feels that municipalities should assume greater and clearer responsibility for local initiatives to attain the objectives. Many of the measures needed to meet the environmental quality objectives are the responsibility of local authorities, and several effective instruments, in particular spatial planning and supervision, are also in their hands.

▶ **THE COUNCIL CONSIDERS** that municipalities are failing to lend sufficient weight to environmental concerns in their policy decisions, planning and supervision.

▶ **THE COUNCIL PROPOSES** that the Government should clarify questions of responsibility, so that local authorities are able to implement the environmental objectives in an effective and forward-looking manner. Small authorities may need special support to enable them to fully discharge their responsibilities.

4.4.1 NATIONAL OBJECTIVES BENEFIT LOCAL ENVIRONMENTAL ACTION

The Environmental Objectives Council notes that local authorities have very important roles to play in securing progress towards the environmental objectives. Translated into local goals and measures, national and regional environmental objectives can serve as effective tools in local policymaking, in defining priorities, in land use planning, in other planning and follow-up, in the management systems of local authority services, in communication with companies and the public, and so on.

The environmental objectives have very much made their mark at the local level. This is made clear by a Government-commissioned evaluation of local authorities' efforts in pursuit of the objectives, conducted by the Environmental Protection Agency in collaboration with the Swedish Association of Local Authorities and Regions: 'Local authority implementation of the environmental objectives' (November 2006). Environmental issues are frequently felt to have been given a higher political priority. Municipalities are taking a wide range of action to achieve the objectives. Almost all (84%) of Sweden's 290 local councils are working in some way with environmental objectives. Just over a third have developed and adopted local environmental goals of their own, based on the national and regional objectives. Another almost 40% of authorities are currently elaborating such goals. Just under a tenth have targets for the environment that are not based on the national or regional ones, while others are not developing goals

of their own, being content to base their efforts on the national objectives.

In two-thirds of municipalities, responsibility for environmental objectives rests with the municipal executive board (the council cabinet). In just under a third, it lies with the environment and building, planning or other specialized committee whose remit includes the environment. Key factors explaining why some local authorities are ahead of others in this area include political leadership on environmental issues and active council officers. Other contributors include active NGOs giving prominence to environmental concerns, and a desire to establish a 'green' image for a municipality.

Most local authorities state that they benefit to a great or a certain extent from the national environmental objectives, and that the latter have resulted in tangible action in their areas. The objectives are seen as useful tools in local sustainable development efforts. Their pursuit lends greater visibility to environmental issues and enhances knowledge and commitment, as well as providing a common platform for collaboration and communication between the national, regional and local levels. Cooperation among local authority departments is also enhanced, creating a valuable link between environmental objectives and practical measures. More account is now being taken of the environment in municipal planning. Compared with Agenda 21, action related to the environmental objectives is more closely linked to existing structures and responsibilities. In many municipalities, citizens, businesses and NGOs are working with the local authority. Business development and growth are among the questions discussed in such contexts. Schools and pre-schools, with the considerable scope they offer for providing information and education from an early age, are seen as important in engaging the interest of children and young people in the environment as an issue affecting their future. Local authorities are major purchasers of goods and services, and green procurement can play a part in meeting several of the environmental quality objectives. They are also important employers, in a position to provide information and training for their employees on environmental matters.

4.4.2 LOCAL ENVIRONMENTAL COOPERATION

Most local authorities cooperate with the relevant county administrative board in implementing the environmental objectives. They also work with NGOs, local businesses and regional cooperation bodies. Far fewer of them, however, collaborate with central government agencies. Municipalities vary in their opinions of cooperation with county boards. Almost half of councils' environmental affairs officers take the view that the county administrative board's regional implementation of environmental objectives supports the work of the local authority 'to a large extent'. Most of the others regard it as doing so 'to a certain extent'. At the same time, several critical comments may be noted concerning the benefits of interaction with the county administrative board, particularly from elected councillors. Several consider that the objectives reflect a 'top-down' approach.

4.4.3 RESOURCES AND BALANCE IN LOCAL IMPLEMENTATION OF THE OBJECTIVES

The Environmental Objectives Council believes that there is a significant imbalance in the basic premises for implementation of the environmental objectives. Municipalities in sparsely populated regions and those with fewer than 12,500 inhabitants are overrepresented among local authorities not working with environmental goals. Net spending by authorities on environment and health rose by some 20% in real terms between 1999 and 2006, although the figures from municipal summary accounts are uncertain. The figures available indicate that resources have primarily been devoted to tasks involving an exercise of public authority, for which a real increase of around 40% may be noted. Other net costs related to environment, health and sustainable development fell somewhat, although both expenditure and revenue continued to rise. Larger local authorities are able to devote more resources to work in this sector, and those experiencing strong economic growth are sometimes better placed to influence activities with environmental impacts in their areas. The gap between well-resourced and under-resourced municipalities could widen, not least because Local Invest-

ment Programme (LIP) and Climate Investment Programme (Klimp) funding has to a significant extent gone to large and medium-sized authorities. The picture is a complex one, however. Some sparsely populated municipalities are among the most proactive in terms of strategic efforts in pursuit of sustainable development.

Although the environmental objectives are regarded as a useful tool, they do not eliminate the obstacles in the way of action for a better environment, namely insufficient resources, inadequate commitment and conflicts of goals. According to almost 60% of local authorities, a lack of resources, financial or human, is a major barrier to implementing the objectives. Inadequate support from the state is viewed by almost a third as a serious hindrance.

Goal conflicts, finally – here between environmental objectives and other policy aims and interests – are also seen as a significant obstacle. Business interests and economic wishes frequently take precedence over consideration for the environment. The latter is almost invariably subordinated to vital economic interests, for example in connection with road building, mining, and the establishment of companies and retail outlets. Smaller municipalities, especially, often have neither the money nor the staff to undertake much more than the minimum supervision required by law.

4.4.4 PLANNING AS A TOOL

With their monopoly on planning, local authorities have in their hands one of the most important instruments for achieving the environmental quality objectives. Land use planning, including plans for transport, energy, green space and cultural environments, is of great significance for virtually all the objectives and for the cross-cutting issues *Human Health*, *The Cultural Environment* and *Wise Management of Land, Water and Buildings*. Using tools such as comprehensive and detailed development plans, area regulations, environmental impact assessments, building permits and demolition permits, municipalities can to some extent shape the long-term development of the physical environment. These tools are regulated by the Planning and Building Act, in most cases with links to the Environmental Code. Land use planning is intended to ensure an integrated view of society, which is of paramount importance in attaining the objectives. Such a view is also called for by several lead and sectoral agencies and county administrative boards. Planning, furthermore, involves a statutory process of consultation with both politicians and the general public, making for broader understanding and consensus when the measures decided on are to be implemented.

One function of comprehensive planning, which potentially is the most powerful instrument, is balancing and prioritizing different interests: private and public, and those of different functions in society, for example transport and development in various forms. According to the regional reports received, setting priorities in this context generally seems to be difficult. Where different interests have to be weighed one against the other in the plan, and the local authority's decision goes to appeal, the body hearing the appeal often has difficulty upholding the interests of the environment. Another major problem is that municipalities' comprehensive plans are updated far too rarely to have any effect at a practical level. One reason for this is that several authorities view comprehensive planning as a very cumbersome process. Recent amendments to the Planning and Building Act could make updating these plans easier. It will also be simpler to supplement and add more detail to them.

In its background report to the Environmental Objectives Council, the National Board of Housing, Building and Planning observes that land use planning is less effective an instrument for achieving the environmental objectives than it could be. This, the Board says, is due not primarily to shortcomings in laws and regulations, but rather to inadequate supervision and application of the legislation.

Another problem is a lack of municipal energy plans. Local authorities are required by law to have such plans, but despite this the majority do not, or else have plans that are out of date.

4.4.5 SUPERVISION AND OTHER TOOLS

Key problem areas in the work of local authorities that are highlighted by the national lead agencies include – apart from land use planning – supervisory issues and implementation of environmental quality standards. Properly functioning supervision is a basic factor for success on a host of issues crucial to many of the environmental objectives. A common dilemma is that many municipalities often feel that they lack sufficient resources to discharge their supervisory responsibilities. A case in point is the problem of single-household sewage systems, where the action taken varies widely among local authorities. Some authorities have carried out extensive inventories and are also actively introducing appropriate measures; others do not see this as a priority. A relatively high proportion of the phosphorus entering aquatic systems comes from sewage facilities of this kind. In almost half of all cases, treatment standards fall short of what the law requires.

The supervision prescribed in the Environmental Code makes considerable demands on municipalities' resources, and sometimes comes at the expense of efforts to formulate environmental goals. At the same time, most local authorities find the environmental objectives useful in their supervisory duties. One-fifth of authorities consider that they are unable to give priority to environmental activities other than supervision. The Committee on Public Sector Responsibilities proposes that all regulatory supervision (enforcement of legally binding regulations and decisions arising from them) should be a central government responsibility. If this recommendation is acted on, i.e. county administrative boards are given overall responsibility for environmental supervision in their counties, it will have major consequences for the work of local authorities in the area of supervision and the environment. That in turn will affect their scope to use supervision as a means of attaining the environmental objectives. The Committee argues that supervision needs to be better coordinated and the variations in assessments, quality and resources across the country reduced.

In a study supported by the Environmental Objectives Council, IVL Swedish Environmental Research Institute Ltd. has looked at how local authority supervision in the environmental field could be developed to produce the maximum benefits for the environment and thus help to meet the national environmental quality objectives. The report suggests that supervision in this area needs to be designed more than at present on the basis of what effect it is primarily intended to have. According to the study, opinions differ among those responsible for supervision as to what should take priority: equality before the law (avoiding restriction of competition) or securing the greatest possible environmental benefits (helping to achieve the environmental objectives). It emerges that the environmental quality objectives are increasingly often being used as selection criteria in the supervisory process. But information about the objectives and what firms can do to help meet them is rarely provided in that framework. A greater focus on the objectives in the context of environmental supervision could help motivate companies to take preventive action. One conclusion drawn from the study is that there is no forum in which companies and public authorities can discuss the shape of environmental legislation and supervision in an open, positive and constructive atmosphere.

Environmental quality standards for outdoor air are an important instrument for attaining several of the interim targets, in particular under *Clean Air*. Action programmes to meet these standards have been or are to be adopted by around a dozen local authorities in Sweden. However, the programmes introduced in Stockholm and Göteborg have not led to the standards being met, since the measures they propose have not been decided on or implemented. This is partly due to a lack of clear responsibility both for implementing and for following up such measures.

Municipalities could, in addition, do with applying more rigorously the protective instruments available to safeguard future drinking-water supplies. This is a point also made by the OECD in its recommendations.

4.5 The environmental objectives and the courts

Sweden's environmental legislation is one of several policy instruments that can be used in the pursuit of the environmental objectives. In 2006 the Environmental Objectives Council funded a study by the Geological Survey of Sweden (SGU) that looked at the extent to which the environmental quality objectives are taken into account by the courts when applying the provisions of the Environmental Code. The study examined a number of rulings, noting any references to the objectives appearing in them. It showed that:

- In 1.6% (10 out of 608) of the rulings studied, the grounds for the judgment indicated that the environmental quality objectives had guided the court's application of the provisions of the Code.
- Of the objectives referred to in the grounds, *A Non-Toxic Environment* appears to have been particularly influential as a guiding consideration. More specifically, this was in connection with determinations by the courts, when setting conditions relating to chemicals, of the scope of the knowledge requirement provided for in Chapter 2, Section 2 of the Code.

In the legislative history of the Environmental Code, it is stated that the environmental objectives are intended to guide the application of the Code as far as interpretation of the concept of sustainable development is concerned. An evaluation by the Environmental Code Committee of how the Code was being applied, however, found no clear indication of the objectives influencing the environmental courts' assessments of cases. The Environmental Court of Appeal, meanwhile, has underlined the importance of the Code's provisions being interpreted in the light of the environmental quality objectives adopted by the Riksdag.

Some of the rulings studied included references to sustainable development. In these cases, the courts already had a clear idea of how sustainability was to be interpreted, without going via the objectives. In cases where the courts touched on the environmental quality objectives, they did so with varying degrees of precision: everything from clear references to specific objectives – which had evidently guided courts in their application of particular provisions of the Environmental Code – to more general statements about there being environmental objectives, with no very clear links to provisions of the Code.

The Environmental Objectives Council considers that the environmental quality objectives could serve to a greater extent as guidance in the application of the Environmental Code. This presupposes that the courts are supported in their reasoning by the public agencies concerned.

4.6 The role of the business sector

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL MAKES** the assessment that the business sector, together with public agencies, could do more to create networks and forums for dialogue on the environmental objectives, with a view to achieving mutual understanding. In this way, environmental issues could be taken forward.

▶ **THE COUNCIL CONSIDERS** that experience of using the environmental objectives as an integral part of environmental management systems could be passed on to others within the business community.

▶ **THE COUNCIL ALSO CONSIDERS** that the business sector could, to a greater degree, give prominence to the link between 'environment and business' and, in addition, contribute knowledge and initiatives which demonstrate that systematic attention to the environment makes economic sense, both for society at large and for businesses. Greater efforts by business sector organizations could help companies play a part in attaining the environmental objectives. The project already under way in collaboration with the Swedish Agency for Economic and Regional Growth (Nutek) is a welcome initiative.

4.6.1 BUSINESS'S ROLE IN ACHIEVING THE OBJECTIVES

The business sector has an important part to play, along with others, in implementing the environmental quality objectives. Many companies today pursue structured environmental programmes that make a significant difference to the environment. Businesses themselves, however, do not commonly link these efforts to the environmental objectives. According to a study carried out for the in-depth evaluation by the Confederation of Swedish Enterprise, there is no link between successful environmental management on the part of an individual company and the company's approach to the national environmental objectives. The study shows that many companies are familiar with the objectives, but that they do not tend to be integrated into their activities.

The business sector is involved in the process of developing and monitoring the environmental objectives, in that the Confederation of Swedish Enterprise and the Federation of Swedish Farmers each have an expert attached to the Environmental Objectives Council, as well as representatives on the Council's working groups. At the regional level, individual companies have been invited by some county administrative boards to take part in discussions on regional environmental goals.

From the business point of view, a welcome aspect of implementation of the environmental objectives is that many public agencies now appear to be working more closely together. The business community believes that the Environmental Objectives Council continues to have an important part to play in providing, on an ongoing basis, relevant information and statistics on the state of the Swedish environment, and in promoting better interaction between agencies. However, attention is also drawn to a need for the authorities to take greater account of business concerns in their efforts to attain the objectives: impact assessments, for example, must take greater

head of impacts on companies. This is necessary as a basis both for understanding how businesses tackle environmental issues, and for a constructive dialogue on the objectives. Environmental agencies, it is said, seem to have difficulty appreciating companies' environmental achievements and rewarding voluntary environmental measures in relation to the objectives. Companies also highlight a need for industry-specific expertise within the lead agencies for the objectives. The Environmental Objectives Council considers that the business sector, together with public agencies, could do more to create networks and forums for dialogue on the environmental objectives, with a view to fostering mutual understanding. In this way, environmental issues could be taken forward.

According to the Confederation of Swedish Enterprise's evaluation, most companies welcome the existence of a long-term environmental strategy for Sweden and the fact that national environmental objectives have been elaborated. They are also agreed that the business sector has a significant role to play in promoting an environmentally sustainable society. On the other hand, the environmental objectives do not appear to directly guide and drive companies' actions. Many feel that there are too many objectives – and that no national priorities among them have been identified. The business community considers it unfortunate that the interim targets, especially, are worded in such varying ways, making it difficult for companies to get their bearings and set priorities of their own. Some of the targets describe an effect, result or level of environmental quality, as was intended, but many can be regarded more as environmental policy goals or relate to measures. To make the interim targets clearer and easier to communicate, businesses would like to see the current plethora of targets simplified and those referring to measures scrapped. Often, the environmental objectives are seen as the property of politicians and the wider society, and as the tools of public agencies.

Environmental objectives in companies' management systems

The environmental efforts of industries and companies have become broader in scope since the 1990s and now often involve a comprehensive approach to both direct and indirect environmental aspects. This change of outlook can probably be attributed to a number of interacting factors, including:

- Growing globalization: many companies now have production facilities, suppliers and customers worldwide.
- Pressure on companies, e.g. from customers, markets and the media, to report on their environmental performance.
- Environmental management systems.
- Voluntary environmental initiatives, in the form of action programmes, tools and standards which companies can sign up to voluntarily.
- Awareness that environmental and sustainability issues can make a major difference to a company's financial position and brand image.
- Growing pressure for environmental risks to be disclosed in directors' reports.

The environmental objectives are increasingly often being incorporated in companies' environmental management systems. This is done, for example, when significant direct and indirect environmental aspects are identified, or when companies set environmental goals of their own. Standards for such systems have helped many firms realize that environmental issues need to be addressed in a broad, holistic framework. In this context, regional and local environmental goals are most commonly used, since in many cases these are more tangible than the national objectives. Around 4,000 Swedish enterprises currently have a certified environmental management system, with the international ISO 14001 standard now the dominant one. Companies generally have positive experiences of these systems, which, when integrated with other management systems, make attention to the environment a natural component of the overall running of the business. An environmental management system also involves training employees to show due consideration for the environment. In this way companies, as major employers, are helping to impart awareness of the environmental

quality objectives to large sections of the population. Firms that have actively integrated the Swedish environmental objectives into their management systems find this a useful approach, lending support to their long-term environmental efforts.

The Environmental Objectives Council considers that experience of using the objectives in environmental management systems could be passed on, both within the business community and to public agencies. Businesses could show more clearly how links can be created between the objectives and corporate environmental management systems. The Council believes that companies could give more prominence to the link between 'environment and business'. They should, to a greater degree, be able to contribute knowledge and initiatives which demonstrate that systematic attention to the environment makes economic sense, both for society at large and for businesses. The project already under way in collaboration with the Swedish Agency for Economic and Regional Growth (Nutek) is a welcome initiative and should be developed further.

4.6.2 THE OBJECTIVES DO NOT DRIVE COMPANIES' ENVIRONMENTAL EFFORTS

It is clear from the study of the business sector that companies do not feel that the environmental objectives have a direct guiding and driving influence on their environmental activities. The objectives are not binding on the business sector as a whole, or on individual industries or firms. The principal legal instrument governing companies' efforts in this area, rather, is the Environmental Code. Larger operations are subject to individual permitting, which means that permits are granted, and conditions attached to them, on the basis of what is judged to be the best available technology. As well as meeting legally binding requirements, the business sector also needs to undertake voluntary measures if the environmental objectives are to be achieved. Such voluntary action is contingent on there being a constructive dialogue at various levels between business and central government.

A study of companies' environmental efforts was conducted for the Environmental Objectives Council at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University in 2007. The preliminary results suggest that there are appreciable differences in the ways different firms handle environmental issues and in their familiarity with the environmental objectives. Large companies with environmental management systems have extensive environmental programmes and are aware of the objectives, whereas small businesses often lag far behind as regards such programmes and are unaware of the objectives. Compared with similar surveys in 1992 and 1999, the biggest improvements in terms of efforts to safeguard the environment have occurred in medium-sized enterprises.

Many companies operate in an international arena, and in a transnational group it can be difficult to fit Sweden's environmental objectives into a global strategy. For individual facilities in Sweden, however, the objectives can be of significance. They highlight the need to harmonize legislation and environmental goals at both the EU and the global level. Companies live in a competitive world, and the general view is that Sweden's environmental ambitions should evolve at a reasonable pace in relation to those of other countries.

4.6.3 BUSINESS A KEY PLAYER – FOR ALL THE OBJECTIVES

Business sectors of great significance when it comes to achieving many of the environmental objectives include transport and the distributive trades. These sectors make a difference, for example, in terms of the location of retail outlets, the range of eco-friendly products available, and delivery of goods to and from shops. For key aspects of the environmental quality objective *A Good Built Environment*, construction companies and property owners and managers play a crucial role. Their activities have a major bearing on the interim targets concerning the indoor environment, energy use in buildings, separation of waste and safeguarding buildings of cultural heritage value. The principle of producer responsibility, which is based on businesses taking responsibility for recycling of packaging and other materials, is another important factor for the waste target.

When it comes to the environmental quality objective *A Non-Toxic Environment*, operators have a major

responsibility. They are required to avoid and limit chemical risks in their activities and to apply the substitution principle at all times, i.e. wherever possible to replace a chemical product currently used with a less hazardous one or one that can be handled more safely, or alternatively with another technology. This responsibility is to be guided by the precautionary approach and the product choice principle, and product development must take account of chemical risks to health and the environment. To be able to meet their obligations, operators must have a good understanding of the risks associated with chemical and other products. The EU's chemicals legislation, REACH, will help to promote greater knowledge, wider dissemination of information about risks, and further rules concerning restrictions. Companies are undertaking or developing major programmes to replace hazardous substances with less dangerous ones or to reduce risks by other means, as those risks become known.

The decisive factor in achieving the environmental quality objectives relevant to agriculture and forestry is these sectors' day-to-day stewardship of natural and cultural assets. Successful nature conservation is dependent on close collaboration and mutual understanding and respect between the conservation agencies and the people who own and manage the land. Since the late 1980s consideration for nature conservation and cultural heritage interests has improved appreciably, in farming and forestry alike, and stakeholders in these sectors have assumed greater responsibility both for conserving natural and cultural features and for protecting the environment in general. In recent years, however, these improvements have, in many respects, more or less levelled off. There are several reasons for this. In the forest sector, for example, inadequate attention to nature and cultural heritage conservation may partly be attributed to unclear provisions in the Forestry Act. Economic return requirements and strong demand for forest raw materials also play a part. In agriculture, too, stewardship needs to improve. Changes in that sector over the last ten years have, on the whole, reduced pressure on aquatic systems. Even so, farming still has very substantial impacts, through prevailing cultivation systems and the use and handling of fertilizers and pesticides. The Federation of Swedish Farmers, in its background report to the Environmental Objectives Council, suggests that, for the primary sectors to shoulder their responsibility for the environmental quality objectives, the following conditions need to be met:

- Stakeholders must be well informed.
- The justification for the objectives must be clear.
- There must be strong local support for the objectives.
- Clear economic and social incentives must be in place.
- There must be an active group of owners capable of implementing the necessary environmental measures.

Public sector activities and the state as an operator

The state and public sector organizations are in a special position – and have a special responsibility – to set an example in the environmental field. The state is Sweden's biggest corporate owner. A study has shown that enterprises in which central government holds a stake are often no better at taking the environment into account than other companies – and sometimes in fact less good at doing so. The Government's new rules requiring state-owned enterprises to present sustainability reports drawn up in accordance with the Global Reporting Initiative guidelines are an important step forward. Enterprises run by municipal and county councils, too, need to develop their environmental activities and base them on the environmental quality objectives. Public procurement turns over almost SEK 500 billion every year. Given its scale, it is of major significance in driving improvements in environmental performance. Trends in this regard are not clear. According to a questionnaire survey in the autumn of 2007, reported in Swedish Environmental Protection Agency Report 5791, some 70% of county councils and around 60% of local authorities set environmental criteria when purchasing goods and services. In both cases, the proportion has declined since 2004. For central government agencies, the figure is about 50%. In the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles, the Environmental Objectives Council proposes that public organizations should apply clear environmental criteria in their procurement procedures.

4.7 Non-governmental organizations and individual citizens

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL JUDGES** the voluntary activities of environmental non-governmental organizations (NGOs) and others to be important in safeguarding the environment, both through the tangible results they achieve and, perhaps even more, because they create wider understanding of the efforts required to meet the environmental objectives. Different stakeholders and groups in society, as well as individual citizens, must play a part in attaining the objectives. To be able to do that, they have to be aware of what needs to be done and which of their everyday choices will make a difference. The Council stresses the importance of communicating environmental issues as part of an endeavour to promote sustainable development, not only to environmental NGOs, but to an even greater extent to trade unions, adult education associations, tenants' and residents' associations, and others.

▶ **THE COUNCIL PROPOSES** that the Government should look into ways of increasing support for different organizations in society, to enable them to foster greater understanding of environmental issues among their members and to take practical steps in the framework of their activities to ensure that the environmental objectives make a difference.

▶ **THE COUNCIL CONSIDERS** it necessary to draw attention to the importance of environmental and sustainability issues at all levels of education. To a greater extent than at present, these issues need to be made an integral part of both initial and continuing education. For this to be possible, appropriate educational materials and methods must be developed and teachers must be given the necessary training.

▶ **THE COUNCIL PROPOSES** that the Government should explore how environmental and sustainability issues can be given more space at all levels of education, and that particular attention should be paid to the need for continuing education for teachers in this area.

4.7.1 VOLUNTARY SECTOR EFFORTS TO MEET THE OBJECTIVES

If the environmental quality objectives are to be achieved, many different stakeholders in society need to contribute. Non-governmental organizations (NGOs) play an important part in communicating what has to be done to attain the objectives, and can also take active, practical initiatives. Both the Swedish Society for Nature Conservation (SSNC) and Friends of the Earth Sweden (FoE Sweden) use the environmental objectives to communicate environmental issues in a variety of contexts. SSNC and FoE Sweden alike have considerable confidence in the objectives, and representatives of both participate as experts in the work of the Environmental Objectives Council. The two organizations have submitted background reports to the present in-depth evaluation, proposing, among other things, a number of measures relevant to various environmental quality objectives, and also to cross-cutting issues related to the objectives. Many NGOs already devote a good deal of effort to environmental issues and to disseminating

information about the existence of the environmental objectives.

SSNC does a great deal to make the objectives better known, for example through meetings of its local and county branches, consultation responses, press monitoring and seminars, but also through its national website, members' magazine, conferences, political lobbying etc. In addition, the society runs projects of its own, such as the 'Good Environmental Choice' initiative (which has been well received among both retailers and consumers) and 'Urban-Fringe Forests'. It also mounts special campaigns. In its arguments in certain legal proceedings, too, SSNC has made use of the environmental objectives. Furthermore, the organization is widely involved in consultations with county administrative boards, regional bodies of the Swedish Forest Agency, and local authorities.

Within SSNC it is generally felt that the objectives system provides a good platform for safeguarding the environment, and that the objectives are ambitious, promote sustainable development and support the society's own work. Some criticism is voiced, though, regarding certain interim targets and concerning inadequate implementation of measures and monitoring of progress. The organization also points to a need for priorities in implementing the objectives. For its own activities, SSNC has identified five priority areas, which are expressed differently from the environmental quality objectives, but which are closely linked to *Reduced Climate Impact*, *A Non-Toxic Environment*, *Zero Eutrophication*, *A Balanced Marine Environment*, *Flourishing Coastal Areas and Archipelagos*, *Sustainable Forests*, *A Varied Agricultural Landscape* and *A Rich Diversity of Plant and Animal Life*.

Both SSNC and FoE Sweden argue in their background reports that NGOs should be given greater scope to participate in various processes in society that are crucial to attaining the environmental objectives. They believe that such an approach holds considerable potential, in terms both of achieving good communication with broad sections of the population and of enhancing knowledge and understanding among consumers. They also stress the need to give citizens and organizations a greater say and to secure their involvement. They refer, for example, to adult education associations and trade unions as important in gaining broader support for the objectives. Another possible group is tenants' and residents' associations. NGOs also undertake active, practical environmental initiatives of their own, such as meadow and river restoration projects. As regards freshwater and fisheries conservation, both the Swedish Anglers' Association and local fishery conservation associations are of great significance. Local heritage societies and village associations make major contributions to the management and conservation of local features of natural and cultural interest.

FoE Sweden calls for greater democratic participation, for example in regional development efforts. The bodies with responsibility for the environmental objectives which, alongside NGOs, are closest to ordinary citizens are local authorities. They have an important part to play in communicating with local residents and organizations on environmental issues, in the context of local action to improve the environment. In the local democratic process, authorities need to be attuned to the views and suggestions of citizens concerning planned changes in their areas.

4.7.2 Individual citizens' awareness of the objectives

For different stakeholders to recognize their role in working for a better environment, they need to be aware of what the most pressing environmental issues are and what tangible action they themselves can take on a day-to-day basis. Detailed knowledge of the environmental objectives is perhaps not important, but those objectives can help to clarify priorities and provide inspiration. Individual citizens are of crucial significance as consumers, but also through the political pressure they can apply and in other ways.

How well known, then, are the environmental objectives to various groups in society? To investigate their status in the Swedish Parliament, the Riksdag, a review was carried out for the Environmental Objectives Council, in autumn 2007, of a selection of parliamentary documents (motions, interpellations

and questions for written answer) from the 2005/6 and 2006/7 sessions. This study showed that the environmental quality objectives *Reduced Climate Impact* and *A Non-Toxic Environment* were mentioned most frequently in Riksdag documents, while *A Magnificent Mountain Landscape* and *A Protective Ozone Layer* were referred to least. Furthermore, since 1999 between 1.6% and 8% of the total number of Riksdag documents each year have dealt with the objectives.

In spring 2007, Synovate conducted a survey of public awareness of the environmental objectives on behalf of the Council. Three out of ten respondents said that they had heard of the objectives. The three best-known ones, i.e. those which the largest number said they were well aware of, were *Reduced Climate Impact*, *A Protective Ozone Layer* and *Flourishing Lakes and Streams*. The four objectives which members of the public were least familiar with were *Thriving Wetlands*, *A Good Built Environment*, *A Magnificent Mountain Landscape* and *Natural Acidification Only*. The survey also showed, however, that more people were aware of environmental issues in general, such as noise and the 'ozone hole'.

From the Affärsdata media archive, information can be gleaned on the number of articles referring to the various environmental objectives in the newspapers *Dagens Nyheter* and *Expressen* and from the TT news agency over the period 2005–7. *A Good Built Environment* was mentioned in the largest number of articles. Not unexpectedly, *Reduced Climate Impact* also comes high up the list. *A Protective Ozone Layer* was not mentioned once, while *Flourishing Lakes and Streams*, *Thriving Wetlands*, *A Varied Agricultural Landscape*, *A Magnificent Mountain Landscape* and *A Rich Diversity of Plant and Animal Life* were each referred to in one article.

The results of these studies make it clear that the environmental quality objectives are not very widely known. On the other hand, many citizens do have a knowledge of environmental issues in general.

4.7.3 EMPOWERING INDIVIDUALS TO MAKE THE 'RIGHT' CHOICES

People are exposed to a wide array of chemical substances in the environment, in their diet, in various products, and also in their places of work. As consumers, we choose on a daily basis what happens to the environment, through our purchases of food and other products, the way we travel, and so on.

Several of the background reports, from authorities and organizations alike, highlight the important part which consumers have to play in achieving the environmental objectives. There is a need both for improved knowledge and understanding, to promote more sustainable consumption, and for authorities and companies, through their planning and their products, to put individuals in a better position to act in eco-friendlier ways in their everyday lives.

From the viewpoint of a public agency, this may involve developing preventive measures relating to chemicals, or deciding how transport and energy needs are to be met when housing developments and shopping centres are planned. REACH, for example, provides a better foundation for both official and corporate action to reduce chemical risks to health and the environment, one means to this end being improved information to individual firms and consumers to guide their choices of chemical and other products. Another approach may be to develop better environmental labelling schemes or indicators which show in a straightforward way how the choice of a particular product can reduce impacts on the environment, for example in terms of greenhouse gas emissions, whether the product is manufactured in Sweden or in China.

Through their responsibility for schools, local authorities are very well placed to reach children and young people, for instance by arranging in-service education for teachers and other staff. The environmental objectives offer a good basis for work on environmental and sustainable development issues, but information and educational materials need to be developed. The Environmental Objectives Council's collaboration with the Keep Sweden Tidy Foundation and its teacher training initiative has been

evaluated and found to have produced good results. It could do with being developed further, though, in order to reach a sufficiently wide circle of teachers and schools. Similar initiatives would be useful at other levels of education as well. The key needs are to provide teachers with usable methods and materials, and also encouragement.

Environmental and sustainability issues must, to a much greater extent than at present, become a natural and integrated part of the educations of various professional groups, such as craftsmen, engineers and economists. This should be done both at the primary and secondary levels and in higher education. In this context, courses arranged in the form of continuing education for those already in a profession are perhaps particularly important. Here, companies and trade associations are in a good position to train employees on environmental issues relevant to the businesses concerned, in terms of both their direct environmental impacts and their indirect impacts through products. This is particularly the case when it comes to combining environmental with financial management.

4.8 The environmental objectives in an international perspective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL CONSIDERS** that the environmental quality objectives and their interim targets should define the direction of environmental efforts in Sweden, and that they can also speed the transition to sustainability beyond the country's borders. It therefore believes that the Government could make greater use of the environmental objectives as a starting point for negotiations, in the EU and internationally. The Council takes the view that interim targets associated with the environmental quality objectives should as far as possible be set on the basis of international agreements, although they can also go further. The environmental objectives have very significant international dimensions. In many cases, their achievement will only be possible if steps are taken to reduce emissions and other environmental impacts in other countries. At the same time, production and consumption in Sweden affect the environments of other nations.

▶ **THE COUNCIL MAKES** the assessment that, in the EU and internationally, Sweden should underscore the importance of its approach of integrating the environmental objectives into all policy areas, through sectoral responsibility and regional and local authorities. In particular, it wishes to emphasize the importance of the country continuing to participate actively in international cooperation, since this is essential to achieving the Swedish environmental objectives.

▶ **THE COUNCIL PROPOSES** that the Government and government agencies should inform others about Sweden's system of environmental objectives in a variety of international contexts, and above all in conjunction with the Swedish EU Presidency in autumn 2009.

4.8.1 MAKE MORE OF THE OBJECTIVES INTERNATIONALLY

The long-term goal of handing over to the next generation a society in which the major environmental problems have been solved is one of the most challenging visions for the environment formulated anywhere in the world. At a seminar on the environmental objectives at the Riksdag in October 2007 it emerged that, in international comparisons, Sweden scores highly when it comes to the state of its environment – but that, even so, considerable challenges remain. The Swedish people make heavy demands on natural resources. If all the inhabitants of our planet were to use resources on the same scale, it would take another two and a half earths to meet everyone's needs.

Sweden's environmental objectives and how efforts to achieve them are organized attract much interest in other parts of the world. Countries such as Canada, China and Australia are among those that have asked for information on the subject. Many of the enquiries received concern what is working well and, at the same time, what problems there are – not least, how the agencies responsible for the objec-

tives get their message across to different sectors and levels of society. The system of follow-up, based on environmental monitoring and indicators, also generates a good deal of interest. In a review of Sweden's performance in meeting its domestic objectives and international commitments regarding environmental management, published by the OECD in 2004, one of the conclusions drawn is that progress in this area is continuing. The fact that priority environmental issues have been defined at the highest political level, in the form of ambitious environmental quality objectives, is cited as a major factor for success. Another such factor, according to the OECD, is that action to safeguard the environment has benefited from the solid institutional and regulatory frameworks on which it is based. In order to meet the challenges which the environmental quality objectives represent, the OECD recommended in its report that Sweden should implement more efficient environmental policies, further integrate environmental concerns in economic and other policies (e.g. health, energy, transport, forestry and agriculture), and further strengthen its international environmental cooperation.

Internationally, then, it is regarded as a strength that the environmental objectives have been laid down by the Swedish Parliament and that they define the direction of and provide signals for environmental efforts throughout society, from government agencies to the business sector and individual citizens.

The combination of long-term objectives, with more visionary wordings, and shorter-term and more tangible interim targets is also viewed by other countries as a useful approach. In addition, other nations are very interested in the way the objectives are formulated in terms of environmental quality, the process involved in adopting their wordings, and the way progress towards them can be tracked. The long time series of environmental data which Sweden has built up, partly through environmental monitoring, are unique by international standards. Such monitoring is crucial if it is to be possible to follow trends in the state of the environment and set quality objectives. The process of regular follow-up of environmental trends in relation to the objectives, combined with evaluations of how implementation is progressing, also meets with considerable international interest. Another cornerstone of the system of objectives that is seen in a positive light is the linking of questions of environmental quality to human health and the cultural environment.

Perhaps, though, it is the division of responsibilities for implementing the objectives that attracts most attention. Few other countries have a similar allocation of responsibility for the environment among national, regional and local authorities. Given the international interest that exists in the Swedish system of environmental objectives, the Environmental Objectives Council proposes that the Government and government agencies should inform others about this system in a variety of contexts, including in conjunction with the Swedish Presidency of the EU in autumn 2009.

The Council considers that interim targets associated with the environmental quality objectives should as far as possible be set on the basis of international agreements. They can also go beyond such agreements, following a clear assessment of the impacts. The interim targets can thus give direction and impetus to international environmental cooperation. Increasingly, targets are also being adopted under various directives and agreements within the EU and internationally, for example under the Water Framework Directive and the thematic strategies. Often, a problem with these targets is that it is not clear what they are intended to achieve – for example, if they were set on the basis of what the parties were able to agree at the time, rather than spelling out what is required to secure good ecological quality. The level of ambition, in other words, may be unclear. Many of these targets are not very precisely expressed, either, creating scope for diverging interpretations.

In various contexts in connection with the implementation of Sweden's environmental objectives, it is said that the objectives are too domestic in focus and need to be supplemented so as to incorporate international dimensions in the system. Environmental efforts need to take account of Sweden's environ-

mental impacts on other countries, for example through imports and consumption of products.

4.8.2 Swedish environmental action makes a difference internationally

Since Sweden joined the European Union in 1995, the country's efforts in the environmental sphere have been very much dependent on EU legislation. International conventions also play a crucial part. However, these are not always binding, often assuming the form of recommendations only.

The work that needs to be done in the EU and internationally to achieve the Swedish environmental objectives, though, is not just a matter of environmental policy, but also to a large extent of policies in areas such as agriculture, fisheries, transport systems and – not least – trade and economic growth. Sweden has an important part to play in promoting sustainable development in these areas, and the environmental objectives can be one of the instruments used to that end. There is a risk otherwise that farm and fisheries policies, for example, could continue to favour short-term economic interests at the expense of long-term sustainable use.

In some cases EU cooperation lends impetus to, and in others it restrains, Swedish action to safeguard the environment. The first effect is a result of urgent environmental issues being brought into focus, and of the fact that many of today's environmental problems require international cooperation. The restraining effect may arise from the strong emphasis on free movement of goods across borders: environmental requirements which Sweden wishes to impose may come into conflict with the principle of free trade.

Reduced Climate Impact

The environmental quality objective which most clearly is entirely dependent on what happens internationally is *Reduced Climate Impact*. The forthcoming international political negotiations are absolutely crucial to securing the necessary global reductions in emissions. Sweden's EU membership puts it in a position, in decisive negotiating situations, to press for the adoption of far-reaching targets. The country has also made important contributions, in particular, in the context of the Intergovernmental Panel on Climate Change and the UN Framework Convention on Climate Change, one significant factor here being Sweden's own commitments, expressed in its environmental objectives. The thirteenth Conference of the Parties to the Kyoto Protocol (COP 13), held in Bali in December 2007, was the third such meeting since the Protocol came into force. Its significance lay in the fact that it marked the start of serious negotiations between the parties on what is to come after the first commitment period of the Kyoto Protocol, 2008–12. A 'roadmap', setting out the route to a new agreement for the period beyond 2012, was discussed. A decision on such an agreement is expected at COP 15 in Copenhagen in autumn 2009. That meeting will be held during Sweden's EU Presidency, which means that Sweden could play a key role in the negotiations. The heads of state and government of the EU have already agreed on the level of ambition of EU targets for 2020.

Clean Air and *Natural Acidification Only*

Long-range atmospheric transport of pollutants is and has long been a cause of problems such as acidification, eutrophication and elevated concentrations of ground-level ozone and particles, especially in the south of Sweden. International action to reduce air pollution is therefore also of great significance inside the country's borders. The most important international arenas for these issues, from Sweden's point of view, are the UN Convention on Long-Range Transboundary Air Pollution and the EU's Clean Air For Europe programme, including the National Emission Ceilings Directive. In these contexts, international undertakings on emission reductions and other matters are made through special protocols and directives. Good progress has been achieved in this area since the 1980s, and the problems of acidification and high ozone episodes have been alleviated. Further commitments are essential, however, particularly to reduce the transboundary impacts of particles and ozone precursors.

Opportunities to use international cooperation to influence atmospheric emissions from shipping need to be put to good use and developed further. The

maximum sulphur levels for marine fuels set by the International Maritime Organization and the EU for the Baltic Sea, North Sea and English Channel represent improvements, but fall far short of what is required. Other key instruments in combating acidification are the various EU directives which directly or indirectly regulate, for example, emissions from industrial plants and vehicles.

A Protective Ozone Layer and *Reduced Climate Impact*

International efforts under the Montreal Protocol on Substances that Deplete the Ozone Layer are crucial to attaining the environmental quality objective *A Protective Ozone Layer*. But as the substances in question also have a powerful greenhouse effect, the work done in that context is of considerable relevance to the climate objective as well. The Montreal Protocol is one of the oldest environmental conventions and is regarded as a highly successful one. One aim of the rapid Swedish phase-out of ozone-depleting substances was to demonstrate that phase-out was possible. Sweden managed to phase out a range of such substances through a combination of legislation and incentives.

Alongside the negotiating process, Sweden is involved in a number of initiatives to encourage and enable the parties, above all the developing countries, to meet their commitments. The future success of the Montreal Protocol will depend on all the countries of the world signing up to the Protocol and its amendments, on the countries bound by it fulfilling their undertakings, and on the parties reaching agreement on further measures.

A Non-Toxic Environment

With the adoption of the REACH Regulation, the EU now has the most extensive and far-reaching chemicals legislation in the world. REACH is and will continue to be of great significance for the environmental quality objective *A Non-Toxic Environment*. Implementation and ongoing review of the regulation will be crucial in reducing emissions in Europe and hence the effects of chemicals on health and the environment in Sweden. REACH puts companies in a better position to use less dangerous substances in chemical and other products. However, it is not enough to achieve *A Non-Toxic Environment*, and there is therefore an urgent need to tighten up its provisions.

EU cooperation, then, is one decisive factor in attaining *A Non-Toxic Environment*. Chemical substances travel from one country to another, via the atmosphere and the oceans, and increasingly through a considerable volume of trade. Consequently, Sweden also needs to promote practical implementation of the Strategic Approach to International Chemicals Management (SAICM) in the majority of countries around the world. Sweden must remain a leading force in shaping international chemicals policy and securing more stringent international conventions in this field.

Water-related environmental quality objectives

Since the sea areas surrounding Sweden adjoin those of several other countries, international cooperation is crucial in this context. Many of the major threats can only be addressed through joint undertakings. However, the international conventions under which emission reductions are agreed are not always binding, often assuming the form of recommendations only. The Helsinki Convention, between the Baltic Sea states, is a case in point. After many years, though, many of its recommendations are now largely being followed, and recently the countries agreed to reduce inputs of nitrogen and phosphorus. If this had been a binding convention, measures could have been introduced and had an effect considerably sooner.

EU action on the aquatic environment is becoming better coordinated and more vigorous than before, and most of the countries with sea areas bordering on Swedish waters are now EU members. A crucial instrument here is the Water Framework Directive, which is now progressively being incorporated into the member states' legislation and water environment policies. It is of very great importance in the implementation of many of the measures needed to achieve several environmental quality objectives related to water, such as *Good-Quality Groundwater*, *Zero Eutrophication*, *Flourishing Lakes and Streams* and *A Balanced Marine Environment*, *Flourishing Coastal Areas*

and Archipelagos. The directive, which is binding in character, is expected to help bring about better water quality in Sweden. Hope is also placed in the Marine Directive and the forthcoming Maritime Strategy.

Environmental quality objectives relevant to farming, forestry and fisheries

For several of the environmental quality objectives, the EU's Common Agricultural Policy (CAP) is of great significance. It was originally established to safeguard food production, but eventually environmental effects such as eutrophication, unsafe use of pesticides and depletion of biodiversity became increasingly evident. Over the last ten years, there have been several reforms of the CAP, but it continues to encourage agricultural practices with major adverse impacts on the environment. On the positive side, however, it has helped to maintain farming in areas where conditions for it are less favourable. In Sweden, payments for management of pasture land, in particular, have been of value. Nonetheless, further reforms are necessary, and Sweden can use its environmental objectives as a platform for pursuing change in an environmentally more sustainable direction.

A parallel exists in the Common Fisheries Policy of the EU, which regulates fishing in Sweden. This is a Community policy where EU regulations take precedence over national legislation. One problem here has been a lack of acceptance for the measures needed to adjust the scale of fishing to the fish resources available. In international negotiations within the EU, national politicians have up to now given their own fisheries and short-term profitability priority over an approach to fishing that is sustainable and financially viable in the long term. Sweden has been unable to secure support for a more restrictive fisheries policy.

A Good Built Environment

In areas of significance for the environmental quality objective *A Good Built Environment*, too, there are transboundary issues or strong links with what is happening in other parts of the world. Transport noise, for example, is partly dependent on how vehicles and tyres are designed; waste generation hinges on how goods are produced, packaged, transported and consumed worldwide; and indoor environments depend to some degree on building products and interior fittings manufactured outside Sweden. EU and other international cooperation is very important in these contexts as well.

A Rich Diversity of Plant and Animal Life and the Landscape Convention

For several of the environmental objectives relating to biodiversity and different types of landscapes, international efforts – not least under the Convention on Biological Diversity – have a part to play. At the European level, a current example is implementation of the European Landscape Convention. Recognizing that landscape contributes to human well-being, the Convention calls among other things for objectives to be defined in this area and for consideration for landscape to be integrated into all planning and sectoral policies with impacts on it. Furthermore, the public should have opportunities to be actively involved in valuing and managing landscapes. The Landscape Convention demonstrates the importance of linking issues related to the natural environment, cultural heritage and human well-being, and thus closely reflects the basic principles of Sweden's environmental objectives system.

CHAPTER 5.

The environmental objectives – progress and proposals

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S OVERALL ASSESSMENT** of the prospects of attaining the environmental quality objectives within the time frame laid down for them makes it clear that considerable challenges remain. In many cases, even if the measures proposed are implemented and the interim targets met, there will still be a 'gap' to achieving the objectives on time.

▶ **THE COUNCIL NOTES** that environmental trends are pointing in the right direction in several of the areas over which Sweden itself has control. However, based on its assessments of the prospects of meeting the objectives by 2020, it wishes to stress that the pace of the progress being made is not sufficient. In several cases, action needs to be taken without delay if the quality of the environment which the objectives describe is to be brought about in the foreseeable future – or perhaps at all. Urgent measures are called for, not least, by the climate change now under way, which will have far-reaching implications not only for the climate goal, but for the other environmental objectives as well. *Reduced Climate Impact* is an environmental quality objective that is judged by the Council to be very difficult or not possible to attain. On current trends, global greenhouse gas emissions are expected to rise more rapidly over the next 20–30 years than they have in the last 35. The Council views climate change and its possible repercussions for other objectives with alarm. The state of our seas, too, is deeply disturbing. Nutrient inputs are declining, but improvements in terms of eutrophication are less clear. The status of cod and eel stocks is critical. These are some of the factors behind the Council's assessment that it will be very difficult or not possible at all to attain the objectives *Zero Eutrophication* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* within the time frame set. For *Sustainable Forests*, some encouraging trends can admittedly be noted, including increases in the amount of dead wood left in forests, numbers of large trees, and areas of mature forest with a large deciduous element. At the same time, forests of very high conservation value are being harvested and cultural remains in forest areas are being damaged. Forests are subject to intensive exploitation. The objective *Sustainable Forests* is considered very difficult or not possible to attain by 2020.

▶ **THE COUNCIL JUDGES** nine of the 16 environmental quality objectives to be very difficult or not possible to meet within the defined time frame. For two objectives, it has revised its assessments since the 2007 progress report. One of these, *A Protective Ozone Layer*, stands out as a goal that is now considered achievable, provided that successful implementation of the Montreal Protocol continues. The other revised assessment is for *A Good Built Environment*. This objective is now deemed very difficult or not possible to reach, partly because several of the specifications of what it entails will be hard to fulfil on time. In addition, several of the interim targets linked to the fundamental values underpinning the environmental objectives are considered difficult to achieve – in particular, those linked to human health, which is affected by poor indoor environments, and to cultural heritage, with too little being done to identify and protect the cultural assets of built environments.

▶ **THE COUNCIL CONSIDERS** it important to bear in mind the international dimensions of the objectives. Many of these goals are very much dependent on what happens in the wider world. In several cases, international as well as national measures will be needed if they are to be attained. This is especially true of *Reduced Climate Impact*, *Clean Air*, *Natural Acidification Only*, *A Non-Toxic Environment*, *A Protective Ozone Layer*, *Zero Eutrophication* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*.

▶ **THE COUNCIL PROPOSES** changes to the wordings of the environmental quality objectives *Natural Acidification Only* and *A Safe Radiation Environment*. In addition, it suggests deleting the sentence 'This environmental quality objective is intended to be achieved within one generation', included in five of the objectives, since all the objectives apart from *Reduced Climate Impact* – not just five of them – are to be met within a generation.

▶ **THE COUNCIL PROPOSES** revisions of the majority of the interim targets. Seven targets should, it suggests, remain unchanged. In addition, 19 new interim targets are proposed, relating for example to emissions from shipping, private water supplies, organic production, and nature in and near urban areas. The Council's proposals in terms of new, revised and unchanged interim targets will bring the total number of such targets to 70.

The Environmental Objectives Council makes the assessment that nine of the 16 environmental quality objectives will be very difficult or not possible to attain by the target year 2020 (2050, as a first step, in the case of the climate objective), that one objective is achievable within the defined time frame, and that six objectives can be reached if further action is taken. The goal that is considered achievable is *A Protective Ozone Layer*, for which the latest assessment is more favourable than that reached last year, when this objective was judged to be possible to attain, subject to further measures being introduced. The assessment for *A Good Built Environment* has been revised in the opposite direction, from achievable with additional measures to very difficult or not possible to attain even if further action is taken.

For six of the environmental quality objectives, the trend in the state of the environment is judged to be positive, for one of them negative, and for nine unclear. Since last year's assessment, the trend for one objective, *Clean Air*, has become less favourable, moving from positive to no clear trend. For the other objectives, trends are as before.

The Council judges that 26 of the interim targets will be very difficult or not possible to meet by the target dates, that 23 can be met if further action is taken, that 11 are achievable with existing measures – including a few that have already been met, before the target year – and that 10 had been attained by the target year. For two of the interim targets, the target year has passed without the targets being achieved. Of the 13 targets with revised appraisals, four have now been given a more favourable and nine a less favourable assessment.

The assessments that have been made of progress towards the regional environmental objectives form a basis for the Council's appraisals of the national objectives.

This chapter gives a brief presentation of each of the national environmental quality objectives and the associated interim targets. For each objective, there are two sections reviewing progress towards the existing objective and interim targets; a third concerning the wording of the objective and specifications, or an interpretation, of what it entails on a time scale of one generation; a fourth section containing proposals for revised, new or unchanged interim targets; and finally, a section on how far there is still to go to achieve the environmental quality objective. This last section is intended to answer the question whether there will still be a gap to attaining the objective, even if the interim targets are met and the proposed measures implemented, and if so, how large that gap will be.

All the county administrative boards have adopted regional environmental goals based on the national environmental quality objectives. This chapter ends with a section on these regional goals.

The measures and policy instruments proposed in the background reports, and judged most effective in securing results with regard to several of the environmental quality objectives, are presented in the strategy chapter (Chapter 6). A comprehensive list of the measures proposed is to be found in Appendix 1, which is published separately (Swedish Environmental Protection Agency Report 1268).

As far as possible, the Environmental Objectives Council has made overall impact assessments of the measures needed to meet the proposed interim targets. These provide an indication of the possible cost to central government up to 2020. The Council's appraisal is based on and presupposes a continuation of existing government financial commitments. All the impact assessments included in the background reports on individual objectives are presented in Appendix 2 (see Report 1268).

For a more in-depth analysis of each of the environmental quality objectives and the measures proposed, readers are referred to the background reports on each of the objectives (in Swedish, some with summaries in English).

For an overview of the system of environmental objectives and the Council's proposals regarding the structure of objectives, interim targets etc., please see Chapter 3 of this report.

Will the environmental quality objectives be achieved?

OBJECTIVE	Forecast for 2020	Trend	Factors that have affected the assessment
1. Reduced Climate Impact*			To meet the goal, global greenhouse gas emissions must begin to fall within 10–15 years, be halved by 2050 and be near zero by 2100. Globally, emissions have grown by 70% in the last 35 years, and are expected to go on rising for the next 20–30.
2. Clean Air			Causes of air pollution include old vehicles, increased traffic, wood-fired heating and studded tyres. In 2020, pollutants will still have adverse effects on health and the environment. The trend towards better air quality in towns has not been maintained.
3. Natural Acidification Only			Land-based sulphur and nitrogen emissions in Europe have fallen sharply, but not enough. Factors behind the fall in Sweden include the sulphur tax and vehicle exhaust standards. Shipping emissions are rising. Growth in forestry could add to acidification.
4. A Non-Toxic Environment			Diffuse releases of dangerous substances from products and processes will be hard to tackle by 2020. Production volumes are rising, especially in countries with limited regulation of chemicals. REACH is a major step forward, but further action is needed.
5. A Protective Ozone Layer			For the first time, this goal is judged achievable. Sweden's phase-out of ozone-depleting substances is going as planned, but substances are still present in some products. Levels in the upper atmosphere are falling, thanks to successful global action.
6. A Safe Radiation Environment			Emissions of radioactive substances are limited. Changing human behaviour so as to reduce the incidence of skin cancer is difficult. But the target for electromagnetic fields is now judged to be met, as risks are being studied and addressed.
7. Zero Eutrophication			Swedish emissions of phosphorus compounds and nitrogen compounds, including ammonia, have fallen. The majority of nutrient inputs to seas and forest soils originate in other countries. Recovery of natural ecosystems will take a long time.
8. Flourishing Lakes and Streams			Better stewardship is needed in farming and forestry. Conservation of cultural and natural environments must be stepped up. Conditions for ecological restoration have improved. Water supply plans are often lacking. Many species are threatened. Alien species are a problem.
9. Good-Quality Groundwater			Groundwater is affected by farming, towns, roads, contaminated land, over-abstraction etc. Monitoring is inadequate. Many water sources lack adequate protection. Water authorities' programmes of measures are expected to help meet this objective.
10. A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos			Nutrient inputs are falling, but abatement of eutrophication is less clear. The status of cod and eel stocks is critical. Coastal and offshore development pressures are growing, as is the risk of oil discharges. The area protected is gradually increasing.
11. Thriving Wetlands			Wetland conservation and restoration are progressing slowly. Environmental stewardship must improve, especially in forestry. On the plus side: a revised Mire Protection Plan and continued progress on Natura 2000, water management and threatened species.
12. Sustainable Forests			Conflicting trends can be seen. Several key factors for biodiversity are improving, e.g. dead wood, large trees, mature forest. But forests of high conservation value are being felled, and cultural remains damaged. Use of forest resources is intensive.
13. A Varied Agricultural Landscape			Natural and cultural assets are threatened by both scrub encroachment and intensification of farming. Agri-environment measures and business and rural development are major factors affecting the prospects of achieving the objective.
14. A Magnificent Mountain Landscape			Reindeer grazing is needed to maintain the unique values of the mountain landscape. Reindeer numbers have fallen. Damage due to off-road vehicles has increased slightly. More of these vehicles are now quieter. Mountain cultural heritage is inadequately protected.
15. A Good Built Environment			Buildings and urban structures have long lifetimes, so existing problems will persist, making it hard to meet the objective by 2020. Noise and poor indoor environments are major health problems. Cultural heritage is inadequately protected.
16. A Rich Diversity of Plant and Animal Life			Despite the action taken, loss of biodiversity (both species and ecosystems) continues. Several common species, e.g. farmland birds, are declining. The status of threatened species has worsened. Many biological resources are not being used sustainably.

* Target year 2050, as a first step

How to read the 'smiley' tables

The tables on pages 92 and 94 set out in a highly simplified form the Environmental Objectives Council's assessments of whether the environmental quality objectives and interim targets will be achieved within the time frames laid down for them. For this purpose, happy, neutral and sad faces (smileys) in different colours are used. The smiley for an environmental quality objective may be red, despite largely favourable assessments of progress towards its interim targets. One important reason for this is the long time scale of recovery of natural ecosystems: the effects of the measures introduced may not become apparent in the natural environment until after the target date. Another reason may be that action also needs to be taken in other countries if Sweden's environmental objectives are to be met.

For each national environmental quality objective a trend arrow is also given, indicating the current trend in the state of the environment. That trend may be positive, even if the objective concerned is not judged to be achievable within the defined time frame.

A presentation of county administrative boards' assessments of progress towards regional environmental objectives will be found on page 242.

The meanings of the different smileys and arrows are explained below.

Symbols used in the tables on pages 92, 94 and 242

Smileys for environmental quality objectives and interim targets

The assessment is that the objective/target can be achieved within the defined time frame.

The objective/target can be achieved within the defined time frame, provided that further action is taken.

The objective/target will be very difficult or not possible to achieve within the defined time frame, even if further action is taken.

Additional smileys for interim targets

The target year has passed. The target was achieved by that date.

The target year has passed. The target was not achieved by that date.

Trend arrows for the national environmental quality objectives

The trend in the state of the environment is positive.

No clear trend in the state of the environment can be seen.

The trend in the state of the environment is negative.

Will the interim targets be achieved? Forecasts and outcomes

1. Reduced Climate Impact

- Greenhouse gas emissions, 2008–2012

2. Clean Air

- Sulphur dioxide, 2005
- Nitrogen dioxide, 2010
- Ground-level ozone, 2010
- Volatile organic compounds, 2010
- Particles, 2010
- Benzo[a]pyrene, 2015

3. Natural Acidification Only

- Acidification of lakes and streams, 2010
- Acidification of forest soils, 2010
- Sulphur dioxide emissions, 2010
- Nitrogen oxide emissions, 2010

4. A Non-Toxic Environment

- Data on health and environmental properties of chemical substances, 2010/2020
- Information on dangerous substances in products, 2010
- Phase-out of substances of very high concern, 2007/2010
- Continuous reduction of health and environmental risks of chemicals, 2010
- Guideline values for environmental quality, 2010
- Remediation of contaminated sites, 2010
- Remediation of contaminated sites, 2005–2010/2050
- Dioxins in food, 2010
- Cadmium, 2015

5. A Protective Ozone Layer

- Emissions of ozone-depleting substances, 2010

6. A Safe Radiation Environment

- Radioactive substances, 2010
- Skin cancer, 2020
- Electromagnetic fields (ongoing)

7. Zero Eutrophication

- Phosphorus emissions, 2010
- Nitrogen emissions, 2010
- Ammonia emissions, 2010
- Nitrogen oxide emissions, 2010

8. Flourishing Lakes and Streams

- Protection of natural and cultural environments, 2005/2010
- Restoration of rivers and streams, 2005/2010
- Water supply plans, 2009
- Releases of animals and plants, 2005
- Action programmes for threatened species, 2005

9. Good-Quality Groundwater

- Protection of water-bearing geological formations, 2010
- Groundwater levels, 2010
- Good-quality drinking water, 2010

10. A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos

- Protection of environments, 2005/2015
- Strategy for cultural heritage and agricultural landscapes, 2005
- Action programmes for threatened marine species, 2005
- Bycatch, 2010
- Catches and recruitment of fish, 2008
- Noise and other disturbance, 2010
- Discharges of oil and chemicals, 2010

11. Thriving Wetlands

- Strategy for protection and management, 2005
- Mire Protection Plan, 2010
- Forest roads, 2006
- Wetlands on agricultural land, 2010
- Action programmes for threatened species, 2005

12. Sustainable Forests

- Long-term protection of forest land, 2010
- Enhanced biological diversity, 2010
- Protection of cultural heritage, 2010
- Action programmes for threatened species, 2005

13. A Varied Agricultural Landscape

- Meadow and pasture land, 2010
- Small-scale habitats, 2005 (part of target)
- Culturally significant landscape features, 2010
- Plant genetic resources and indigenous breeds, 2010
- Action programmes for threatened species, 2006
- Farm buildings of cultural heritage value, 2005

14. A Magnificent Mountain Landscape

- Damage to soil and vegetation, 2010
- Noise, 2010/2015
- Natural and cultural assets, 2010
- Action programmes for threatened species, 2005

15. A Good Built Environment

- Programmes and strategies for planning, 2010
- Built environments of cultural heritage value, 2010
- Noise, 2010
- Extraction of natural gravel, 2010
- Waste, 2005–2015
- Energy use etc. in buildings, 2020/2050
- A good indoor environment, 2010/2015/2020

16. A Rich Diversity of Plant and Animal Life

- Halting the loss of biodiversity, 2010
- Fewer species under threat, 2015
- Sustainable use, 2007/2010

5.1 Reduced Climate Impact

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Reduced Climate Impact* will be very difficult or not possible to achieve by 2050. Emissions need to be reduced throughout this century if the objective is to be met. Globally, emissions have increased by 70% in the last 35 years and, on current trends, are expected to rise more rapidly over the next 20–30. The trend in the state of the environment is negative.

▶ **THE COUNCIL JUDGES** the interim target for greenhouse gas emissions to be achievable within the defined time frame, without additional measures being introduced.

▶ **THE COUNCIL MAKES** the following proposal regarding the Government's specification of the environmental quality objective:

- Revise the specification so as to stipulate that the global average temperature should rise by no more than 2°C above its pre-industrial level, and that Sweden should work internationally to ensure that global action is geared towards achieving that goal.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Retain the interim target for greenhouse gas emissions unchanged throughout the target period 2008–12, i.e. up to and including 2012.
- Introduce an interim target in line with the target for the medium term (up to 2020) proposed by the Climate Committee.

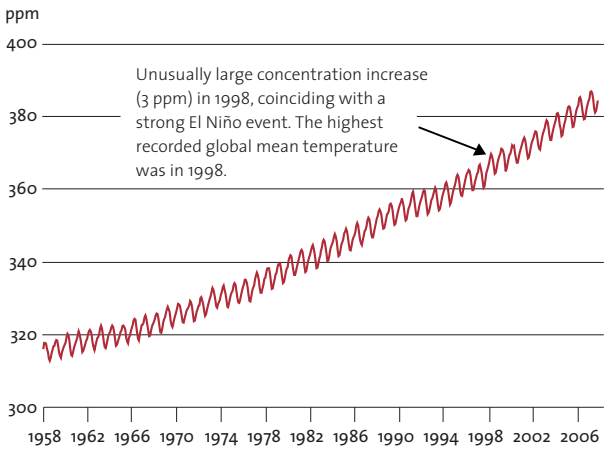
5.1.1 Progress towards the environmental quality objective

REDUCED CLIMATE IMPACT

The UN Framework Convention on Climate Change provides for the stabilization of concentrations of greenhouse gases in the atmosphere at levels which ensure that human activities do not have a harmful impact on the climate system. This goal must be achieved in such a way and at such a pace that biological diversity is preserved, food production is assured and other goals of sustainable development are not jeopardized. Sweden, together with other countries, must assume responsibility for achieving this global objective.

The Environmental Objectives Council's assessment is that this objective will be very difficult to achieve. Total world emissions of greenhouse gases continue to grow, and the global average temperature is rising with increasing concentrations of these gases in the atmosphere.

FIGURE 5.1.1 Atmospheric concentration of carbon dioxide recorded at Mauna Loa Observatory, Hawaii, 1958–2007



Note: ppm = ppmv, i.e. parts per million by volume.

SOURCE: NOAA, EARTH SYSTEM RESEARCH LABORATORY, MAUNA LOA, HAWAII

Atmospheric carbon dioxide has been measured in Hawaii since the late 1950s. The concentration has gradually risen, at a rate of just under 1 ppm per year in the 1960s and around 2 ppm annually in recent years. As the diagram shows, it fluctuates over the course of the year. During the northern summer, growing biomass absorbs the gas from the atmosphere. In the winter months, the concentration rises as carbon dioxide from decaying plants is given off by the soil.

The concentration of carbon dioxide (CO_2) has increased by just over 35% since the mid-19th century, from 280 to 380 ppm (2006). The upward trend is continuing, with an annual increase of almost 2 ppm over the last 10 years. Levels of other greenhouse gases are also rising. The aggregate greenhouse gas concentration now stands at around 430 ppm CO_2 equivalent. Man-made emissions of aerosols – which have a cooling effect – mask some of the climate effects of greenhouse gases. If aerosol emissions are low, 430 ppm CO_2 equivalent is a level of greenhouse gases which current understanding of climate sensitivity suggests should not be exceeded in the long term.

To achieve the objective, global emissions of greenhouse gases should peak no later than 10–15 years from now. Subsequently, they should be halved by 2050 and be close to zero by the end of the century. However, in the last 35 years emissions have grown by 70%, and in the next 20–30 years they are expected to rise even more rapidly if no additional measures are taken to reduce them.

It is above all releases of carbon dioxide from fossil fuel use in the energy supply and transport sectors that have increased. In recent years, the biggest rise has been seen in developing countries with strongly growing economies, such as China and India, but emissions in industrialized countries like the United States, Australia, Spain and Canada have also risen sharply. In addition, deforestation around the world has been a very significant factor behind the increased concentration of carbon dioxide.

Global energy consumption is expected to go on rising in the next few decades, with a particularly large increase in developing countries with strong economic growth. According to projections presented by the Intergovernmental Panel on Climate Change (IPCC), global greenhouse gas emissions could be 25–90% higher by 2030, compared with 2000.

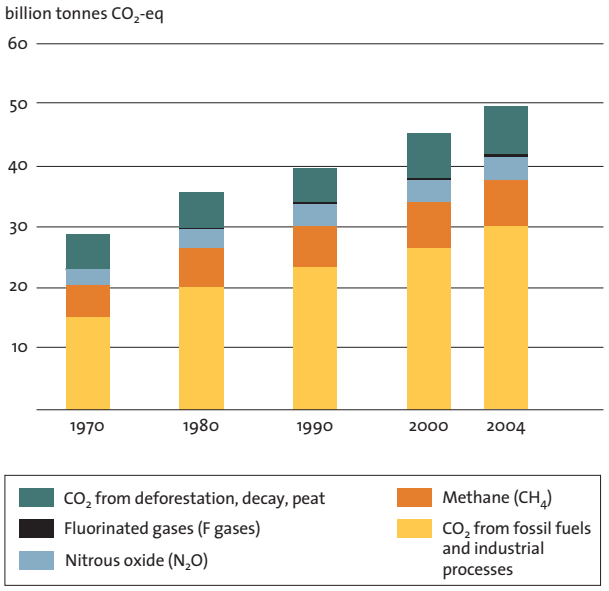
5.1.2 Progress towards the current interim target

GREENHOUSE GAS EMISSIONS

As an average for the period 2008–12, Swedish emissions of greenhouse gases will be at least 4% lower than in 1990. Emissions are to be calculated as carbon dioxide equivalents and are to include the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC. In assessing progress towards the target, no allowance is to be made for uptake by carbon sinks or for flexible mechanisms.

The Environmental Objectives Council judges this interim target to be achievable within the defined time frame, without further measures being introduced. The latest projection for 2010 indicates Swedish emissions at least 4% lower than in 1990. The Council also expects the country's commitment under the Kyoto Protocol, which includes some emissions and uptake associated with land use, to be met by a good margin.

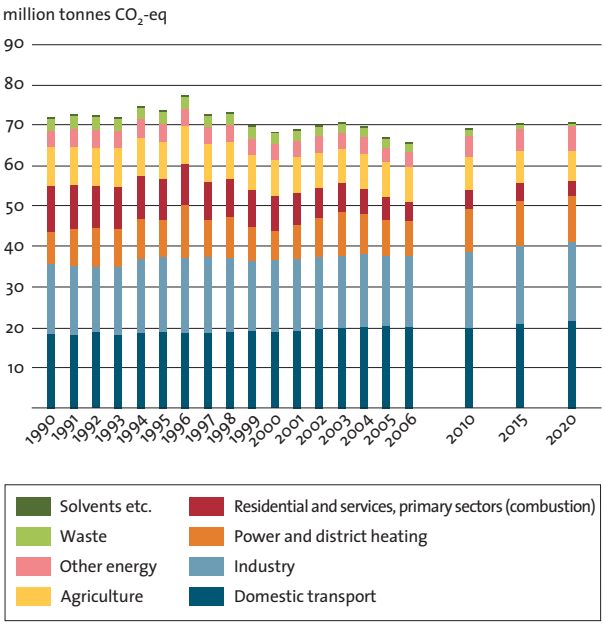
FIGURE 5.1.2 Estimated global emissions of greenhouse gases, 1970–2004



SOURCE: IPCC (WG3, 2007)

The early years of the 21st century have seen a steeper rise in global emissions of different greenhouse gases than previously recorded.

FIGURE 5.1.3 Emissions of greenhouse gases in Sweden by sector, 1990–2006 and projected up to 2020



SOURCE: SWEDISH ENERGY AGENCY AND SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Trends in greenhouse gas emissions differ from one sector to another. Up to 2010, emissions from industry, power and district heating, and refining (other energy) are expected to rise. Releases from individual heating systems in homes and premises and from agriculture and waste have fallen in the last 15 years, a trend that is projected to continue.

Sweden has achieved an emission reduction in parallel with economic growth, and is one of the few industrial nations able to report a downward trend in emissions. Since 1993 the country's GDP has grown by 40%, and yet aggregate releases of greenhouse gases have not increased. In other words, over this period emissions have been decoupled from economic growth. Per capita emissions have fallen from 8.4 tonnes in 1990 to 7.2 tonnes in 2006. These figures exclude international aviation and shipping to and from Sweden. In the Council's assessment, further measures will be needed to prevent a rise in emissions from Swedish sources after 2010.

In 2006, Swedish emissions of greenhouse gases, calculated as CO_2 equivalents, totalled 65.7 million tonnes (excluding land use, land use change and

forestry, LULUCF), a decrease of some 6 million tonnes, or 8.7%, compared with 1990.

The biggest reductions have occurred in emissions from the residential and service sectors and from agriculture and landfill sites (methane). The fall in residential emissions is due to a greater reliance on district heating, heat pumps and wood pellets, rather than oil, for domestic heating. Releases from district heating plants have remained stable, as expansion in this sector has been based on increased use of biofuels and waste. Emissions from transport, mobile machinery and the iron and steel industry, and of fluorinated gases, have increased. However, the growing quantities of waste gases from iron and steel production are being recovered to generate heat and power.

Between 2005 and 2006, emissions declined by around 1.2 million tonnes, chiefly owing to a continuing shift away from oil for heating of homes and premises. Some of the reduction in emissions recorded in 2006 can be attributed to a mild winter and an ample supply of water for hydroelectric power. The upward trend of recent years in emissions from domestic transport was broken, giving way to a slight fall. This was mainly due to lower emissions from aviation and shipping, and to the partial substitution of ethanol for petrol as a motor fuel.

The projection for 2010–20 suggests that total emissions in Sweden will rise to a modest degree, assuming no further policy instruments are introduced, but they are still expected to be lower than in 1990. Increases are anticipated, above all, in the power and heat generation, industrial and refining sectors, which now fall largely within the scope of the EU emissions trading scheme. How that scheme develops after 2012 will thus significantly affect EU and Swedish emissions of greenhouse gases up to 2020.

During 2007, a number of policy decisions of significance for the climate objective were taken:

- Introduction of regulations on energy performance certificates for buildings.
- A bonus of SEK 10,000 for individuals who buy 'clean vehicles'.
- Funding of SEK 1 billion over the period 2008–10 in support of improved energy efficiency, climate research, development of second-generation biofuels, and networks for wind power and sustainable harvesting of biomass from agriculture and forestry.
- An increase of SEK 0.06 per kg in the carbon dioxide tax on transport and households.
- An increase of SEK 0.20 per litre in the energy tax on diesel as a vehicle fuel, and reduced vehicle taxes on diesel-powered cars.

5.1.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Reduced Climate Impact*:

The UN Framework Convention on Climate Change provides for the stabilization of concentrations of greenhouse gases in the atmosphere at levels which ensure that human activities do not have a harmful impact on the climate system. This goal must be achieved in such a way and at such a pace that biological diversity is preserved, food production is assured and other goals of sustainable development are not jeopardized. Sweden, together with other countries, must assume responsibility for achieving this global objective.

▶ **THE COUNCIL MAKES** the following proposal regarding the specification of the environmental quality objective:

- Revise the specification so as to stipulate that the global average temperature should rise by no more than 2°C above its pre-industrial level, and that Sweden should work internationally to ensure that global action is geared towards achieving that goal.

The Environmental Objectives Council proposes no change to the existing wording of the objective *Reduced Climate Impact*.

PROPOSED SPECIFICATION OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specification (Government Bill 2001/02:55)	**Proposed change** (change in italics)
The environmental quality objective Reduced Climate Impact implies that the combined atmospheric concentration of the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC, calculated as carbon dioxide equivalents, should be stabilized at a level lower than 550 ppm. Sweden should work internationally to ensure that global action is geared towards achieving that goal. By 2050, aggregate emissions in Sweden should be less than 4.5 tonnes of carbon dioxide equivalent per capita per year, with further reductions to follow. International cooperation and action by all countries are crucial to achieving the objective.	The environmental quality objective Reduced Climate Impact implies that *the global average temperature should rise by no more than 2°C above its pre-industrial level*. Sweden should work internationally to ensure that global action is geared towards achieving that goal.

The current environmental quality objective is based on the goal set out in the UN Framework Convention on Climate Change, which is to stabilize greenhouse gas concentrations in the atmosphere 'at a level that would prevent dangerous anthropogenic interference with the climate system'. Such a level is to be achieved 'within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner'.

As climate change is a global environmental problem, the national environmental quality objective should continue to reflect the global objective.

The current specification of the objective, from 2002, calls for Swedish greenhouse gas emissions to be reduced by 2050 to no more than 4.5 tonnes of CO_2 equivalent per capita per year. That target is based on the principle that, in the long term, emissions should be evenly distributed among the world's population. Through a new EU-wide climate policy decision in 2006, Sweden agreed to a long-term goal of limiting warming, as a global average, to no more than 2°C above pre-industrial temperatures.

The Council proposes a revision of the existing specification, to the effect that the global average temperature should rise by no more than 2°C above its pre-industrial level. Sweden should work internationally to ensure that global action is geared towards achieving that goal.

The choice of a temperature rise rather than a concentration of greenhouse gases to define the objective's implications links the objective more clearly to the environmental effects that are to be avoided. It also brings the environmental quality objective into line with the EU's long-term climate goal. As a consequence, the present specification of the Swedish objective in terms of stabilizing concentrations of greenhouse gases below 550 ppm CO_2 equivalent should be deleted.

5.1.4 Proposed interim target

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** an unchanged interim target:

GREENHOUSE GAS EMISSIONS

As an average for the period 2008–12, Swedish emissions of greenhouse gases will be at least 4% lower than in 1990. Emissions are to be calculated as carbon dioxide equivalents and are to include the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC. In assessing progress towards the target, no allowance is to be made for uptake by carbon sinks or for flexible mechanisms.

The present interim target of a reduction of at least 4% in Sweden's greenhouse gas emissions compared with 1990 is expressed in terms of an average for the period 2008–12. That means that a final assessment of success in achieving it can only be made when Swedish emissions for 2012 have been determined.

▶ **THE COUNCIL PROPOSES** the introduction of an interim target for the medium term that is in line with the proposals of the Climate Committee.

In parallel with the present in-depth evaluation of the environmental objectives, an all-party committee set up by the Government has reviewed Sweden's climate change policy, as part of 'Checkpoint 2008'. The Committee, whose terms of reference included proposing a climate target for Sweden for the medium term (up to 2020), reported on 4 March 2008. The Council proposes the introduction of an interim target for the medium term that is in line with the Climate Committee's recommendations.

In addition, a process is under way within the EU to apportion the burden of meeting the climate target agreed by the member states, which calls for an emission reduction of 20% by 2020 from 1990 levels. Under the burden-sharing proposals submitted to the European Council by the Commission in January 2008, Swedish emissions not covered by the EU emissions trading scheme would have to be cut by 17% between 2005 and 2020. These emissions currently make up around 70% of the Swedish total, and come chiefly from transport, mobile machinery and equipment, agriculture, waste, and industrial sectors outside the trading scheme.

5.1.5 How far are we from achieving the environmental quality objective?

Modelling results based on alternative future emission scenarios indicate that, up to the end of this century, the temperature will rise by 2.4–4.6°C compared with pre-industrial levels, unless deep cuts in emissions are achieved.

Sweden's Scientific Council on Climate Issues has concluded that, to limit global warming to no more than 2°C above pre-industrial temperatures, atmospheric concentrations of greenhouse gases will probably need to be stabilized in the long term (by 2150) at no more than 400 ppm CO_2 equivalent.

For the industrialized countries, which have the biggest responsibility for cutting emissions, the 2°C target will involve reductions of 30–40% by 2020 and 75–90% by 2050, from 1990 levels. On a basis of long-term convergence towards equal per capita emissions, Sweden will need to reduce its greenhouse gas emissions by 20–25% by 2020 and 70–85% by 2050. That means that, by 2050, the country's emissions should stand at no more than 2–2.5 tonnes of CO_2 equivalent per capita per year.

The international community faces the twin challenge of working together to curb emissions of greenhouse gases and securing global economic development – especially in poorer parts of the world, in line with the Millennium Development Goals and the Convention on Climate Change.

The developed country signatories to the Kyoto Protocol have together pledged to cut their greenhouse gas emissions by at least 5% by 2012. Through two mechanisms under the Protocol – the Clean Development Mechanism (CDM) and Joint Implementation (JI) – these countries are able to contribute to development in and technology transfer to poorer nations, while helping to limit emissions. Since the Kyoto Protocol came into force, the question of new commitments on reductions beyond 2012 has been under discussion. The European Council has decided to reduce greenhouse gas emissions by 20% by 2020 (from 1990 levels) as a unilateral European undertaking, and by 30% as part of a wider international commitment. At the Climate Change Conference in Bali in December 2007, international negotiations on future commitments in the UN framework resulted in agreement on the key building blocks of a new climate change regime, and on a 2009 deadline for further negotiations to that end.

Important global factors in achieving the objective *Reduced Climate Impact* are:

- Development of more energy-efficient technologies.
- More resource-efficient energy systems in all countries.
- A transition from fossil to renewable sources of energy in industrialized countries.

Table 5.1.1 Key technologies and practices with the potential to reduce global greenhouse gas emissions by 2030. Listed by sector, in no particular order (IPCC WG 3, 2007)

Sector	Technologies now commercially available	Technologies projected to be commercialized before 2030
Energy supply	Improved supply and distribution efficiency, nuclear power, fuel switching from coal to gas, increased share of renewable heat and power, increased share of combined heat and power.	Carbon capture and storage (CCS), advanced nuclear power, advanced renewable energy, e.g. tidal/wave energy and solar cell technology.
Transport	Fuel-efficient vehicles, hybrid vehicles, cleaner diesel vehicles, biofuels, modal shifts from road transport to rail/public transport/walking/cycling, land-use and transport planning.	Second-generation biofuels, higher-efficiency aircraft, advanced electric and hybrid vehicles.
Buildings	Efficient lighting, more efficient electrical appliances and heating and cooling devices, improved cooking stoves, better insulation, solar design, alternative refrigerants, recovery and recycling of fluorinated gases.	Integrated technologies providing feedback and control of energy use in buildings, integrated solar cell technology.
Industry	More efficient electrical equipment, heat and power recovery, materials recycling and substitution, control of non-CO_2 greenhouse gas emissions, new process-specific technologies.	Advanced energy efficiency, CCS for cement, ammonia and steel manufacture, inert electrodes for manufacture of aluminium.
Agriculture	Increased soil carbon storage in crop and grazing land, restoration of cultivated peat soils, improved rice cultivation techniques and livestock and manure management to reduce CH_4 emissions, improved nitrogen fertilizer application techniques to reduce N_2O emissions, energy crops to replace fossil fuel use.	Improved crop yields.
Forestry	Afforestation, reforestation, forest management, reduced deforestation, harvested wood product management, better use of forestry products for bioenergy.	Tree species improvement to increase biomass productivity and carbon sequestration, improved technologies for analysis of carbon sequestration potential and mapping of land use change.
Waste management	Landfill methane recovery, waste incineration with energy recovery, composting of organic waste, wastewater treatment, recycling and waste minimization.	Biocovers and biofilters to optimize methane oxidation.

- Transfer of energy-efficient and renewable energy technologies to developing countries, and especially to countries with strongly growing economies such as China, India and Brazil.
- Development of carbon capture and storage (CCS) technologies.
- Reduced deforestation around the world.

According to the IPCC, the potential exists to reduce global emissions below current levels by 2030 by technical measures alone, at a cost of less than US$50 per tonne of carbon dioxide. This is based on reductions being delivered in all sectors. Measures affecting new and existing buildings, in rich and poor countries alike, are judged to offer the greatest potential. Important mitigation technologies and practices identified by the IPCC are shown in Table 5.1.1.

Assuming that the Swedish climate strategy proposed by the Swedish Environmental Protection Agency and the Swedish Energy Agency in their Checkpoint 2008 report is implemented in full, it is

estimated that Sweden could achieve an emission reduction of 25–30% by 2020. Some of this reduction would be based on Swedish investments in projects in other countries.

How Sweden will be able to cut its emissions by 70% by 2050 – the minimum judged necessary to discharge Sweden's global responsibility for the 2°C target – is difficult to assess at present. Considerable difficulties and uncertainties are attached to a projection over such a long time frame. Given emission trends and proposed measures and policy instruments up to 2020, increasingly large annual reductions in emissions will have to be achieved between 2020 and 2050.

5.2 Clean Air

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Clean Air* will be very difficult or not possible to achieve by 2020, even if further measures are introduced. Particles and ground-level ozone will continue to have adverse effects on human health and the environment at that time. So far this century, no improvement in air quality has been recorded in Sweden's towns and cities. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim target for sulphur dioxide was met by the target year 2005; that the targets for nitrogen dioxide, ground-level ozone and particles will be very difficult to achieve within the time frame, even if additional measures are introduced; that the target for volatile organic compounds can be reached on time; and that the target for benzo[a]pyrene can be met on time if additional action is taken.

▶ **THE COUNCIL PROPOSES** no change to the Government's specification of the environmental quality objective on a time scale of one generation, but does propose that the target values to be achieved within that time frame be supplemented and updated.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Withdraw the interim target for sulphur dioxide, which was met by the target year 2005.
- Replace the interim target for nitrogen dioxide with a revised interim target for concentrations of nitrogen dioxide that will apply beyond 2010.
- Replace the interim target for ground-level ozone with a revised interim target relating to ground-level ozone – protection of human health, with 2015 as the target year.
- Replace the interim target for volatile organic compounds with a revised interim target for emissions of volatile organic compounds, with 2020 as the target year.
- Replace the interim target for particles with a revised interim target for concentrations of particles, with 2015 as the target year.
- Retain the interim target for concentrations of benzo[a]pyrene, with 2015 as the target year, in its present form.
- Introduce a new interim target relating to ground-level ozone – protection of vegetation, with 2015 as the target year.
- Undertake a study of the need for an interim target relating to children's health.
- There is no need to introduce interim targets for other particulate fractions than PM10 and PM2.5 or for benzene.

5.2.1 Progress towards the environmental quality objective

CLEAN AIR

The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets.

This environmental quality objective is intended to be achieved within one generation.

In the Environmental Objectives Council's view, this objective will be very difficult to achieve by 2020, even if further measures are introduced. This assessment is based on projections to 2020 in the EU's Thematic Strategy on Air Pollution and on national air pollutant projections. The Council revised its appraisal in its annual review of progress in 2006. Prior to that, the objective had been regarded as achievable provided that further action was taken. The new, more pessimistic assessment is founded on an improved understanding of the environmental and health risks associated with particles, ground-level ozone and benzo[a]pyrene. What is more, concentrations of these pollutants are not falling at the rate required.

Of the regional assessments made by county administrative boards, roughly half agree with the national one, while 12 judge it possible to attain the objective if additional action is taken. On the whole, the more pessimistic view is held by boards representing larger towns, areas of southern Sweden and the county of Norrbotten, which can be affected by inversions. The county boards call for action in Sweden and across Europe, chiefly in the transport and energy sectors. Further instruments and measures to encourage the replacement of old boilers and the installation of accumulator tanks are regarded by several boards as necessary to achieving the objective.

Projections and estimates of the health impacts of outdoor air in Europe as a whole in 2020 suggest that, at that point, life expectancy will still be reduced by an average of five months. For Sweden, the figure is around two months. This effect is due to exposure to fine particles of anthropogenic origin. Even if the best available technology is used, life expectancy will still be reduced in 2020.

The fears expressed in the Council's first in-depth evaluation in 2004 concerning the health effects of particles and the need for measures to tackle high levels of nitrogen dioxide have, unfortunately, been confirmed. Since then, there has been no appreciable improvement in air quality in Sweden's towns and cities. The trends for nitrogen dioxide, sulphur dioxide and particles are unclear. For ground-level ozone, the highest concentrations in rural areas have abated, but at the same time there has been a problematic increase in background levels across the northern hemisphere.

In its bill 'Swedish Environmental Objectives – Interim Targets and Action Strategies' (2000/01:130), the Government made an assessment of concentrations of a number of different substances that could be judged acceptable in terms of achieving the *Clean Air* objective. Below, an outline account is given of the state of the environment with regard to these substances and the prospects of meeting the long-term targets for them.

Table 5.2.1 Summary of health impacts in Sweden in 2020, based on CAFE (Clean Air For Europe) scenario analyses

	2000	Baseline	Thematic strategy	Maximum technically feasible reduction
PM2.5*	3.5	2.7	2.4	2.0
Ozone**	197	189	178	135

* Particles smaller than 2.5 µm. Loss in statistical life expectancy in months

** Number of premature deaths per year attributable to exposure to ozone levels exceeding 70 µg/m^3

Ground-level ozone

The three long-term targets for ozone concentrations in ambient air will not be met by 2020. The target value for the maximum daily 8-hour mean, 70 µg/m^3, is exceeded on up to 250 days a year, with a clear upward trend for rural areas of southern Sweden. A projection to 2020 estimates the population-weighted average number of days with exceedances at 190–200. At exposed sites, the number may be appreciably higher.

A downward trend can be noted in maximum hourly mean concentrations at rural monitoring sites in the south. However, the number of days each year when the target value of 80 µg/m^3 is exceeded is rising.

Mean ozone levels over the period April–October exceeded the long-term target set in the framework of the environmental quality objective, 50 µg/m^3, at the majority of monitoring sites in Sweden most years between 1990 and 2005. For rural sites in the south of the country, no clear trend in mean concentrations for April–October can be observed.

Particles

Estimates suggest that, in 2020, the loss in life expectancy attributable to exposure to PM2.5 will still be around two months. The existing specification of the environmental quality objective includes target concentrations of PM10 (particles smaller than 10 µm). According to current projections, these will be exceeded in 2020.

Benzo[a]pyrene

At present, the most significant emissions of benzo[a]-pyrene come from wood-fired heating and, to a lesser degree, from traffic. The concentration stated in the interim target is mainly exceeded in places affected by wood-burning emissions. The long-term target of 0.1 ng/m^3, set in Government Bill 2000/01:130, is also exceeded in southern Sweden and at sites close to traffic. Progress towards this target will require vigorous measures to achieve cleaner burning of wood and international cooperation to reduce emissions. An eye should also be kept on emissions from a growing diesel car fleet. Overall, the prospects of meeting the objective are dependent on a reduction of emissions from small-scale burning of wood, and suitable policy instruments to achieve such a reduction are therefore urgently required.

Benzene

Levels of benzene in air are falling, and the assessment is that they can be brought down to 1 µg/m^3 by 2020. Monitoring in 2006 showed background concentrations in Swedish towns to be roughly 1–1.5 µg/m^3; at urban roadside locations, levels were 1–2.5 µg/m^3. The decline in concentrations is due partly to a reduction in the benzene content of petrol. More stringent exhaust standards for cars have also lowered emissions. Measurements over the winter period show a 75% fall in concentrations since the early 1990s, and the trend since 2000 suggests that there will be a further slight decrease. Further renewal of the vehicle fleet should enable the target to be met.

Formaldehyde

Concentrations of formaldehyde in ambient air, expressed as an hourly mean, are currently below the long-term target value of 10 µg/m^3. Provided that emissions from ethanol- and diesel-powered vehicles can be reduced using new technology, it will be possible to meet the target for this pollutant by 2020.

Cold starts increase emissions of formaldehyde, especially from vehicles run on diesel or ethanol. As the number of such vehicles is growing, vigilance may be called for to avoid rising levels of this substance in urban air.

Ethene

Very few measurements have been made of ethene (ethylene) in air. This is partly because this pollutant is difficult to sample at low concentrations, and partly because monitoring of butadiene has been given higher priority. With limited data available, it is difficult to assess whether the target value of 1 µg/m^3 is being met, and even harder to make a projection up to 2020.

Soot

The long-term target value for soot (black smoke), 10 µg/m³ as an annual mean, is currently being met, and the trend indicates that this will also be the case in 2020. The target value has been set with a view to protecting cultural heritage objects from soiling. Data suggest that health risks exist even below this level. Soot is an important indicator for combustion particles.

Corrosion of materials and cultural monuments

Acidifying air pollutants, chiefly sulphur dioxide, accelerate the corrosion of most materials, although different materials are affected to differing degrees. Other pollutants, especially particles, also need to be included in a long-term strategy to reduce the impacts of air pollution on materials and cultural monuments. Climate, too, is a major factor. The costs to society are appreciable – and cannot be measured in money terms alone, as valuable cultural heritage may also be lost.

5.2.2 Progress towards the current interim targets

INTERIM TARGET 1

SULPHUR DIOXIDE

A level of sulphur dioxide of 5 µg/m³ as an annual mean will have been achieved in all municipalities by 2005.

This interim target is now met throughout Sweden, and the present trend suggests that that will remain the case. According to the county administrative boards' regional assessments, regional interim targets for sulphur dioxide are currently met in the 11 counties where such targets have been adopted. In places significantly affected by international shipping, vigilance is necessary to avoid a rise in concentrations resulting from growth in the volume of seaborne transport.

INTERIM TARGET 2

NITROGEN DIOXIDE

A level of nitrogen dioxide of 60 µg/m³ as an hourly mean and of 20 µg/m³ as an annual mean will largely not be exceeded by 2010. The hourly mean may not be exceeded for more than 175 hours per year.

Concentrations of nitrogen dioxide have not fallen as much as necessary. On current trends and projections, it will be very difficult to meet this target by 2010.

INTERIM TARGET 3

GROUND-LEVEL OZONE

By 2010 concentrations of ground-level ozone will not exceed 120 µg/m³ as an 8-hour mean.

Concentrations of ground-level ozone currently exceed the interim target. There has been a slight downward trend in maximum 8-hour mean concentrations, but it is unrealistic to believe that the international action needed to meet this target will have a sufficient impact by 2010. What is more, nitrogen oxide emissions from shipping, a major factor here, are on the increase.

INTERIM TARGET 4

VOLATILE ORGANIC COMPOUNDS

By 2010 emissions in Sweden of volatile organic compounds (VOCs), excluding methane, will have been reduced to 241,000 tonnes.

Emissions of non-methane volatile organic compounds (NMVOCs) are falling in Sweden and across Europe. According to new estimates, Swedish emissions have for a number of years been considerably below the interim target level.

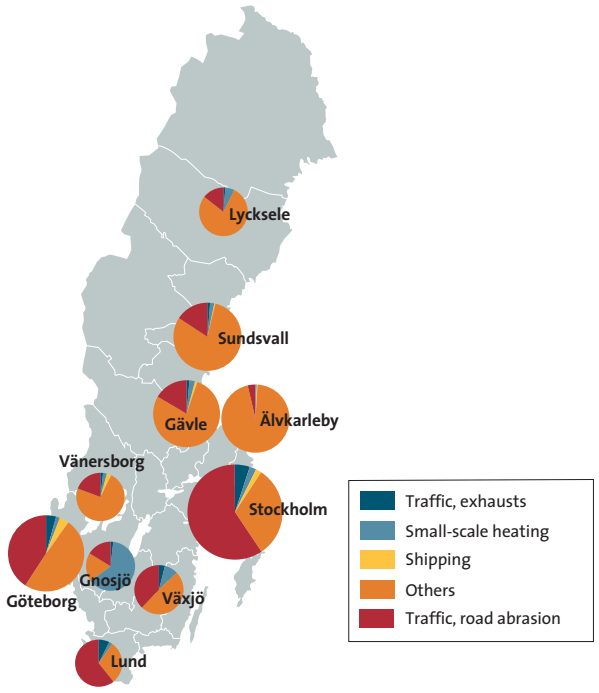
INTERIM TARGET 5

PARTICLES

A level of particles (PM10) of 35 µg/m³ as a daily mean and of 20 µg/m³ as an annual mean will not be exceeded by 2010. The daily mean may not be exceeded for more than 37 days per year. A level of particles (PM2.5) of 20 µg/m³ as a daily mean and of 12 µg/m³ as an annual mean will not be exceeded by 2010. The daily mean may not be exceeded for more than 37 days per year.

This interim target will be very difficult to meet by 2010. The target concentrations are currently exceeded in many locations. Trends and projections indicate that this will remain the case.

FIGURE 5.2.1 Emissions of particles (PM10) from different sources in a number of Swedish towns and cities



SOURCE: SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE

In the areas with the highest emissions of particles, road surface abrasion by studded snow tyres is an important source.

INTERIM TARGET 6

BENZO[A]PYRENE

A level of benzo[a]pyrene of 0.3 ng/m³ as an annual mean will largely not be exceeded by 2015.

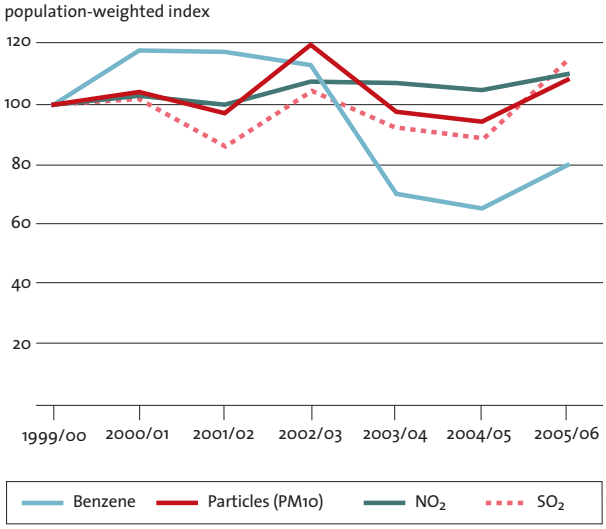
To achieve this target, measures to curb emissions from small-scale burning of wood will be necessary.

5.2.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Clean Air*:

The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets.

FIGURE 5.2.2 Air quality trends in Swedish towns and cities in winter period, 1999/2000–2005/2006



Note: The index used is a weighted average of concentrations in some 30 local authority areas. An index of 100 represents the following concentrations in 1999/2000: NO_2 17.7 µg/m³, SO_2 2.4 µg/m³, benzene 2.1 µg/m³, and PM10 17.1 µg/m³.

SOURCE: SWEDISH ENVIRONMENTAL MONITORING PROGRAMME

Air quality in urban areas of Sweden has not improved since the beginning of this century. Only levels of benzene have fallen. For other pollutants, trends are unclear.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specification of the objective on a time scale of one generation:

- Keep the specification unchanged.
- Define the target values mentioned in the specification in terms of the concentrations set out in Table 5.2.2.
- Introduce additional target values for three substances, and replace the target value for ozone over the summer months with AOT40.

PROPOSED SPECIFICATION OF THE ENVIRONMENTAL QUALITY OBJECTIVE

The present wording of the Government's specification of the objective should be retained. The Environmental Objectives Council proposes that the target values be supplemented and updated in accordance with Table 5.2.2.

Current specification (Government Bill 2000/01:130)	**Proposed change** (change in italics)
Concentrations of air pollutants will not exceed low-risk levels for cancer or target values for protection against diseases or effects on plants, animals, materials and cultural heritage objects. The target values will be set with reference to persons suffering from hypersensitivity and asthma (see table).	No change.

Table 5.2.2 The Council's proposals for target values (changes in italics)

Pollutant	**Concentration that should not be exceeded (µg/m³)** (Govt. Bill 2000/01:130)	**Concentration that should not be exceeded (µg/m³)** Council's proposal	**Averaging period**
Benzene	1	1	1 year
Benzo[a]pyrene	0.0001	0.0001	1 year
Ethene	1	–	1 year
Butadiene		*0.2*	*1 year*
Formaldehyde	10	10	1 hour
Particles < 10 µm, PM10	15	15	1 year
	30	30	24 hours
Soot	10	10	1 year
Ground-level ozone	70	70	8 hours
	80	80	1 hour
	50	–	April–October
		10,000 µg/m³·h	*AOT40 April–September*
Nitrogen dioxide		*20*	*1 year*
		60	*1 hour (98th percentile)*
Sulphur dioxide		*5*	*1 year*

Ground-level ozone

The Environmental Objectives Council proposes a new long-term target for ozone for the protection of vegetation, namely that AOT40 (accumulated exposure over a threshold of 40 ppb), accumulated annually from 1 April to 30 September, should not exceed 10,000 µg/m^3·h as an average over the last five years. This target value has been adopted for the protection of forests in the framework of EU efforts to tackle air pollution. It has also been used under the Convention on Long-Range Transboundary Air Pollution, as the level above which adverse impacts on young trees of sensitive species have been observed under experimental conditions. It is proposed that the earlier target of 50 µg/m^3 as an average for April–October should be dropped. Effects on health and the environment can be observed down to current background concentrations of ozone. No minimum threshold level for damage has been demonstrated. The 1-hour and 8-hour mean values agree with the low-risk level defined by the Institute of Environmental Medicine (IMM) and should be retained.

Particles, including soot

The long-term target values for particles need to be updated, but the Council wishes to defer proposing new ones until better data are available. It has not been possible to establish a threshold level below which there are no adverse effects. It is still difficult to define a clear maximum level of particle concentrations for the purposes of the *Clean Air* objective. Research on the health impacts of different particulate fractions is under way. Soot is a measure of particulate matter that has received greater attention in recent years. The current value included in the environmental quality objective is designed to protect cultural heritage materials etc. from soiling, and should be retained. At present, there are insufficient data to propose additional values for the protection of health.

Nitrogen dioxide and sulphur dioxide

Definitions of low-risk levels of sulphur dioxide and nitrogen dioxide should be included in the specification of the objective. The values proposed are based on assessments of the damage caused by these pollutants, both to human health and to materials and cultural heritage objects. A level of air quality to be aimed for with regard to sulphur dioxide is 5 µg/m^3, based on effects on heritage objects. For nitrogen dioxide, suitable limit values are discussed in the background report on this objective. The hourly mean value of 60 µg/m^3 (as a 98th percentile) is intended to cover health risks even to sensitive groups, while the annual mean concentration of 20 µg/m^3 is designed to avoid damage to materials and cultural heritage. Nitrogen dioxide is also an important indicator for exhaust emissions, for example, but this aspect is not covered by the proposed target levels.

Carcinogens

The current specification of the objective includes benzene, benzo[a]pyrene, ethene (ethylene) and formaldehyde. For benzene and benzo[a]pyrene, the target values set are in line with the low-risk levels recommended by IMM. These levels correspond in theory to a lifetime cancer risk of 1 in 100,000, assuming constant exposure. It is proposed that the target value for ethene should be replaced with one for butadiene. The data available on ethene are very limited. Following estimates and animal experiments, 1,3-butadiene has been judged by IMM to be the alkene posing the greatest risk of cancer to the general population. A low-risk level that has been suggested is 0.2–1.0 µg/m^3. The chief sources of public exposure are transport and smoking. Levels of formaldehyde could rise as a result of growing use of diesel- and ethanol-powered vehicles, and the target value for this pollutant should be retained.

5.2.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

CONCENTRATIONS OF NITROGEN DIOXIDE

From 2010 onwards, concentrations of nitrogen dioxide of 60 µg/m^3 as an hourly mean and of 20 µg/m^3 as an annual mean will by and large not be exceeded. The hourly mean may not be exceeded for more than 175 hours per year.

The proposal is to revise the current interim target with regard to its target year: concentrations are to remain below the stated levels beyond 2010. No new scientific data emerged from the recent assessment by the World Health Organization (WHO) that would justify a more stringent target. Simply deferring the target year would further delay implementation of the necessary measures. Consequently, it is proposed that the interim target should apply from the existing target year onwards. Since this target was adopted, nitrogen dioxide levels have not fallen – in certain places, rather, the tendency is for them to rise.

Monitoring and indicators

Since only an adjustment of the target date is envisaged, monitoring will continue as before.

▶ **THE COUNCIL PROPOSES** a revised interim target:

GROUND-LEVEL OZONE – PROTECTION OF HUMAN HEALTH

By 2015, concentrations of ground-level ozone will not exceed 100 µg/m³ as an 8-hour mean. This value is to be calculated as a running average over the last three years, and may not be exceeded on more than 35 days per year.

The WHO Air Quality Guidelines from 2005 tighten up the earlier guideline value for ground-level ozone. The Environmental Objectives Council is following WHO's recommendations and proposing a more stringent interim target for this pollutant, with a new target year of 2015. For there to be a realistic chance of meeting the target, it is proposed that the defined level may be exceeded on 35 days a year. To reduce the significance of year-to-year variations, values are to be calculated as a mean over three years. Successful achievement of this target will require larger reductions in nitrogen oxide and hydrocarbon emissions than have hitherto been decided internationally.

Monitoring and indicators

The revised target does not require any change to existing monitoring arrangements.

▶ **THE COUNCIL PROPOSES** a revised interim target:

EMISSIONS OF VOLATILE ORGANIC COMPOUNDS

By 2020, emissions of non-methane volatile organic compounds (NMVOCs) in Sweden, in tonnes per year, will be in line with the country's undertaking under a new National Emission Ceilings Directive.

One of the biggest obstacles to achieving *Clean Air* is rising background concentrations of ground-level ozone, and volatile organic compounds play a part in the formation of this gas. The Environmental Objectives Council therefore wishes to see a more ambitious reduction target for emissions of non-methane volatile organic compounds (NMVOCs). The precise level at which a new interim target for 2020 should be set is not yet clear, but it is proposed that it should be in line with Sweden's undertaking under a new EU National Emission Ceilings Directive. Judging from projections of NMVOC emissions under different scenarios, a new Swedish undertaking will involve a ceiling in the range of 90,000–140,000 tonnes per year.

The Council sees no need for an interim target for benzene.

Monitoring and indicators

NMVOC emissions will, as before, be monitored as part of Sweden's emissions reporting to the EU and under the UN Convention on Long-Range Transboundary Air Pollution.

▶ **THE COUNCIL PROPOSES** a revised interim target:

CONCENTRATIONS OF PARTICLES

By 2015, concentrations of particles of 30 µg/m³ as a 24-hour mean for PM10, 10 µg/m³ as an annual mean for PM2.5, and 18 µg/m³ as an annual mean for PM10 will not be exceeded. The 24-hour mean concentration may not be exceeded on more than 35 days per year.

It is proposed that the focus of the interim target should be on 24-hour mean concentrations (90th percentile) of PM10 (particles smaller than 10 µm) and annual mean concentrations of PM2.5 (particles smaller than 2.5 µm). The values proposed are in line with WHO recommendations. To maintain the same level of ambition, the new target for particles should be met by 2015. The 24-hour mean should not be exceeded on more than 35 days a year, based on a monitoring year of 350 days.

A recent projection of air pollutant levels (NO_2 and PM10) in Sweden's urban areas indicates that the interim target can be achieved between 2010 and 2020 in towns in the far south, where the impact of studded snow tyres is limited. In towns with a greater reliance on studded tyres in winter, the target will not be met unless action is taken to reduce their use.

The Council considers there to be no need for an interim target for PM1.

Monitoring and indicators

As monitoring of PM2.5 is not yet fully developed across the country, it is proposed that progress towards the target can also be monitored on the basis of annual mean concentrations of PM10. The health effects of PM2.5 are chiefly linked to long-term exposure, while for PM10 the most clearly documented effects are associated with short-term exposure.

▶ **THE COUNCIL PROPOSES** an unchanged interim target:

CONCENTRATIONS OF BENZO[A]PYRENE
A level of benzo[a]pyrene of 0.3 ng/m³ as an annual mean will largely not be exceeded by 2015.

Success in achieving this interim target is dependent on measures to reduce emissions from small-scale burning of wood. The Environmental Objectives Council sees no reason to change the existing target.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

GROUND-LEVEL OZONE – PROTECTION OF VEGETATION
By 2015, concentrations of ozone during the growing season will be reduced so as to achieve an acceptable level of exposure and thus avoid damage to vegetation, i.e. the value of AOT40 from April to September will not exceed 20,000 (µg/m³)·h, calculated as an average over the last five years.

Current levels of ozone in Sweden are estimated to cause annual yield losses in agriculture of 5–15% and to reduce forest growth by around 2%. The parameter AOT40 reflects the exposure of vegetation to ozone during the growing season.

The EU Directive (2002/3/EC) relating to ozone in ambient air establishes target values for ozone in the short and long term. To protect vegetation, chiefly crops, the target value for 2010 is defined in terms of AOT40 over the period May to July not exceeding 18,000 (µg/m³)·h. In Swedish legislation, an environmental quality standard with that value has been introduced, and is to be met no later than 2010. The proposed interim target has a longer monitoring period, from April to September, as effects on growing forests can occur throughout that period. The target level proposed is more stringent than that set in the standard.

Monitoring and indicators

Follow-up with regard to ground-level ozone can be coordinated with monitoring of compliance with environmental quality standards and with reporting to the EU. The proposed new target is framed in such a way as to enable this monitoring system to be used.

▶ **THE COUNCIL PROPOSES** a study to establish an interim target for the protection of children's health.

Particular attention may need to be paid to outdoor environments where children spend significant

amounts of time. The interim target envisaged should focus both on fine particles and on NO_2 as an indicator for vehicle exhausts. It could be framed in the following terms: 'By 20XX, the outdoor areas of all schools and pre-schools will have an acceptable level of air quality with regard to PM2.5 (< 10 µg/m^3 as an annual mean) and NO_2 (< 15 µg/m^3).' The precise concentrations and the target year need to be studied more closely, as do appropriate measures and the impacts of such a target.

5.2.5 How far are we from achieving the environmental quality objective?

The Environmental Objectives Council's assessment is that it will be very difficult to achieve the *Clean Air* objective by 2020, despite the measures it proposes. Action at the EU level and possible measures on a national basis may be expected to improve the situation in the years ahead, but will not be enough. Many of the proposed measures for reaching this objective have not been put into effect, giving rise to an 'implementation deficit'. The biggest obstacles in the way of *Clean Air* are the difficulties involved in reducing concentrations of fine particles and ground-level ozone. Much more global cooperation is needed to curb emissions of ozone precursors. Transport demand needs to be reduced by means of physical planning, and more rapid progress needs to be made in vehicle technology in order to bring down concentrations of particles. It is probably unrealistic to expect these things to have been achieved and had an impact by 2020.

The most important factors affecting the prospects of meeting the *Clean Air* objective are:

- Developments in the transport sector, which is a major source of emissions.
- International efforts to tackle air pollution, as the air pollutant concentrations occurring in Sweden are very largely attributable to sources outside the country.
- Developments in energy use and individual heating systems, as this is an area in which emissions, e.g. from small-scale combustion, can have a very major impact on local air quality.

5.3 Natural Acidification Only

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Natural Acidification Only* will be very difficult or not possible to achieve by 2020, even if further measures are introduced. Sulphur and nitrogen emissions have fallen sharply, but emissions from shipping are expected to continue to rise. Growth in forestry could exacerbate acidification. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim targets for acidification of lakes and streams, acidification of forest soils and sulphur dioxide emissions were met before the target year 2010, and that the target for emissions of nitrogen oxides is achievable within the time frame laid down, provided that further action is taken.

▶ **THE COUNCIL PROPOSES** a change to the wording of the environmental quality objective, replacing the reference to 'the rate of corrosion of technical materials or cultural artefacts and buildings' with a reference to other corrosion effects.

▶ **THE COUNCIL PROPOSES** a minor change to one of the Government's specifications of the environmental quality objective on a time scale of one generation:

- In the specification relating to anthropogenic acidification of soil, the word 'counteract' should be replaced with 'reduce'.
- The other specifications should be kept unchanged.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for acidification of lakes and streams with a revised interim target for acidified fresh waters, with 2015 as the target year.
- Replace the interim target for acidification of forest soils with a revised interim target for acidified forest soils, with 2015 as the target year.
- Withdraw the interim target for sulphur dioxide emissions, which was met at least five years before the target year 2010.
- Replace the interim target for nitrogen oxide emissions with a revised interim target for nitrogen oxide emissions, with 2015 as the target year.
- Introduce a new interim target on the acidifying effects of forestry, with 2015 as the target year.
- Introduce a new interim target for emissions from shipping, with 2015 as the target year.

5.3.1 Progress towards the environmental quality objective

NATURAL ACIDIFICATION ONLY

The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water. In addition, deposition of acidifying substances must not increase the rate of corrosion of technical materials or cultural artefacts and buildings.

This environmental quality objective is intended to be achieved within one generation.

Substantially reduced emissions of acidifying pollutants in recent decades have led to significant improvements in the acidification status of soil and water. Projections point to a further modest decline in emissions by 2020, and the situation is thus expected to improve – but not to a sufficient degree. Emissions from shipping in sea areas around Sweden, on the other hand, are expected to continue to rise, and increased harvesting of forests could exacerbate acidification. The Environmental Objectives Council makes the assessment that the environmental quality objective will not be achieved within the defined time frame, even if further measures are introduced.

Progress towards the objective is assessed with reference to exceedances of critical loads for acidification, which are calculated for both forest soils and lakes. 'Critical load' means the maximum amount of deposition that an ecosystem can receive without incurring significant damage. When this critical load is no longer exceeded, the risk of increased corrosion is also judged to be small. The environmental quality objective has a target year of 2020, and the Council's assessment of progress towards it is based on current trends and decisions already taken.

Despite the considerable emission reductions implemented or decided on, it is estimated that, in 2020, deposition of acidifying substances will still exceed critical loads for 12% of the area of lakes in Sweden. To achieve the objective, therefore, additional action needs to be taken to reduce this deposition. The main sources responsible for it are outside the country's borders.

Exceedance of critical loads is most pronounced in the south-west of Sweden, where acid deposition is highest. With the levels of deposition recorded in 2002–4, the extent of exceedance was the same for forest soils as for lakes. By 2020, exceedance of critical loads for forests is expected to have been reduced virtually to zero.

The current scenario for 2020, which envisages more widespread exceedance of critical loads for lakes than for forest soils, is consistent with the present state of the environment. In south-west Sweden, no serious effects on forests are now to be observed, while thousands of lakes and watercourses remain acidified.

5.3.2 Progress towards the current interim targets

INTERIM TARGET 1

ACIDIFICATION OF LAKES AND STREAMS

By 2010 not more than 5% of all lakes and 15% of the total length of running waters in the country will be affected by anthropogenic acidification.

This interim target, which applies to unlimed lakes larger than 4 hectares (ha) and to watercourses, has been met ahead of the target date. Recovery from acidification has continued. Of the total of just over 50,000 Swedish lakes to which the target applies, only around 1,500, or 3%, were acidified in 2005. This can be compared with 1990, when some 5,000 lakes with an area exceeding 4 ha were acidified. The proportion of the total length of rivers and streams affected by acidification is estimated at 5%, and a further slight decrease is expected by 2010.

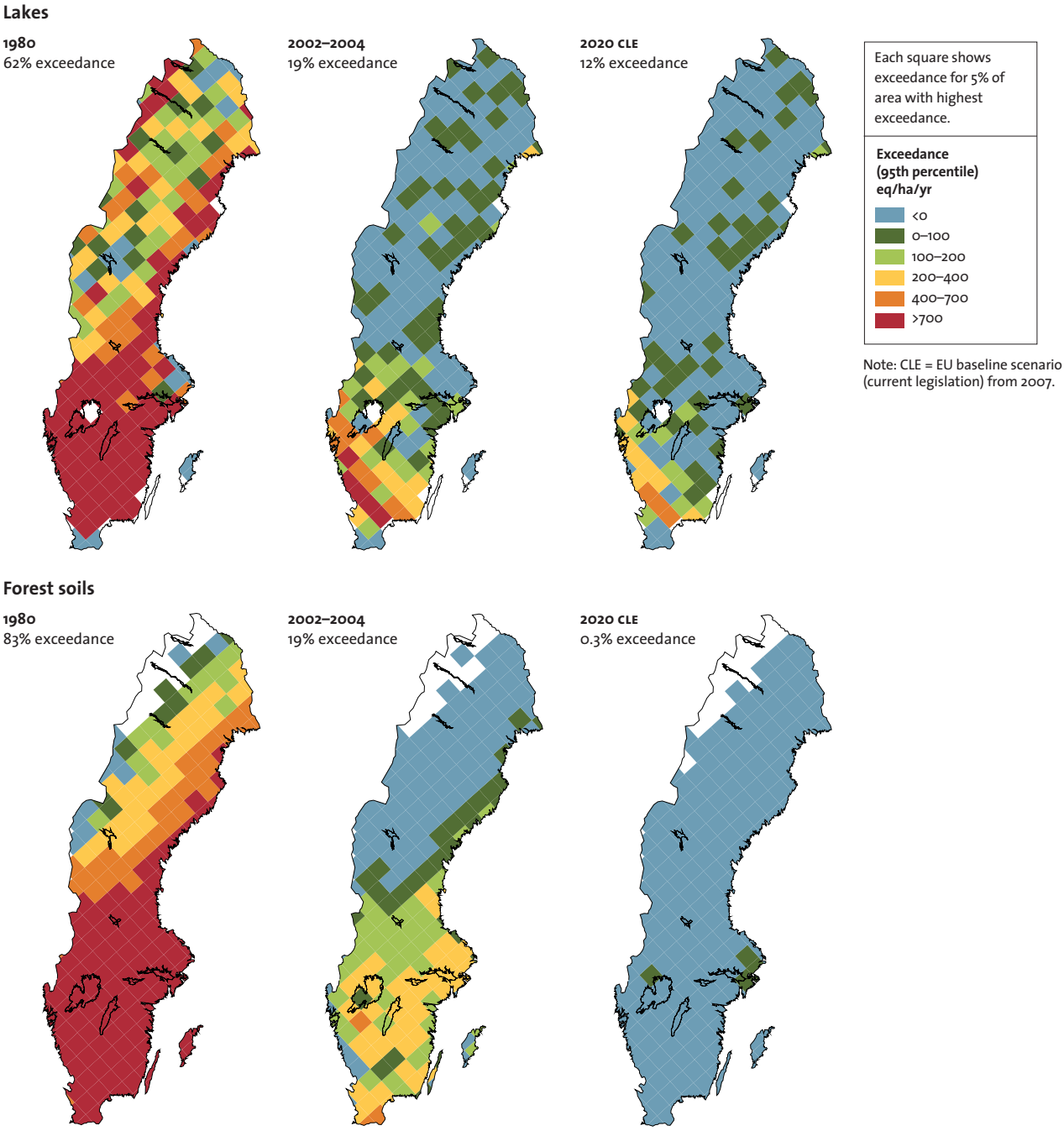
INTERIM TARGET 2

ACIDIFICATION OF FOREST SOILS

By 2010 the trend towards increased acidification of forest soils will have been reversed in areas that have been acidified by human activities, and a recovery will be under way.

This target has already been met. The trend towards increased acidification of forest soils has been halted and a recovery is in progress in acidified areas. The proportions of the forest area with high and very high

FIGURE 5.3.1 Exceedance of critical loads for acidification of lakes and forest soils



SOURCE: DEPARTMENT OF ENVIRONMENTAL ASSESSMENT, SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES, AND IVL SWEDISH ENVIRONMENTAL RESEARCH INSTITUTE LTD.

The acidification status of lakes and forest soils, measured as exceedance of critical loads, has improved considerably since 1980. That year, critical loads were exceeded for more than half the area of both lakes and forest land in Sweden. The degree of exceedance was also much greater than it is now. By 2020, critical loads are expected to be exceeded for 12% of the lake area, while the figure for forest soils is projected to be close to zero.

soil acidity are decreasing, particularly in the south-west of Sweden. Changes in the acidity of mineral layers of the soil, measured as pH and titratable acidity, show a trend towards less acid conditions throughout the country, with the exception of the far north and north-western Götaland, where no changes in pH can be observed. Northern Sweden has not been appreciably affected by acidification, and therefore no change is to be expected there. The lack of evidence of an improvement in north-west Götaland may be due to recovery being less pronounced in that region. Another possible explanation is that some forest soils there are so resistant to acidification that they were not significantly affected in the first place. Levels of exchangeable potassium in forest soils are declining in south-west Sweden, but other substances, such as calcium, magnesium, sodium and exchangeable aluminium, are tending towards a less acidic state. The trend towards increased acidification is judged to have been halted, taking into account all the changes observed.

More intensive forestry, with larger removals of biomass not compensated for, for example, by recycling of wood ash, could adversely affect the capacity for recovery of forest soils.

INTERIM TARGET 3

SULPHUR DIOXIDE EMISSIONS

By 2010 emissions of sulphur dioxide to air in Sweden will have been reduced to 50,000 tonnes.

This target has already been met. In 2006, emissions of sulphur dioxide totalled just under 39,000 tonnes, and the projection for 2010 indicates that by then they will be down to 33,000 tonnes. This trend is the result of measures in several different sectors – and also an effect of revised emission statistics.

INTERIM TARGET 4

NITROGEN OXIDE EMISSIONS

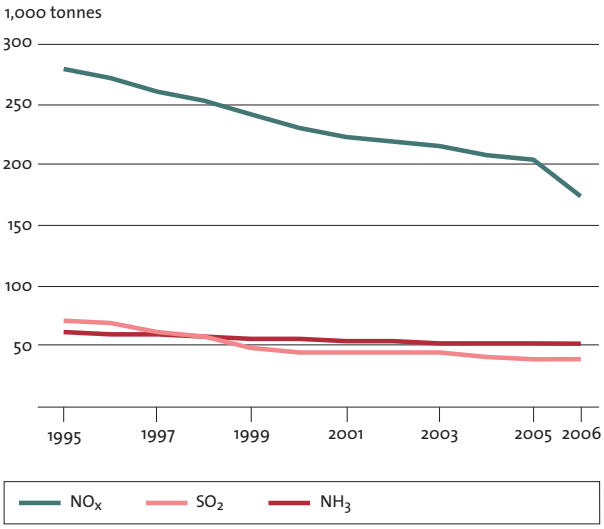
By 2010 emissions of nitrogen oxides to air in Sweden will have been reduced to 148,000 tonnes.

In 2006, nitrogen oxide emissions in Sweden totalled roughly 174,000 tonnes. By 2010, the figure is expected to be around 154,000 tonnes. The interim target of 148,000 tonnes by 2010 is identical to the ceiling laid down in the EU National Emission Ceilings Directive (2001/81/EC). Given both the uncertainty of the projection and the risk of sanctions under the directive, every effort should be made to meet the target by a reasonable margin.

The emission figures shown here differ from earlier presentations and official reporting. This is because new data have emerged on emissions from mobile machinery and equipment. In particular, a breakdown by age category has shown that greater use is made of modern machinery than earlier estimates assumed.

The interim target for nitrogen oxide emissions applies under both *Natural Acidification Only* and the environmental quality objective *Zero Eutrophication*.

FIGURE 5.3.2 Emissions of nitrogen oxides, sulphur dioxide and ammonia to air in Sweden, 1995–2006



SOURCE: SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Emissions of all acidifying substances have fallen in Sweden. Releases of sulphur dioxide have decreased most, by almost half since 1995. Emissions of nitrogen oxides have declined by around a quarter, and those of ammonia by 15%.

5.3.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following wording of the environmental quality objective *Natural Acidification Only*:

The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water. In addition, deposition of acidifying substances must not increase the rate of corrosion of technical materials located in the ground, water main systems, archaeological objects and rock carvings.

▶ **THE COUNCIL PROPOSES** a minor change to one of the Government's specifications of the environmental quality objective on a time scale of one generation:

- In the specification relating to anthropogenic acidification of soil, the word 'counteract' should be replaced with 'reduce'.
- The other specifications should be kept unchanged.

The suggested revised wording of the objective removes the reference to the effects of air pollution on the rate of corrosion of technical materials, cultural artefacts and buildings. This is because such effects are already covered by the environmental quality objective *Clean Air*. The present objective should, on the other hand, encompass effects on the rate of corrosion of objects that are affected by acidification of soil and groundwater. Exposed rock carvings should also be included. The proposed changes are intended purely to avoid double reporting.

The change to the second specification of the objective is prompted by the fact that the chief concern is to reduce acid deposition and other anthropogenic influences. The environmental quality objective cannot be considered to be achieved if such influences have to be counteracted, for example, by means of liming. Measures of that kind can be of value, however, until such time as the objective is attained.

5.3.4 Proposed interim targets

The proposed changes to the interim targets for lakes and streams and for forest soils involve, among other things, a regionalization of the targets, i.e. different targets will apply in different parts of the country.

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

ACIDIFIED FRESH WATERS

By 2015, the proportion of fresh waters acidified as a result of human activities will not exceed 25% in south-west Sweden or 5% in central and south-east Sweden. In northern Sweden, no increase in acidification will occur.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Deposition of acidifying substances will not exceed critical loads for soil and water.	No change.
Measures to counteract anthropogenic acidification of soil will conserve natural productive capacity, archaeological objects and biodiversity.	Measures to *reduce* anthropogenic acidification of soil will conserve natural productive capacity, archaeological objects and biodiversity.
Forestry will be adapted to the susceptibility of each site to acidification, thus preventing the acidification of soil and water due to land use.	No change.

Definition: The interim target is defined in terms of numbers of lakes with an area of more than 1 ha and watercourses with a catchment area larger than 2 km². Limed waters which according to the national environmental quality criteria are classed as affected by acidification will also be considered to be acidified.

The existing interim target for acidification of lakes and streams has already been met. At the same time, significant problems remain at a regional level. This is not made clear with the present wording of the target, which refers to percentages for the country as a whole. Furthermore, the current restriction of the target to lakes larger than 4 ha means that it excludes some 40% of the country's lakes; there are around 35,000 standing waters in Sweden with an area of less than 4 ha but more than 1 ha. With the new environmental monitoring programme, which covers lakes larger than 1 ha, this restriction is no longer justified. It is now possible, moreover, to calculate to what extent limed lakes are affected by acidification, which means that limed acidified lakes can also be included in the target. The new environmental quality criteria introduced in 2007, which are more clearly linked than before to biological effects, have reduced the proportion of lakes classed as acidified. This, too, necessitates a revision of the target, as the percentage in the existing one was set on the basis of the earlier criteria.

The rivers and streams to be monitored are those with a catchment area larger than 2 km^2.

Monitoring and indicators

Regionalization of the interim target requires an expansion of synoptic environmental monitoring, so as to achieve as precise an indicator for each region as for the country as a whole. To track progress at the county level, national monitoring needs to be supplemented with regional surveys.

▶ **THE COUNCIL PROPOSES** a revised interim target:

ACIDIFIED FOREST SOILS

By 2015, the area of forest land in south-west Sweden with high or very high soil acidity will be reduced by 20% compared with 2000. In other acidified areas of Sweden, a continued improvement will be seen.

The current interim target has now been met, and forest soils have begun to recover from acidification. However, trends are not entirely unequivocal for all the relevant parameters, so continued monitoring of the acidification status of forests is necessary. In the longer term, increased harvesting of forest residues could adversely affect the prospects of recovery.

Monitoring and indicators

The revision of the interim target does not require any change to monitoring arrangements.

▶ **THE COUNCIL PROPOSES** a revised interim target:

NITROGEN OXIDE EMISSIONS

By 2015, emissions of nitrogen oxides to air in Sweden will have been reduced to 130,000 tonnes.

The Council proposes a revision of the existing interim target with regard to the target year and the quantity of nitrogen oxides that may be emitted. The new target requires a somewhat larger reduction by 2015, but is in line with a recently revised projection. To meet the objective, releases of nitrogen oxides will need to be reduced both in Sweden and in other countries whose emissions affect Sweden.

The same interim target for nitrogen oxide emissions is proposed under both *Natural Acidification Only* and *Zero Eutrophication*.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

ACIDIFYING EFFECTS OF FORESTRY

By 2015, the acidifying effects of forestry in acidified areas will not exceed levels that are offset by natural processes.

A study has been made of the impacts of forestry on acidification status. It estimates that 30–70% of acidification of forest soils across much of Sweden is attributable to forestry itself, with the largest effects occurring in Norway spruce forests where whole-tree harvesting is practised.

Monitoring and indicators

Progress towards the target should be monitored in terms of the percentage of spruce forest land in acidified areas where net removal of base cations in conjunction with whole-tree harvesting appreciably exceeds weathering down to a depth of 50 cm. The proposed indicator gives a picture of trends in the acidifying effects of forestry. (Net removal is calculated taking into account not only harvesting, but also recycling of wood ash.)

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

EMISSIONS FROM SHIPPING

By 2015, emissions of sulphur dioxide from ships bunkering in Sweden will have been halved and emissions of nitrogen oxides will have decreased compared with 2005.

This interim target covers both domestic and international shipping, which in this context are defined as follows:

- Domestic shipping: ships that travel only between Swedish ports and that have refuelled (bunkered) in Sweden, including fishing and military vessels. The latter categories are not included in international reporting by the Swedish Environmental Protection Agency, e.g. under the Convention on Climate Change.
- International shipping: ships that have bunkered in Sweden and travel to a port outside the country.

Shipping is the biggest single source of deposition of sulphur and nitrogen oxides in Sweden. While emissions from land-based sources are decreasing, those from ships are increasing, owing to growth in that sector. Within the EU, shipping emissions are expected to rise by 45% between 2000 and 2020. The technology to reduce them exists, and the measures required are relatively inexpensive.

The proposed interim target has been worded in such a way as to cover both national and international action.

The main reason for basing the target on fuel sold in Sweden (to domestic and international shipping) is that quality-assured statistics are available on the resultant emissions. These statistics will continue to be updated on an annual basis. Another important reason is that Sweden has some scope to influence ships refuelling in its ports and the emissions to which they give rise, which have effects on air quality and deposition over Swedish land and water areas.

Monitoring and indicators

Progress towards the new target should be monitored by measuring emissions of sulphur dioxide and nitrogen oxides from ships bunkering in Sweden, in total and per unit of fuel sold (expressed as energy content).

It is proposed that the indicator for the target should cover not only sulphur dioxide and nitrogen oxide emissions arising from the quantity of fuel sold, but also provide a measure of emissions that are not dependent on where ships choose to refuel, owing for example to price differences.

5.3.5 How far are we from achieving the environmental quality objective?

The environmental quality objective cannot be met by national action alone, but requires international cooperation. Success in achieving it will depend primarily on how much emissions in the rest of Europe and from international shipping are reduced. The measures and policy instruments proposed are national, with the exception of the target for shipping, which also calls for international measures. The Swedish Environmental Protection Agency's proposed revised strategy for efforts to tackle air pollution at the international level is part of a wider endeavour to focus on the kinds of action that will contribute most to meeting the environmental goals relating to air quality. It is projected that, in 2020, acid deposition will still exceed critical loads for 12% of the lake area, i.e. the 'gap' can be said to be from 12% to 0%.

The most important factors affecting the prospects of achieving *Natural Acidification Only* are:

- Emissions of sulphur and nitrogen in other countries, such as Poland, the UK and Germany. These remain high, and a large proportion of them give rise to deposition in Sweden.
- International and domestic shipping, which still generate very high emissions of acidifying pollutants. In addition, the volume of seaborne transport is expected to increase.
- Consumption of energy in society, as fossil fuels, which produce acidifying emissions, remain the most important energy source.
- Road transport, as there is a danger that improvements in technology will be offset by growth in traffic and greater use of diesel in cars.
- Forestry, which is becoming increasingly intensive, partly as a result of growing demand for biofuels and raw materials for the forest products industry and manufacturing.

5.4 A Non-Toxic Environment

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Non-Toxic Environment* will be very difficult or not possible to achieve by 2020, even if further measures are introduced. Point-source emissions of substances hazardous to human health and the environment have declined, but the volume of production has grown, making diffuse and secondary sources increasingly important. In addition, substances are produced unintentionally. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim targets for data on the health and environmental properties of chemical substances, information on dangerous substances in products, phase-out of substances of very high concern, continuous reduction of the health and environmental risks of chemicals, remediation of contaminated sites (two targets), and cadmium will be very difficult to meet within the time frames laid down for them, even if additional measures are introduced. It believes that the target calling for guideline values for environmental quality can be achieved on time, and that the target for dioxins in food can be met by the target date, provided that further action is taken.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Broaden the specification concerning overall exposure to include exposure via the diet.
- Broaden the specification requiring all fish in Swedish waters to be fit for human consumption to cover substances released by human activities.
- Keep the other specifications unchanged.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Revise the interim target for data on the health and environmental properties of chemical substances and set 2018 as the target year.
- Revise the interim target concerning information on dangerous substances in products and set 2018 as the target year.
- Replace the interim target for the phase-out of substances of very high concern with a revised target for substances of very high concern, with 2015 as the target year.
- Replace the interim target regarding a continuous reduction of the health and environmental risks of chemicals with a revised target on reducing the health and environmental risks of chemicals, with 2018 as the target year.
- Withdraw the interim target concerning guideline values for environmental quality, which has been met before the target year 2010.
- Revise the interim targets for the remediation of contaminated sites and merge them into a single target for the remediation of contaminated sites, with 2015 as the target year.
- Withdraw the interim target for dioxins in food after the target year 2010 and replace it with a new target for unintentionally produced substances, with 2015 as the target year.
- Replace the interim target for cadmium with a revised target relating to dietary and occupational exposure to cadmium, with 2015 as the target year.

5.4.1 Progress towards the environmental quality objective

A NON-TOXIC ENVIRONMENT

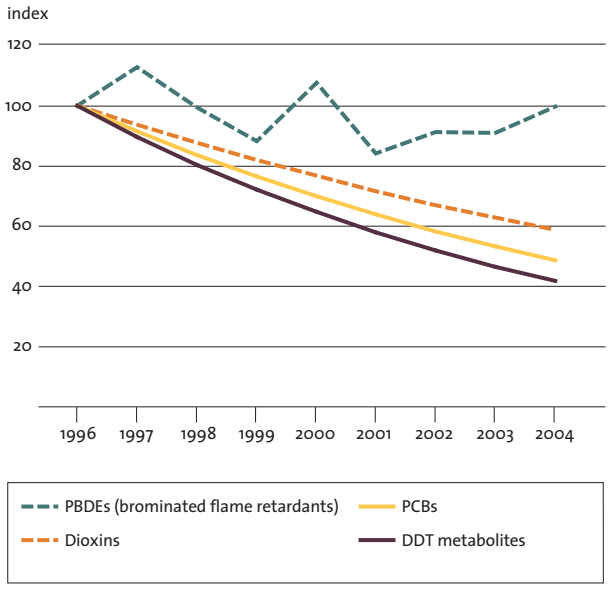
The environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity.

The Environmental Objectives Council's assessment is that it will not be possible to achieve *A Non-Toxic Environment* by 2020. Levels of known toxic pollutants in the environment, such as dioxin-like compounds, mercury and cadmium, will still be a problem by that date. Meanwhile, new problem substances are constantly being identified. Poor understanding of the hazardous properties and environmental occurrence of many chemical substances makes it difficult to assess how far we are from meeting the objective. Trends for different substances in the environment vary, making an unequivocal appraisal of the overall trend in the state of the environment impossible.

According to the Swedish Chemicals Agency's Products Register, there were over 72,000 chemical products in Sweden in 2006, containing some 13,000 different chemical substances. In the mid-1990s, some 160 million tonnes of products of various kinds entered into circulation in the country every year, and there is nothing to suggest that the figure is any lower today. Overall, little is known about how many and what chemical substances these products contain.

Good progress has been made in reducing risks in the workplace, but allergy and other forms of hypersensitivity, for example, remain a major and well-documented work environment problem. Infant exposure to chemicals, at the fetal and neonatal stages, has caused mounting concern in recent years, with growing evidence to suggest a link with permanent developmental changes.

FIGURE 5.4.1 Environmental contaminants in breast milk, 1996–2004



SOURCE: SWEDISH NATIONAL FOOD ADMINISTRATION

This diagram shows how concentrations of environmental contaminants in breast milk from first-time mothers in the Uppsala region have changed, relative to 1996 levels. For dioxins, there has been a downward trend since 1996, and levels of PCBs and DDT have also fallen. In the case of PBDEs, no clear trend can be made out. The decline in concentrations of these persistent organic pollutants in breast milk is slow, despite reductions in both use and emissions. Persistent substances already present in products, buildings and the environment make it very difficult to achieve *A Non-Toxic Environment*.

5.4.2 Progress towards the current interim targets

INTERIM TARGET 1

DATA ON HEALTH AND ENVIRONMENTAL PROPERTIES OF CHEMICAL SUBSTANCES

By 2010 data will be available on the properties of all deliberately manufactured or extracted chemical substances handled on the market. For substances handled in larger volumes and for other substances which, for example after initial general tests, are assessed as being particularly dangerous, information on their properties will be available earlier than 2010. The same information requirements will apply to both new and existing substances.

In addition, by 2020 data will be available on the properties of the most important unintentionally formed and extracted chemical substances.

In the Environmental Objectives Council's judgement, this target cannot be met within the defined

time frame. The new REACH Regulation will achieve significant progress towards it, but for low-volume substances the information requirements laid down in that legislation will not be sufficient. For certain product categories subject to other legislation, too, more stringent information requirements will be needed, e.g. relating to the environmental hazards associated with medicines.

INTERIM TARGET 2

INFORMATION ON DANGEROUS SUBSTANCES IN PRODUCTS

☹ *By 2010 finished products will carry health and environmental information on any dangerous substances they contain.*

The Council's assessment is that this interim target cannot be achieved by the target date. For chemical products there has long been a system of health and environmental information within the EU, but for other products information of this kind on the substances present in them is only required in exceptional cases. The EU's new REACH Regulation introduces a requirement to provide information on any substances of very high concern which products contain. This is an important step, creating a better basis for reaching the target in the longer term.

INTERIM TARGET 3

PHASE-OUT OF SUBSTANCES OF VERY HIGH CONCERN

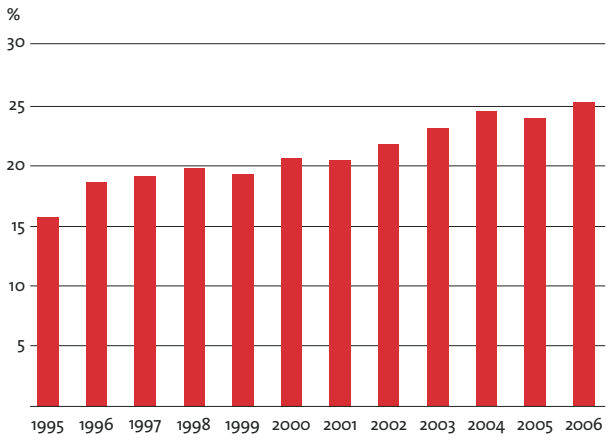
☹ *Regarding the phase-out of substances of very high concern, the following shall apply.*

Newly manufactured finished products will as far as possible be free from:

- *new organic substances that are persistent and bioaccumulating, new substances that are carcinogenic, mutagenic and reprotoxic, and mercury, as soon as possible, but no later than 2007;*
- *other carcinogenic, mutagenic and reprotoxic substances, and endocrine disrupting substances or highly allergenic substances, by 2010, if the products that contain them are intended to be used in such a way that they will enter natural cycles;*
- *other organic substances that are persistent and bioaccumulating, and cadmium and lead, by 2010.*

Nor will these substances be used in production processes unless the company can prove that human health and the environment will not be harmed.

FIGURE 5.4.2 Percentage of consumer-use products containing allergenic substances, 1995–2006



SOURCE: SWEDISH CHEMICALS AGENCY, PRODUCTS REGISTER

The diagram above shows the percentage of chemical products for consumer use that contain known allergenic substances. The proportion has increased somewhat in recent years. To reduce the quantities of such substances in consumer products, a range of measures are needed. Of a total of almost 12,000 chemical products used in Swedish households in 2006, around 3,000 contained one or more allergenic substances.

Already available finished products containing substances with the properties listed above, or mercury, cadmium or lead, will be handled in such a way that the substances in question are not released to the environment.

The spread to Sweden by air or water of substances covered by this interim target will decrease continuously.

This interim target applies to substances that are man-made or extracted from the natural environment. It also applies to substances giving rise to substances with the above properties, including those formed unintentionally.

The Environmental Objectives Council considers that this interim target cannot be met within the time frame laid down for it. REACH introduces a system of time-limited authorizations for substances of very high concern, which largely correspond to the groups of substances referred to in the target. This system will increase pressure on companies to replace such substances with less hazardous alternatives. For other dangerous substances, including those present in imported products, REACH includes a system of

restrictions similar to those in the existing Marketing and Use Directive.

INTERIM TARGET 4

CONTINUOUS REDUCTION OF HEALTH AND ENVIRONMENTAL RISKS OF CHEMICALS

☹ *Health and environmental risks associated with the manufacture and use of chemical substances will be reduced continuously up to 2010, as measured by indicators and ratios to be established by the competent authorities. Over the same period, the occurrence and use of chemical substances which impede recycling of materials will decrease. This target applies to substances not covered by interim target 3.*

The Council judges that this target cannot be met within the defined time frame, a more pessimistic assessment than in *de Facto 2007*. Most known chemical risks are being reduced, but at the same time new substances, technologies and applications are emerging which may involve new opportunities, but also new risks. No clear trends can be made out from existing indicators. For many substances, there is a lack of basic data on their hazardous properties and occurrence in products, as well as on exposure levels in the workplace and the external environment. The EU's REACH legislation is expected to prompt significant risk reduction efforts by a large number of companies.

INTERIM TARGET 5

GUIDELINE VALUES FOR ENVIRONMENTAL QUALITY

☺ *By 2010 guideline values will be established by the competent authorities for at least 100 selected chemical substances not covered by interim target 3.*

This target has been met. Guideline values established by the authorities are in place for more than 100 substances.

REMEDIATION OF CONTAMINATED SITES

INTERIM TARGET 6

☹ *Studies will have been carried out and, where necessary, appropriate action will have been taken by the end of 2010 at all contaminated sites that pose an acute risk on direct exposure, and at contaminated sites that threaten important water sources or valuable natural environments, today or in the near future.*

INTERIM TARGET 7

☹ *Between 2005 and 2010, measures will be implemented at a sufficiently large portion of the prioritized contaminated sites to ensure that the environmental problem as a whole can be solved by 2050 at the latest.*

In the Council's assessment, these targets will not be met by 2010. Temporary measures will have been taken at most of the sites covered by interim target 6, however, and if conditions remain favourable the element of interim target 7 referring to 2050 will be achieved. The main reason why the targets will not be met in their entirety is that remediation is a relatively new and complex interdisciplinary field. It has taken time both to generate the necessary knowledge and to develop organizational arrangements and markets. To reach these targets, the pace of remediation needs to be stepped up, with both government and private funding, and data on contaminated sites need to be improved.

INTERIM TARGET 8

DIOXINS IN FOOD

😐 *By 2010 clear action programmes will have been established to bring about a continuous decrease in levels in food of dioxins harmful to humans.*

The Council believes that this target can be met on time, provided that further action is taken. To be able to identify what additional measures will be effective, more needs to be known about the contributions which different sources make to the dioxin levels found in food. This calls for further research on sources and on the properties of substances produced unintentionally by human activities. In addition, systematic efforts are needed to detect in the environment and characterize hitherto unidentified, unintentionally formed substances of very high concern, in order to limit their further dispersion at as early a stage as possible.

INTERIM TARGET 9

CADMIUM

☹ *By 2015 the dietary and occupational exposure of the population to cadmium will be at a level that is safe from a long-term public health point of view.*

The Council's assessment is that this interim target cannot be met by the target date. Concentrations in food and in arable soils are admittedly expected to

fall, but there is considerable uncertainty about what constitutes a safe level of exposure, and what measures are required to achieve such a level.

5.4.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Non-Toxic Environment*:

The environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Broaden the specification concerning overall exposure to include exposure via the diet.
- Broaden the specification requiring all fish to be fit for human consumption to cover substances released by human activities.
- Keep the other specifications unchanged.

The proposed changes are as follows:

- The specification concerning overall exposure should be broadened to include exposure via the diet. The change is intended to highlight this important pathway for human exposure.
- The specification requiring all fish to be fit for human consumption should be broadened to cover substances released by human activities. In the case of freshwater fish, mercury is a major factor affecting fitness for consumption. Mercury is in fact a naturally occurring substance, but one that has been released more widely into the environment by human activities.

The revisions will require changes in terms of follow-up. Methods are already available that are being used by the National Food Administration both to monitor levels of certain substances in food and to estimate total intake in food. These methods can be developed as follow-up needs change.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Concentrations of naturally occurring substances in the environment will be close to background levels.	No change.
Concentrations of non-naturally occurring substances in the environment will be close to zero and their impacts on ecosystems will be negligible.	No change.
All fish in Swedish seas, lakes and watercourses will be fit for human consumption with respect to their content of non-naturally occurring substances.	All fish in Swedish seas, lakes and watercourses will be fit for human consumption with respect to their content of *substances released by human activities.*
Overall exposure to substances of very high concern in the work environment, the external environment and the indoor environment will be close to zero, while exposure to other chemical substances will not be harmful to human health.	Overall exposure to substances of very high concern in the work environment, the external environment and the indoor environment *and via the diet* will be close to zero, while exposure to other chemical substances will not be harmful to human health.
Contaminated sites will have been investigated and, where necessary, remediated.	No change.

5.4.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

INFORMATION ON HEALTH AND ENVIRONMENTAL PROPERTIES OF CHEMICAL SUBSTANCES

By 2018, sufficient information will be available on the hazardous properties of manufactured, imported and extracted chemical substances with respect to human health and the environment.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- For medicinal products, sufficient information will be available on the environmental hazards they present, based on expected concentrations of the substances concerned in the environment.
- It is particularly important that information is available on chronic toxicity to aquatic organisms and on persistent, bioaccumulative and toxic (PBT) properties.
- Based on expected concentrations of the substances in the environment, sufficient information will be available on the environmental hazards of food additives, particularly in the case of substances that are persistent in the environment.
- For chemical substances manufactured or imported in significant quantities (over 10 tonnes), information will be available on the health and environmental hazards they present, corresponding to the information requirements of REACH. For individual substances, a lower level of information will be acceptable only if it does not adversely affect the possibility of ensuring safe handling.
- For chemical substances manufactured or imported in smaller quantities (1–10 tonnes), information will be available on the health and environmental hazards they present, corresponding to the information requirements for substances that are currently priority low-volume substances under REACH.
- No specific information requirements are defined at present for substances manufactured or imported in quantities of less than 1 tonne.
- When methods become available that are reasonable from an animal welfare and an economic point of view, the interim target should be supplemented to include additional information requirements. Information requirements should then be made more stringent for all substances below 10 tonnes.
- For all substances, regardless of quantity, for which the information available is inadequate in relation to their handling, companies must take this uncertainty about risks into account in their assessment and perform further tests or take additional precautions to prevent damage to human health and the environment.
- Information will be available on the health and environmental hazards of nanosubstances.

Monitoring and indicators

REACH will provide a good basis for developing suitable indicators to monitor the availability and development of information on the health and environmental hazards posed by substances registered under that legislation.

▶ **THE COUNCIL PROPOSES** a revised interim target:

INFORMATION ON DANGEROUS SUBSTANCES IN PRODUCTS

By 2018, anyone using a product will be provided with health and environmental information on any dangerous substances present in it. This information will be available throughout the life cycle of the product.

This interim target applies to all products, both chemical and non-chemical (i.e. what REACH calls 'substances', 'preparations' and 'articles'), and has been revised to include the stipulation that the relevant information must be available throughout a product's life cycle, i.e. including at the waste

stage. The target year 2018 has been chosen with the REACH timetable in mind. Information on different substances cannot be expected to be reasonably complete until then. In that respect, the feasibility of meeting the target has been taken into account. Nonetheless, this target represents a higher level of ambition than may be expected to result from REACH in its present form, since it aims to ensure that information on all products is available to consumers throughout products' life cycles.

For products other than chemical products (i.e. 'articles'), REACH introduces a requirement that information on any substances of very high concern present in them must be made available to professional users. On request, consumers can also obtain this information. The biggest gap between the present state of affairs and the interim target thus exists for products other than chemical products. The measures proposed are therefore primarily designed to close that gap.

Monitoring and indicators

The target will be followed up through supervision of companies, which will include monitoring of their compliance with the information requirements for chemical products. Correspondingly, the Medical Products Agency can track progress in relation to cosmetic and personal hygiene products. The Swedish Environmental Management Council will monitor the development of voluntary environmental product declarations. Follow-up of legislation and regulations requiring information on dangerous substances contained in products, or which should require such information, will remain a crucial element in monitoring progress towards the interim target.

▶ **THE COUNCIL PROPOSES** a revised interim target:

SUBSTANCES OF VERY HIGH CONCERN

1. *Newly manufactured products will as far as possible be free from substances of very high concern.*
2. *By 2015, products containing substances of very high concern will, throughout their life cycle, be handled in such a way that those substances are not released into the environment.*
3. *Emissions from production processes of substances of very high concern will as far as possible be reduced. By 2015, substances of very high concern will not be used in production processes unless the operator can demonstrate that no harm will be caused to human health or the environment.*
4. *The long-range transport to Sweden, by air or water, of substances of very high concern will be continuously reduced.*

This interim target applies to substances that are manufactured, recovered, or extracted from the natural environment.

'Substances of very high concern' means:

- substances that are persistent and bioaccumulative (PB substances),
- substances that are carcinogenic, mutagenic or toxic for reproduction (CMR substances),
- endocrine-disrupting or highly allergenic substances, and
- the heavy metals mercury, cadmium and lead.

As the current interim target is not expected to be met on time, there is no reason to delay changing the target year and the wording. The revised target proposed here identifies, in four points, key dispersion pathways for substances of very high concern, each of which requires a reasonably precise wording if the interim target is to give a clear message to and guide the actions of relevant stakeholders.

The phrase 'as far as possible' in the first point of the target may be understood to mean 'taking into account other goals of society'.

In the second point, an addition is proposed, requiring the entire life cycle of products containing substances of very high concern to be taken into account. This is because substances may be released into the environment beyond the normal life of a product, in conjunction with its disposal or recycling. It is better to talk about a product's life cycle, rather than its handling at the waste stage, as it is often unclear how far that stage extends. Certain types of waste may be turned into new products, and the interim target is also intended to cover that phase.

As for the third point, a broader wording than before is proposed, as production can be undertaken by other operators besides companies.

The fourth point includes the words 'long-range transport', to emphasize that the concern here is with the diffuse release of substances from sources outside Sweden.

Monitoring and indicators

Progress towards the target will be monitored using data from the Swedish Chemicals Agency's Products Register and reports, and with reference to the development of relevant regulations – i.e. in the same way as with the existing target.

▶ **THE COUNCIL PROPOSES** a revised interim target:

REDUCING HEALTH AND ENVIRONMENTAL RISKS OF CHEMICAL SUBSTANCES

The health and environmental risks associated with all handling of chemical substances will be continuously reduced and will by 2018 be so low that no harm will be caused to human health or the environment. Particular account is to be taken of children and sensitive groups.

Over the same period, the use of chemical substances that impede recycling of materials will be reduced, so that recycling is not prevented.

The proposed target date for this interim target is 2018, the year when the information on substances that is needed to achieve it will be available under REACH. The existing wording has been broadened to ensure that no form of handling is excluded. Exposure should be at a level low enough to avoid harm to human health. Measures particularly need to be introduced in contexts involving especially sensitive groups. The risk of harm to health is dependent both on the hazardous properties of substances and on whether people are exposed to those substances. In addition, some groups, such as children and allergy sufferers, are particularly sensitive to certain dangerous substances.

Progress towards the target is already being monitored using parameters other than 'indicators and ratios established by the competent authorities'. Indicators and ratios will remain important in tracking trends regarding chemical risks, but mentioning these particular instruments in the interim target would restrict the options available. At present, it is virtually impossible to provide an overall picture of risk reduction measures across the country. Further efforts to develop ways of following up the target are therefore very important.

Monitoring and indicators

Progress will continue to be monitored by describing how exposure has been reduced in various environments, such as homes, workplaces, schools and urban areas. Particularly sensitive groups will also be followed. Work is under way, for example, to develop better methods to measure exposure to dangerous substances among children.

New indicators are required, and existing ones need to be developed to permit better follow-up of the target.

▶ **THE COUNCIL PROPOSES** a revision and merger of the two existing interim targets for the remediation of contaminated sites:

REMEDIATION OF CONTAMINATED SITES
By 2015, priority contaminated sites will have been remediated to such an extent that the problem will be solved no later than 2050. Collated, clear and quality-assured information on contaminated sites will be generally available no later than 2015.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Identification of priority sites will ensure that contaminated sites posing very high risks to human health or the environment are remediated first. Particular priority will be given to sites which pose acute risks to humans on direct exposure or which, now or in the near future, threaten important water sources or valuable natural environments.
- Generally available information on contaminated sites will ensure that sufficient data on potential and confirmed contaminated sites are available and capable of being utilized to avoid sites being used in ways that cause harm to human health or the environment.

It is neither appropriate nor possible at present to set a direct, measurable quality target for contaminated sites. Investigations and remedial action will be focused on the sites judged to represent the greatest risks to human health and the environment. As far as possible, such sites will be dealt with first. The reason why high priority should continue to be given to sites posing acute risks is that new sites of this kind could emerge during the period covered by the target, owing to changing criteria or new data. Within a short space of time, such sites can cause significant and irreparable damage to assets of great value. It is therefore important to give them priority wherever possible, in both privately and publicly funded contexts. This is also in line with the ordinance on state funding in this area.

To achieve the interim target, all sites posing very high risks to health or the environment must be remediated by 2050. This distant target date can be justified by the large number of sites, the volume of data involved, and the fact that the ongoing inventory of sites, on its present scale, is not expected to be completed until 2013. Considerable effort will be needed to collate and assure the quality of all the data at the national level, adapt them to national and international standards, and ensure that they are utilized to avoid sites being used in ways that could harm health or the environment.

Collated, clear and quality-assured information on sites identified as potentially or actually contaminated needs to be generally available no later than 2015. A sentence to this effect is therefore included in the proposed target. The aim is to avoid contaminated sites being used, now or in the future, in ways that give rise to risks. Information is needed, for example, as a basis for planning and to define priority measures under other environmental quality objectives. The suggested target is also in line with the proposal for an EU Soil Framework Directive.

Monitoring and indicators

Monitoring could possibly be linked to the Real Property Register.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

UNINTENTIONALLY PRODUCED SUBSTANCES
By 2015, information will be available on the formation, sources, emissions and dispersion of the most important unintentionally produced substances. By the same date, studies will have been made of the environmental and health properties of the substances in question. Releases to the environment of these unintentionally produced substances will be continuously reduced.

For several groups of substances that are formed unintentionally, there is a clear lack of data. Areas requiring particular attention include the identification and quantification of unintentionally produced persistent organic pollutants. As a basis for longer-

term risk assessments, we need a better understanding of how natural processes affect the transport and distribution of these substances in the environment. For the target to be workable in practice, the expression 'the most important unintentionally produced substances' needs to be fleshed out by developing criteria for determining priorities, based on the Swedish Environmental Protection Agency's report on the health and environmental properties of such substances (Report 5736, in Swedish). This will require access to the results of research that may be initiated for this purpose.

Monitoring and indicators

Follow-up of the target will involve both identification of 'the most important unintentionally produced substances' and quantitative assessments of the environmental and health risks associated with the formation and release of these substances.

▶ **THE COUNCIL PROPOSES** a revised interim target:

DIETARY AND OCCUPATIONAL EXPOSURE TO CADMIUM

By 2015, the dietary and occupational exposure of the population to cadmium will be at a level at which the entire population is protected, with particular account taken of sensitive groups.

The current interim target was adopted by the Riksdag following a motion which, among other things, described cadmium in agricultural produce as a potentially serious public health problem. The phrase 'safe from a long-term public health point of view' in the existing target is difficult to interpret, and the Environmental Objectives Council therefore proposes that it be reworded. It is uncertain, though, whether the target can realistically be expected to be met by 2015, even if vigorous measures are introduced.

Monitoring and indicators

Follow-up of the target will focus on recorded concentrations and on releases of cadmium into the environment. Suitable indicators are needed to ensure that exposure levels do not pose a risk to the health of sensitive groups.

5.4.5 How far are we from achieving the environmental quality objective?

The Council's ambition has been to propose measures to achieve *A Non-Toxic Environment* and to fill an identified gap. It is difficult to predict, though, whether the measures put forward will in fact close that gap. The processes that need to take place within the EU and internationally for the objective to be reached are difficult to speed up and, on the whole, national action can be no substitute for them. There are too many uncertainties at present for the remaining gap to attaining the objective to be quantifiable as a percentage or a period of time.

The most important factors affecting the prospects of achieving *A Non-Toxic Environment* are:

- Growing demand for chemical products and globalization of production and trade, resulting in wider distribution of chemicals and of products containing dangerous substances.
- Preventive regulation of chemicals, to avoid damage before it occurs.
- More stringent legislation and implementation of new regulations, which are important elements in preventive action.
- More effective supervision, to ensure good compliance with regulations.
- Swedish efforts to promote global action on chemicals, given that measures in other countries will affect Sweden's prospects of attaining *A Non-Toxic Environment*.
- Swedish and international research of a high standard, as a basis for assessing the scale of different health and environmental risks associated with chemicals.
- Reduced use of dangerous substances in products, in order to limit their spread.
- The pace of remediation of contaminated sites.
- Industry's own efforts in the area of substitution and product development.

5.5 A Protective Ozone Layer

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Protective Ozone Layer* can be achieved by 2020, provided that successful implementation of the Montreal Protocol continues. Sweden's phase-out of ozone-depleting substances is progressing according to plan, but such substances are still to be found in some products. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim target for emissions of ozone-depleting substances can be achieved within the time frame laid down for it.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation. However, it does propose that attainment of the objective should be interpreted on the basis of the same definition as is used in the assessment undertaken under the Montreal Protocol, and that the objective should be considered to be achieved when a turnaround in depletion of the ozone layer has been reached.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Retain the interim target for emissions of ozone-depleting substances unchanged until the target year 2010, after which it should be withdrawn. Interpretation of the target should, however, be clarified by defining 1990 as the base year.
- No new interim target is proposed. The assessment is that effective progress can be made towards the environmental quality objective without such a target.

5.5.1 Progress towards the environmental quality objective

A PROTECTIVE OZONE LAYER

The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.

The Environmental Objectives Council's assessment is that this environmental quality objective will be achieved by 2020. This is a revised assessment compared with *de Facto 2007*.

The Montreal Protocol has had an impact on concentrations of ozone-depleting substances in the atmosphere. The degree of ozone depletion remained constant over the period 2002–5, suggesting that ozone levels are no longer declining. One indication that a positive trend really is under way is that this state of affairs can be linked to a simultaneous decrease in abundances of ozone-depleting gases in the upper atmosphere. Total ozone is still 3.5% lower than before ozone-depleting substances began to be released into the atmosphere. Projections suggest that it will be possible to observe a turnaround in ozone depletion around 2020. In other words, by then the thickness of the ozone layer will have passed its minimum level, and the layer can subsequently be expected to begin to recover. According to the projections, full recovery can be achieved at some point beyond 2050. These conclusions assume, however, that successful implementation of the Montreal Protocol will continue.

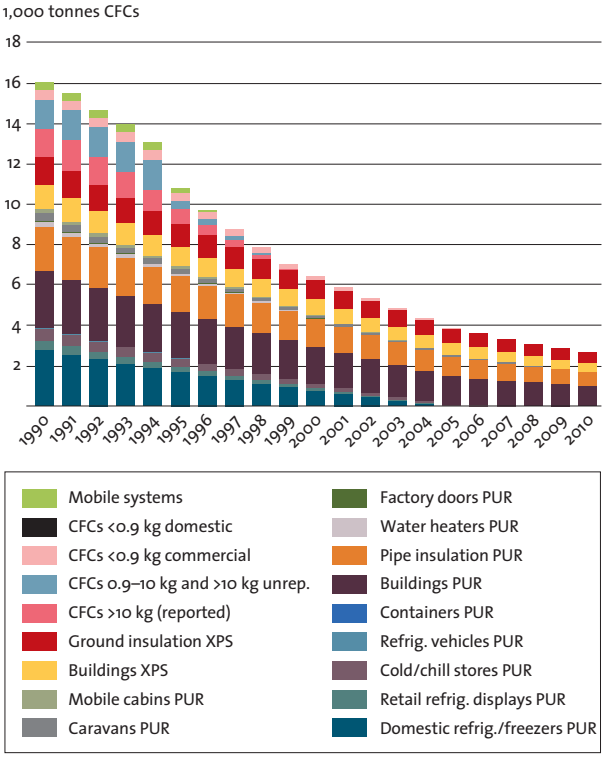
5.5.2 Progress towards the current interim target

EMISSIONS OF OZONE-DEPLETING SUBSTANCES

By 2010 the great majority of emissions of ozone-depleting substances will have ceased.

The Council judges that this interim target will be met by 2010. According to estimates, Swedish emissions of ozone-depleting substances decreased very substantially between 1990 and 2006, and the target is therefore expected to be achieved by the 2010

FIGURE 5.5.1 Estimated bank of CFCs held in different products in Sweden, 1990–2010



SOURCE: ECOMANAGEMENT SE

The largest source of CFC emissions in Sweden is leakage from products of various kinds (chiefly insulation materials) that still contain CFCs.

CFCs = chlorofluorocarbons

XPS = extruded polystyrene foam

PUR = polyurethane foam

XPS in legend captions means products etc. with insulation consisting of XPS.

PUR in captions means products etc. with insulation consisting of PUR.

CFCs <0.9 kg domestic – private use of CFCs as refrigerants. Linked to exemption from ban on CFC use for small factory-built units.

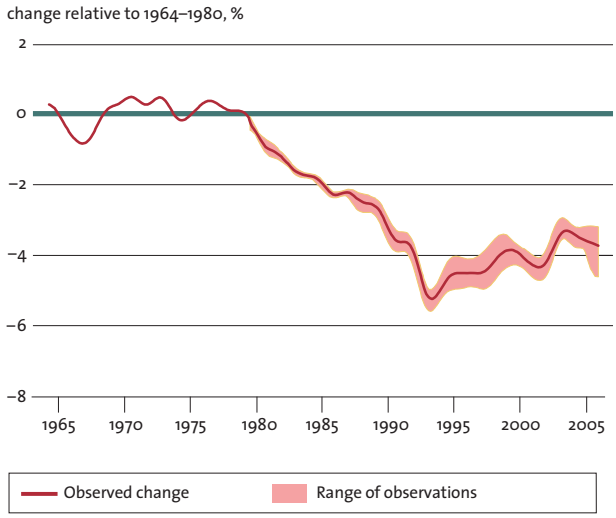
CFCs <0.9 kg commercial – commercial use of CFCs as refrigerants. Linked to exemption from ban on CFC use for small factory-built units.

CFCs 0.9–10 kg and >10 kg unrep. – estimated use of CFCs in factory-built units not subject to reporting requirement (0.9–10 kg) and estimated use not reported as required.

CFCs >10 kg (reported) – use of CFCs as refrigerants in systems with a charge of over 10 kg (usually commercial). Linked to reporting requirement set out in Refrigerants Order.

Mobile systems – small factory-built units containing CFCs in cars and other vehicles.

FIGURE 5.5.2 Changes in global ozone abundance 1964–2006, relative to the average before the ozone layer was significantly affected by human activities



Note: The average before the ozone layer was significantly affected by human activities is based on the period 1964–80.

SOURCE: UNITED NATIONS ENVIRONMENT PROGRAMME

A tendency towards an initial slowing of ozone decline can be noted. According to projections, a significant turnaround is expected around 2020. Full recovery of the ozone layer may not occur until after 2050.

deadline. However, this assessment presupposes that proposed measures relating to hazardous waste (demolition plans and permits) are implemented. The largest remaining quantities of ozone-depleting substances in Sweden include those to be found in insulation materials, which in certain cases have a lifetime extending beyond the horizon of the environmental quality objective. If these remaining amounts are recovered in an environmentally safe way when the products concerned reach the end of their life and become waste, there is a good chance that they will not give rise to emissions in the future.

Since ozone-depleting substances are not to be phased out altogether until 2020, some use may occur even after 2010, with the potential to produce emissions. The great majority of releases occur only when products are scrapped – not when they are used. To avoid difficulty in assessing progress towards this target, it is proposed that 'emissions' in this context should continue to be limited to emissions arising from end-of-life products containing ozone-depleting substances.

5.5.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Protective Ozone Layer*:

The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.

▶ **THE COUNCIL PROPOSES** no change to the specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL PROPOSES** that attainment of the environmental quality objective should be interpreted on the basis of the same definition as is used in the assessment undertaken under the Montreal Protocol, which means that the objective should be considered to be achieved when a turnaround in depletion of the ozone layer has been reached.

No change to the wording of the objective is proposed. Ongoing protection against dangerous levels of ultraviolet radiation will be ensured by means of legal and economic instruments that will apply for at least a generation. In practice, the environmental quality objective implies that the anthropogenic influence on the ozone layer must be small in relation to natural processes. That in turn means that, in the long term, concentrations of ozone-depleting substances in the stratosphere must not exceed natural levels.

Achievement of the objective should be interpreted on the basis of the definition used in the scientific assessment undertaken under the Montreal Protocol. In that context, three stages in the recovery of the ozone layer are described:

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Sweden will work to ensure that concentrations of chlorine, bromine and other ozone-depleting substances in the stratosphere do not exceed natural levels.	No change.
The use of ozone-depleting substances in Sweden will be phased out within one generation.	No change.

Stage 1 – An initial slowing of ozone decline, identified as the occurrence of a statistically significant reduction in the rate of decline in ozone. The reduction must be due to changes in levels of equivalent effective stratospheric chlorine (EESC).

Stage 2 – The onset of ozone increases ('turnaround'), identified as the occurrence of statistically significant increases in ozone above previous minimum values. The increases must be due solely to declining EESC.

Stage 3 – Full recovery of ozone, identified as when the ozone layer is no longer significantly affected by ozone-depleting substances. In the absence of changes in the sensitivity of the ozone layer to such substances, this is likely to occur when EESC returns to pre-1980 levels.

The first two stages have either already been reached or are expected to be reached within the next two decades. The third and final stage will be reached in the longer term (around mid-century). For the environmental quality objective to be judged to be achieved, the recovery process must have progressed beyond stage 2.

According to the first specification of the objective, Sweden is to work to ensure a return of atmospheric concentrations of ozone-depleting substances, i.e. the ozone-depleting capacity of the atmosphere, to natural levels. Ozone-depleting capacity is often described in terms of the amount of equivalent chlorine in the atmosphere. 'Natural levels' are defined on the basis of conditions in 1980, a reference year that is also used internationally.

No ozone-depleting substances are produced in Sweden, but these substances have been used in a range of applications. The phase-out process has therefore been focused on their use in manufacturing (e.g. of foam plastics), in newly installed equipment and in the recharging of existing equipment, and on their continued use as refrigerants in existing equipment. The use of ozone-depleting substances is to be phased out altogether in Sweden within one generation. This has been taken to mean that, in the long term, their use is also to be phased out in existing equipment and in sectors that are currently exempt, e.g. defence and civil aviation. Where there are no alternatives that are acceptable from a safety point of view, exemptions may be permitted.

5.5.4 Proposed interim target

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** that the interim target for emissions of ozone-depleting substances should be retained unchanged until the target year 2010, after which it should be withdrawn:

EMISSIONS OF OZONE-DEPLETING SUBSTANCES
By 2010 the great majority of emissions of ozone-depleting substances will have ceased.

Interpretation of the target should be clarified by defining 1990 as the base year.

No new interim target is proposed.

The Council proposes that the interim target for emissions of ozone-depleting substances should be retained unchanged until the target year 2010, after which it should be withdrawn. In earlier evaluations

of progress towards this target, no clear base year has been defined. To facilitate follow-up of the target, the Council proposes that 1990 be set as the base year.

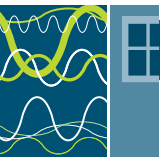
Effective progress towards the environmental quality objective *A Protective Ozone Layer* can be achieved without an interim target. The forecast for the objective is good, and provided that implementation of the Montreal Protocol continues, the ozone layer will begin to recover. The combined abundance of ozone-depleting gases in the atmosphere is declining. The phase-out of ozone-depleting substances in Sweden is expected to be completed by 2020, provided that there is full compliance with existing legislation and a ban on the use of HCFCs is introduced. However, it is important to continue to review progress in future evaluations, to ensure that any changes that are of significance for the assessment are not overlooked. It is also important to monitor compliance with legislation. Swedish efforts under the Montreal Protocol should remain a priority, to ensure continued good progress towards the environmental quality objective.

5.5.5 How far are we from achieving the environmental quality objective?

According to the projections made, the environmental quality objective *A Protective Ozone Layer* will be attained by 2020. In other words, there is no 'gap' to achieving it.

The most important factors affecting the prospects of attaining the objective are:

- The Montreal Protocol: scientists and decision-makers are agreed that levels of ozone-depleting substances in the atmosphere need to be reduced.
- An effective combination of economic and legal instruments, supported by information initiatives.
- Technical solutions for the recovery of ozone-depleting substances and the development of alternatives.
- An international decision to accelerate the phase-out of HCFCs, reached under the Montreal Protocol in September 2007.



5.6 A Safe Radiation Environment

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Safe Radiation Environment* can be achieved by 2020 if further action is taken. Emissions of radioactive substances are limited, but it is difficult to change human behaviour in such a way as to reduce the incidence of skin cancer. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim target for radioactive substances can be met within the defined time frame if additional measures are taken; that the interim target for skin cancer will be very hard to meet within the time frame even if further action is taken; and that the interim target for electromagnetic fields (EMFs) has been achieved.

▶ **THE COUNCIL PROPOSES** a revised environmental quality objective, extended to cover all environments where people may be exposed to radiation that can have harmful effects (excluding radon and medical radiation).

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Revise the specification on radiation doses to cover the work environment and the indoor environment as well.
- Modify the specifications on effective radiation doses and the effects of ultraviolet (UV) radiation.
- Revise the specification on preventing incidents to cover all activities that involve ionizing radiation.
- Revise the specification on the risks of electromagnetic fields to cover exposure as well.
- Introduce a specification on the effects of ionizing radiation on plants and animals.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Withdraw the interim target for radioactive substances after the target year 2010 and replace it with a new interim target for disposal of radioactive waste, with 2020 as the target year.
- Retain the interim target for skin cancer unchanged, with 2020 as the target year.
- Replace the interim target for electromagnetic fields with a revised interim target for exposure to electromagnetic fields, with 2020 as the target year.

5.6.1 Progress towards the environmental quality objective

A SAFE RADIATION ENVIRONMENT

Human health and biological diversity must be protected against the harmful effects of radiation in the external environment.

The Environmental Objectives Council judges that the environmental quality objective *A Safe Radiation Environment* can be met within the defined time frame if further measures are undertaken. No clear trend in the state of the environment is discernible. As for the interim target for reduced emissions of radioactive substances, the trend is considered positive. Radiation doses to the public from individual activities are considered negligible. However, a series of key issues remain to be dealt with before the problem of how to dispose of all radioactive waste can be regarded as resolved in the long term.

For the interim target for monitoring of the risks associated with electromagnetic fields (EMFs), too, the trend is found positive. Sweden aims to be at the leading edge of electronic communication. Accordingly, exposure to EMFs in our surroundings may increase. But this exposure may also decrease as a result of improved technology. For the interim target for curbing the increase in the incidence of skin cancer, however, the outlook is less positive. The number of cases is continuing to rise and this interim target is deemed to be very difficult to reach. This is mainly because it takes time to change attitudes and behaviour, and for such changes to feed through into fewer cancer cases.

Environmental monitoring programmes are being established and various surveys have been conducted. Environmental monitoring, research on the health effects of radiation, work to change people's attitudes towards sunbathing, and supervision remain vital measures.

5.6.2 Progress towards the current interim targets

INTERIM TARGET 1

RADIOACTIVE SUBSTANCES

By 2010 environmental concentrations of radioactive substances emitted from all human activities will be so low as not to represent a threat to human health or biological diversity. The additional individual dose to members of the public will be lower than 0.01 mSv per person per year from each individual operation.

Work on this interim target is proceeding in the right direction, and the target should be within reach. The interim target comprises several components: emissions of radioactive substances from activities; development of a solution for final disposal of radioactive waste; and prevention and reduction of the risks of radiological incidents. Radiation doses to the public from emissions of radioactive substances are judged to be negligible. The focus should now be on developing methods and systems for disposing of all types of radioactive waste. In terms of operating emissions from activities and risk prevention, the target may be considered to be fulfilled or in the process of being fulfilled.

Action has been taken to reduce emissions of radioactive substances from activities, for example by means of new regulations. Environmental monitoring and a survey carried out by the Swedish Radiation Protection Authority (SSI) have provided a better picture of the status of the radiation environment.

The Environmental Objectives Council points to the importance of continuing to develop our radiation protection capability in certain vulnerable areas. The safety level in Sweden's 'near abroad' is judged to have risen over the past decade. Efforts to establish long-term international cooperation to prevent the risk of accidents beyond Sweden's borders are continuing.

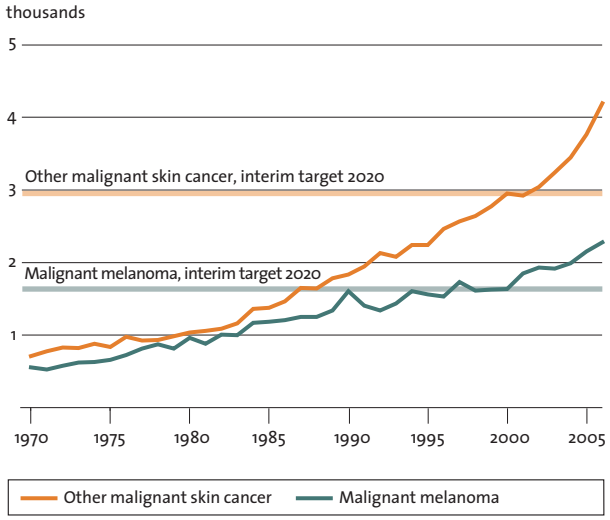
INTERIM TARGET 2

SKIN CANCER

By 2020 the annual incidence of skin cancer caused by ultraviolet radiation will not be greater than it was in 2000.

The incidence of skin cancer is still increasing, and this interim target is judged to be very difficult to

FIGURE 5.6.1. Number of new cases of malignant skin cancer, 1970–2006



SOURCE: SWEDISH NATIONAL BOARD OF HEALTH AND WELFARE, STATISTICAL DATABASES

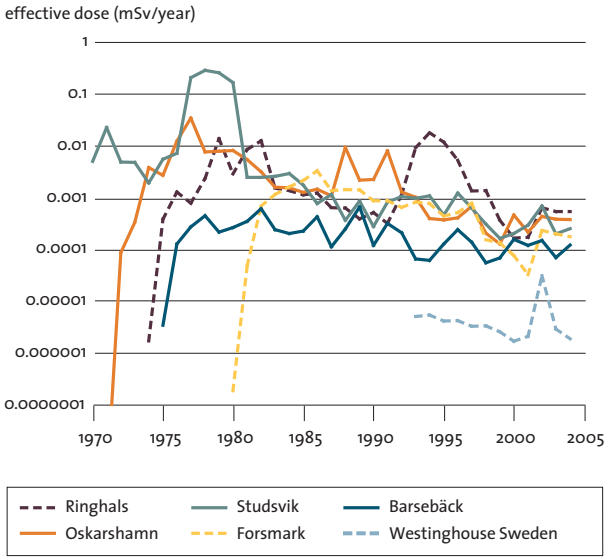
The number of new cases of skin cancer in Sweden continues to rise. The main difficulty in reversing this trend is that it takes time to change attitudes and sunbathing habits. In addition, it takes decades before the impact of behavioural changes is reflected in cancer statistics, since the latency period for skin cancer is long. Besides the forms of skin cancer shown in the diagram, some 37,000 cases a year of the milder form, basal cell carcinoma, are detected.

achieve within the time frame. The main difficulty is that it takes time to change attitudes and behaviour. No trend reversal in figures for skin cancer can yet be observed, and this is probably due to the long latency period of the disease.

In preventive work, the priority target group is children and adults in proximity to children. It is important to create environmental conditions that permit a reduction of children's exposure to UV radiation. Playgrounds and school yards, for example, should be designed so as to afford access to shade.

Results from SSI's annual questionnaire survey show that the population is well informed about UV radiation and its association with skin cancer. However, this knowledge does not automatically lead to a change in behaviour. Over the past few years, grants for publicity, survey and research initiatives in this field have been increased. Prospects of reducing the future incidence of skin cancer have thus improved.

FIGURE 5.6.2. Emissions from nuclear installations, 1970–2004



SOURCE: SWEDISH RADIATION PROTECTION AUTHORITY

Radiation doses are now far below the limit value for the maximum permitted dose to members of the public, which is 0.1 mSv per year, and the figure (0.01 mSv per year) cited in the interim target for radioactive substances. In general, these doses have decreased over the past 20 years. The reason why the figures for Westinghouse Sweden are lower than those for the other installations is that it is a nuclear-fuel factory, i.e. a different type of nuclear installation. Accordingly, other radioactive substances are emitted, and these result in a lower effective radiation dose.

INTERIM TARGET 3

ELECTROMAGNETIC FIELDS

Risks associated with electromagnetic fields will be studied on an ongoing basis and necessary action will be taken as any such risks are identified.

The Environmental Objectives Council judges that this interim target has been achieved. SSI continuously surveys the risks associated with electromagnetic fields (EMFs), especially through its Independent Expert Group on Electromagnetic Fields, which issues an annual update on the state of knowledge in this area. SSI also takes the requisite measures if new risks are identified. Since new applications for EMFs are emerging at a rapid rate, it is imperative to retain an interim target dealing with EMF issues. New applications may either boost exposure, owing to the

rising number of applications, or reduce it by means of new, improved technology.

For two areas of application there are, at present, certain scientifically based suspicions that long-term, low-level exposure can cause harmful health effects. These areas are, first, magnetic fields from power lines and other electrical installations and, second, long-term use of mobile telephones. SSI recommends exercising some caution in these cases. Regarding electricity allergy, in SSI's view this is not a matter of radiation protection but a medical problem – and a social problem of significant proportions. It is vital for its causes to be studied and the victims to receive support and care.

5.6.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following wording of the environmental quality objective A Safe Radiation Environment:

Human health and biological diversity must be protected against the harmful effects of radiation.

▶ **THE COUNCIL MAKES** the following proposals regarding the specifications of the environmental quality objective on a time scale of one generation:

- Revise the specification on radiation doses to cover the work environment and the indoor environment as well.
- Modify the specifications on effective radiation doses and the effects of UV radiation.
- Revise the specification on preventing incidents to cover all activities that involve ionizing radiation.
- Revise the specification on the risks of electromagnetic fields to cover exposure as well.
- Introduce a specification on the effects of ionizing radiation on plants and animals.

In its current wording, *A Safe Radiation Environment* refers only to protection against radiation in the external environment. In the Environmental Objectives Council's view, however, radiation protection must be seen as a whole, including all environments where people may be exposed to radiation with potentially harmful effects. This applies to all types of radiation that are covered by *A Safe Radiation Environment*, i.e. ionizing radiation, UV radiation and EMFs. Radon issues will still be dealt with under the objective *A Good Built Environment*.

The presence of people with expertise in radiation protection at workplaces where radiation sources are used is a precondition for good protection. Many activities may result in human exposure to radiation, although the radiation as such has no bearing on the activity but is, rather, its unintended consequence.

Measures relating to the work environment may boost radiation in the external environment, and action to protect the external environment may involve elevated exposure in the work environment. One example of the latter is the disposal of radioactive fire alarms after their service life has ended: nowadays, these are collected to prevent radioactive substances from entering the environment. It is important for activities to be regarded in a life-cycle perspective, so that the activity concerned is not the only factor to govern the selection of priority measures.

For the above reasons, the Environmental Objectives Council thus proposes that the objective should be extended to include radiation in the indoor environment and the work environment (but not radon).

Radiation protection of patients should, the Council proposes, remain excluded from the scope of this objective. This kind of protection is covered by both the Euratom Radiation Protection Directive and the Swedish Radiation Protection Act.

The proposed broadening of the environmental quality objective means that the criteria for fulfilment of this objective need to be clarified and expanded.

The first specification pinpoints the fact that good radiation protection must take place on a comprehensive basis, with the inclusion of every environment that may expose people to radiation with potentially harmful effects. In practice this means, first, that the benefits of an activity involving radiation will be weighed against the risks to which its surroundings

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Radiation doses will be limited as far as reasonably possible.	*In the work environment and the indoor environment, as well as the external environment, individuals' exposure to harmful radiation* will be limited as far as reasonably possible.
The maximum annual effective radiation dose due to human activities involving radiation to which individual members of the public may be exposed will not exceed 1 millisievert (mSv) per person in the course of one year.	The maximum ~~annual~~ effective radiation dose due to human activities involving radiation to which individual members of the public may be exposed will not exceed 1 millisievert (mSv) per person *per year.*
	Effects of ionizing radiation on plants and animals will have been assessed in accordance with scientifically based methods and, if necessary, reduced.
Serious incidents and accidents in nuclear installations will be prevented. The release of radioactive substances into the environment will be prevented or limited where accidents nevertheless occur.	Serious incidents and accidents in nuclear installations *or in other activities involving ionizing radiation* will be prevented. *If an incident or accident should nonetheless occur, action will be taken to limit the consequences.*
The effects of UV radiation will be limited as far as possible.	*The harmful effects of UV radiation will be prevented.*
Any risks associated with electromagnetic fields will be identified as far as possible, and necessary measures will be taken as potential risks are identified.	The risks of *and exposure to* electromagnetic fields (EMFs) will be identified ~~as far as possible~~, and necessary measures will be taken as ~~potential~~ risks are identified.

are exposed and, second, that limit or similar values will be applied to radiation doses. Licensing under the Radiation Protection Act involves examining whether an activity may be regarded as justified and optimized, i.e. adjusted in such a way as to minimize radiation doses as far as is reasonably feasible, taking economic, social and environmental factors into account, while the desired outcome is attained.

The second specification makes a direct connection between the environmental objective and the dose limit for members of the public that is specified in SSI's regulations and taken into consideration for licensing purposes.

The third specification is proposed in view of such factors as the assessment in Government Bill 2004/05:150 that it is important to ensure protection of plant and animal life against the harmful effects of radiation from radioactive substances. Dose rates need to be estimated before effects can be assessed and degrees of compliance with environmental protection requirements ascertained.

The fourth specification incorporates the tightened requirements applying to Sweden's capability for radiation protection and crisis management. Preventive efforts to avoid accidents or incidents should cover not only nuclear but also other types of activity, such as transport of radioactive material. Criminal handling of radioactive substances or other radiation sources is included. Incidents are to be prevented as far as reasonably possible, taking economic, social and environmental factors into account. If an untoward event nonetheless occurs, its harmful effects must be restricted, as must any release of radioactive substances into the environment.

The fifth specification focuses on preventing the harmful effects of UV radiation as far as reasonably possible, taking economic, social and environmental factors into account. It is, for example, important to enhance people's awareness of the harmful effects of UV radiation and to modify the environment to enable individuals to reduce their exposure to such radiation.

The sixth specification means that risks associated with EMFs must be detected with a view to their maximum reduction, taking economic, social and environmental factors into account.

5.6.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the introduction of a new interim target:

DISPOSAL OF RADIOACTIVE WASTE
By 2020, systems for safe disposal of all radioactive waste will be in place.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Decisions will have been made, under a national waste plan, on methods of dealing with all radioactive waste; these will include decisions on how disposal of spent nuclear fuel is to take place.
- Long-term responsibility for management and final disposal of all types of radioactive waste will be determined.
- A solution will have been found to the problem of long-term preservation of information about final disposal facilities (repositories) for long-lived radioactive waste, including their location and contents.
- Historical and orphan radioactive waste will have been disposed of.

The portions of the current interim target relating to emissions from activities and also capability for limiting the effects of possible accidents may be judged to be fulfilled. What remains is the disposal of all radioactive waste, and this is regarded as the top priority for radiation from radioactive substances. (Emissions are excluded from this aspect despite being included in, for example, the International Atomic Energy Agency's definition of radioactive waste.)

Disposal must be safe and it must comply with the requirements and criteria expressed in SSI's regulations and elsewhere. These clarify the impact final disposal may be allowed to have on the natural environment. The level of environmental quality specified by the wording of the environmental quality objective, i.e. that human health and biodiversity must be protected against harmful effects of radiation, applies to this interim target as well.

Monitoring and indicators

Monitoring of progress regarding waste that is not long-lived can be established when the proposed public inquiry is completed and the national waste plan is ready, since these will determine the strategies, targets and time schedules adopted. Management of long-lived nuclear waste will be monitored within the framework of the research, development and demonstration programme of the Swedish Nuclear Fuel and Waste Management Company (SKB) and the application procedure for containment and final disposal facilities. The Government or the agency proposed by the Government should, within the framework of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, work to set up an international archive for long-term preservation of knowledge. The proposal means that the new Swedish Radiation Safety Authority should work for this kind of focus in connection with the forthcoming review meeting of the Convention in 2009.

▶ **THE COUNCIL PROPOSES** an unchanged interim target:

INCIDENCE OF SKIN CANCER
By 2020 the annual incidence of skin cancer caused by ultraviolet radiation will not be greater than it was in 2000.

The trend for skin cancer due to exposure to UV radiation exhibits no reversal: on the contrary, the incidence of this disease continues to rise. The Council sees no reason to revise this interim target.

▶ **THE COUNCIL PROPOSES** a revised interim target:

EXPOSURE TO ELECTROMAGNETIC FIELDS
By 2020, exposure to electromagnetic fields in workplaces and other environments will be so low that human health and the environment will remain protected.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **There will be a programme of continuous environmental monitoring of exposure to EMFs among the public and employees, with regularly issued reports. These reports will cover exposure among the public and employees in various environments and for various applications, for fields ranging from 0 Hz to 300 GHz.**
- **There will be a programme of continuous and effective supervision of activities entailing risks of harmful exposure to EMFs.**
- **Risk assessments, based on the overall scientific state of knowledge of environmental medicine and of exposure levels, will exist for various EMF applications. These assessments will be updated annually.**
- **All the local and regional supervisory agencies concerned will possess relevant knowledge of EMFs.**
- **A plan for communication of information about risks to the public will have been drawn up by the agencies concerned, in cooperation with operators.**
- **The county councils and primary care services will be kept informed about the state of knowledge and a common view will prevail on the kind of care that should be provided for people suffering from, or worried about, damage to their health.**

One aspect of the revised interim target is that it includes a target year. The Environmental Objectives Council judges that the current target has been fulfilled, since the risks have been continuously studied and the requisite measures taken when risks have been identified. The need for an interim target for electromagnetic fields (EMFs) remains, however, not least because of the rapid development and spread of new applications involving EMFs. The proposed target involves a time frame and points to a continuous reduction of human and environmental exposure. In view of what is, in some cases, high EMF exposure at the workplace, the target includes the work environment.

Monitoring and indicators

SSI is currently devising an environmental monitoring programme for EMFs, primarily with a view to tracking human and environmental exposure trends over time. Data on exposure to radio-frequency fields, including wireless broadband and mobile-telephony masts, were compiled during 2007. The wording of the interim target for EMFs makes it difficult to monitor progress towards its achievement using indicators. Accordingly, no indicators are specified.

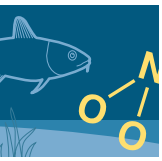
5.6.5 How far are we from achieving the environmental quality objective?

It is hard to judge what remains to be done for this objective to be achieved. In some areas, knowledge of effects and risks is deficient. This applies, for example, to radiation protection for plant and animal life. In some areas, too, development work is still under way; one example is the issue of how final disposal of radioactive waste should take place.

Today, it cannot be stated with certainty that the natural environment is protected, this being a requirement for *A Safe Radiation Environment* to be judged to be fulfilled. Nor can it be said that the action proposal involving assessment of the effects of radiation on plants and animals suffices for fulfilment of the objective. This action is expected to show whether any activities entail risks of harmful effects on the natural environment, which may mean that new measures will become necessary in the future.

The key factors affecting the prospects of achieving *A Safe Radiation Environment* are:

- Society's dependence on electricity, since roughly half of the electricity used in Sweden is generated by means of nuclear power, and electricity dependence may therefore cause radioactive substances to be emitted and spread.
- Threats of terrorism and nuclear warfare, since the world situation is not stable.
- Activities involving radiation, since radioactive substances figure largely in energy production, healthcare, industry and research.
- National capability for radiation protection, since if, for example, a nuclear accident were to occur the effects could be catastrophic.
- Radioactive waste, since the disposal issue is not yet resolved.
- Exposure to UV radiation, since changing human behaviour is very difficult.
- Demand for applications entailing EMFs, since EMFs arise around, for example, power lines, wireless broadband and '3G' (i.e. emergent third-generation technologies for mobile wireless networks).



5.7 Zero Eutrophication

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Zero Eutrophication* will be very difficult or not possible to achieve by 2020 even if further action is taken. Although emissions of eutrophying substances into both air and water are continuing to decrease, the state of the environment shows no corresponding improvement. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim targets for emissions of phosphorus and nitrogen compounds and nitrogen oxides can be met within the defined time frame if additional measures are taken, and that the interim target for emissions of ammonia was met five years before the target year 2010.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Withdraw the specification on the effects of nutrients on health and biodiversity.
- Retain unchanged the specifications on critical loads of nitrogen compounds and the contribution of groundwater to eutrophication.
- Delete the word 'ecological' in the specifications referring to the EU Water Framework Directive.
- Clarify the specification on nutrient conditions in coastal waters so that it refers to nutrient inputs.
- Insert a percentage and a figure for the quantity of accumulated nitrogen in the specification on the nutrient status of forest soils.
- Clarify certain elements of the specification on the nutrient status of agricultural soils.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for phosphorus emissions with a revised target for phosphorus emissions, with 2016 as the target year.
- Replace the interim target for nitrogen emissions with a revised target for nitrogen emissions, with 2016 as the target year.
- Revise the interim target for ammonia emissions and set 2015 as the target year.
- Revise the interim target for nitrogen oxide emissions and set 2015 as the target year.

5.7.1 Progress towards the environmental quality objective

ZERO EUTROPHICATION

Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.

The Environmental Objectives Council judges that it is not possible to meet this environmental quality objective and several of the existing specifications by 2020. On the other hand, the Council considers it possible to create, by 2020, the conditions required to fulfil this objective in the long term. Emissions to both air and water are continuing to decrease, but there is no corresponding improvement in the state of the environment. No clear changes in eutrophication status have become evident since the previous in-depth evaluation, and the situation remains grave. The marine environment is suffering from the most severe problems, the Baltic proper being worst affected. Because of eutrophication, algal blooms appear to have increased in number and scale alike. In 2005 and 2006 there were massive blooms in the Baltic, those in 2006 being the largest for ten years. Depletion of oxygen and accumulation of hydrogen sulphide in the northern and western parts of the Gotland Basin were the worst ever recorded.

This environmental quality objective presupposes a state of the environment relatively unaffected by eutrophication. Fulfilment of the objective is thus a remote prospect. The fact that the load to the surrounding seas and to forest land comes largely from other countries is one of four factors making it, in practice, probably not possible to achieve the objective by 2020. The other three factors are that a long recovery period is required, that large-scale natural processes affect nutrient dynamics, and that this environmental quality objective reflects a high level of ambition. However, while the state of the environment still shows no large-scale improvement, the load in terms of emissions to both air and water, in Sweden and certain other parts of Europe alike, is decreasing. New surveys show that concentrations of nutrients are falling in watercourses dominated by agriculture in southern Sweden, and the forecasts indicate further decreases. New commitments to reduce emissions are under discussion within, for example, the framework of the EU Thematic Strategy on Air Pollution. Work on the HELCOM Baltic Sea Action Plan will bring about a decrease in pollution loads. The EU Water Framework Directive and Marine Directive are considered crucial for reducing eutrophication in Europe.

New studies show that the effects of climate change may result in both reduced and increased eutrophication.

5.7.2 Progress towards the current interim targets

INTERIM TARGET 1

PHOSPHORUS EMISSIONS

By 2010 Swedish waterborne anthropogenic emissions of phosphorus compounds into lakes, streams and coastal waters will have decreased by at least 20% from 1995 levels. The largest reductions will be achieved in the most sensitive areas.

Emissions decreased by 14% between 1995 and 2005. In 2005, a further reduction of 150 tonnes was needed to meet the interim target. The reductions in 1995–2005 were effected mainly through measures at municipal sewage treatment works and in industry, but also in agriculture and regarding single-household sewage systems. New calculations show that anthropogenic phosphorus emissions are lower than was previously assumed. The nationwide potential for further decreases is limited, although major regional problems persist. The interim target is judged to be achievable, provided that further action is taken.

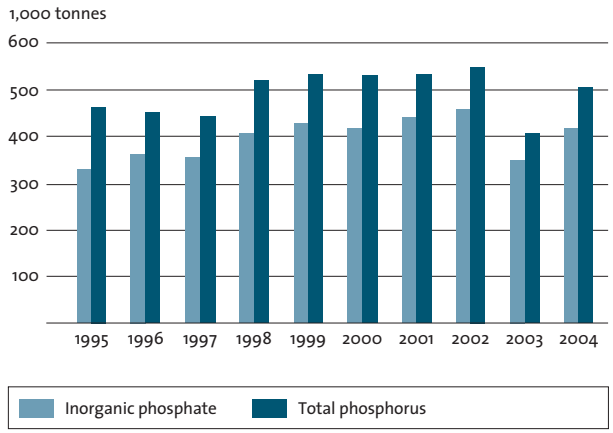
INTERIM TARGET 2

NITROGEN EMISSIONS

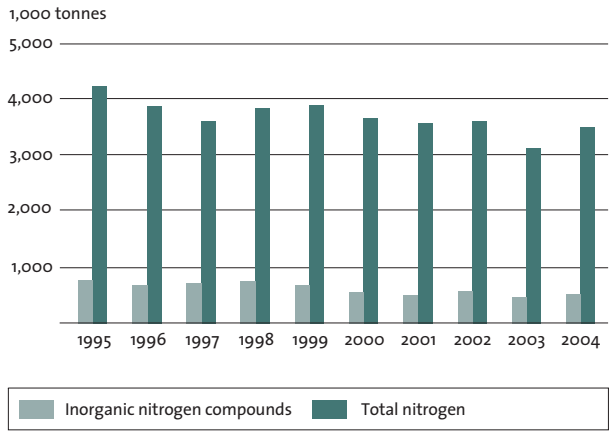
By 2010 Swedish waterborne anthropogenic emissions of nitrogen compounds into sea areas south of the Åland Sea will have been reduced by at least 30% compared with 1995 levels.

FIGURE 5.7.1 Variation in estimated quantities of phosphorus and nitrogen in the sea, 1995–2004

a) Phosphorus



b) Nitrogen



SOURCE: STOCKHOLM MARINE RESEARCH CENTRE

In recent years, it has become increasingly clear that the quantities of nutrients in the open Baltic can vary sharply without a clear connection with loads. These fluctuations are thought to derive from large-scale natural processes. Through, for example, denitrification, achieved by bacterial decomposition processes, the sea can release large quantities of nitrogen, while large amounts can be bound by nitrogen fixation by cyanobacteria. Correspondingly, large quantities of phosphorus can be immobilized in or released from the sediments. These processes are governed by climatologically conditioned changes and may be so considerable that long-term pollution trends cannot be reliably distinguished. They can also result in rapid changes in the phosphorus and nitrogen situation in the water column.

Emissions decreased by 24% between 1995 and 2005. In 2005, a further reduction of 3,500 tonnes was needed to meet the interim target. Major reductions have been achieved through measures in municipal sewage treatment works, industry and agriculture. Estimates of nitrogen leaching from arable land (root-zone leaching) show that it decreased by approximately 5,000 tonnes of nitrogen, representing two-thirds of the sectoral target for farming by 2010, between 1995 and 2005.

Given the current favourable trend and the expected further fall in emissions, the interim target is judged to be achievable by 2010 if further action is taken.

INTERIM TARGET 3

AMMONIA EMISSIONS

By 2010 emissions of ammonia in Sweden will have been reduced by at least 15% compared with 1995 levels.

This interim target was met five years before the target year. The latest figures (from 2005) show a fall of 15% in ammonia emissions since 1995, and a further fall is also expected. Agriculture accounts for the bulk (some 85%) of these emissions: there, emissions have decreased by 18% since 1995 and the sector target – a reduction of 7,300 tonnes of ammonia (13%) by 2010 – has already been met.

INTERIM TARGET 4

NITROGEN OXIDE EMISSIONS

By 2010 emissions of nitrogen oxides to air in Sweden will have been reduced to 148,000 tonnes.

Emissions of nitrogen oxides in Sweden amounted to approximately 174,000 tonnes in 2006. A decrease to 154,000 tonnes by 2010 is forecast. However, this fall is 6,000 tonnes short of the requirement, and this interim target is judged not to be achievable without further action being taken.

The interim target for emissions of nitrogen oxides is the same for *Zero Eutrophication* and *Natural Acidification Only*.

5.7.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Zero Eutrophication*:

Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Withdraw the specification on the effects of nutrients on health and biodiversity.
- Retain unchanged the specifications on critical loads of nitrogen compounds and the contribution of groundwater to eutrophication.
- Delete the word 'ecological' in the specifications referring to the EU Water Framework Directive.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

To facilitate monitoring and permit an assessment of progress towards the objective and the need for action after 2010, the Environmental Objectives Council proposes certain revised specifications of the environmental quality objective.

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Nutrient inputs will not have adverse effects on human health or be detrimental to biodiversity.	Withdraw the specification.
Deposition of airborne nitrogen compounds will not exceed critical loads for eutrophication of soil and water anywhere in Sweden.	No change.
Groundwater will not contribute to additional eutrophication of surface water.	No change.
Lakes and streams will, with respect to nutrient levels, meet the requirements for good ecological status, as defined in the Water Framework Directive (Directive 2000/60/EC). For lakes in the agricultural landscape, this means that the total phosphorus concentration should not exceed 25 micrograms per litre.	Lakes and streams will, with respect to nutrient levels, meet the requirements for good ~~ecological~~ status, as defined in the Water Framework Directive (Directive 2000/60/EC).
Nutrient conditions in coastal waters and seas will be essentially the same as in the 1940s, and nutrient inputs into the sea will not cause eutrophication.	*Nutrient inputs into the sea will be at such a level that nutrient conditions in coastal waters and seas can regain the status that prevailed* in the 1940s.
Swedish coastal waters will, with respect to nutrient levels, meet the requirements for good ecological status, as defined in the Water Framework Directive (Directive 2000/60/EC).	Swedish coastal waters will, with respect to nutrient levels, meet the requirements for good ~~ecological~~ status, as defined in the Water Framework Directive (Directive 2000/60/EC).
The nutrient status of forest soils will be such as to promote preservation of the natural species composition.	The nutrient status of forest soils will be such as to promote preservation of the natural species composition, *and a maximum of 5% of forest land in Sweden will have a level of nitrogen accumulation exceeding 5 kg N/ha.*
The nutrient status of agricultural soils will be such as to preserve the natural species composition.	The nutrient status of agricultural soils will be *balanced and* such as to preserve *a favourable ecological status in soil, the habitats of the farmed landscape and the surrounding environment.*

- Clarify the specification on nutrient conditions in coastal waters so that it refers to nutrient inputs.
- Insert a percentage and a figure for the quantity of accumulated nitrogen in the specification on the nutrient status of forest soils.
- Clarify certain elements of the specification on the nutrient status of agricultural soils.

5.7.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

PHOSPHORUS EMISSIONS

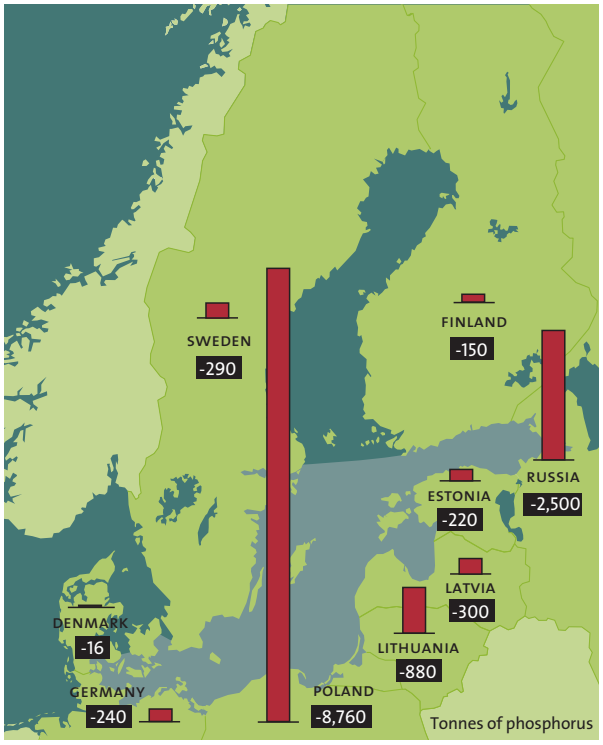
By 2016, action will have been taken to reduce Swedish waterborne anthropogenic emissions of phosphorus compounds to the Baltic Sea by 290 tonnes from the level of 1997–2003, in accordance with HELCOM's preliminary burden-sharing formula.

The current interim target is based not on the reductions required to attain desirable environmental status, but on what was considered reasonable within the defined time frame. The proposed new target should, instead, be based on calculations of the size of emission reductions required for the Baltic Sea to achieve a relatively undisturbed status. Within the framework of HELCOM's Baltic Sea Action Plan, a preliminary estimate of the total requisite decrease in phosphorus inputs to the Baltic proper is approximately 15,000 tonnes a year, with a preliminary estimate of Sweden's share being some 290 tonnes. A review is planned within HELCOM, and this will probably result in Sweden's reduction target being changed by 2010. The required reductions are intended to reflect what is financially and socially reasonable. Sweden's anthropogenic emissions to the Baltic proper, including Öresund, in 2005 are estimated at some 1,000 tonnes. This represents a fall of 130 tonnes in the gross load since 1995.

The proposal is that the new national interim target should be based on the above provisional reduction requirement, expressed as tonnes of phosphorus. This will call for vigorous action by Sweden. It is proposed, moreover, that the new target should have 2016 as its target date, with 1997–2003 as base years. This, too, tallies with HELCOM's preliminary proposal.

Sweden has done a great deal to reduce its phosphorus emissions from point sources. The scope for reducing emissions from municipal sewage works and industry is therefore not large. Measures to achieve the proposed target, with impact assessments, will be

FIGURE 5.7.2 HELCOM's preliminary burden-sharing formula for reducing anthropogenic emissions of phosphorus compounds to the Baltic Sea



SOURCE: HELCOM

According to HELCOM's preliminary burden-sharing formula, by 2016 Sweden must have taken measures resulting in a reduction of 290 tonnes, from the level of 1997–2003, in its emissions of phosphorus compounds into the Baltic. This will require vigorous action by Sweden.

presented by the Swedish Environmental Protection Agency in a report requested by the Government in its appropriation directions for 2008.

Eutrophication is also caused in lakes and watercourses, but the assumption is that these problems will be remedied by means of the programmes of measures required under the Ordinance on Water Quality Management.

Monitoring and indicators

The revised interim target has a new base year for the reference value, which is based on the measured aggregate load of phosphorus instead of model calculations that distinguish between the natural and anthropogenic loads. To date, the target has been followed up by means of modelling, but henceforth progress will need to be tracked by environmental monitoring instead. The revision of the target does not require any change in the monitoring programme.

▶ **THE COUNCIL PROPOSES** a revised interim target:

NITROGEN EMISSIONS

By 2016, action will have been taken to reduce Swedish waterborne anthropogenic emissions of nitrogen compounds to the Baltic Sea by 20,780 tonnes from the level of 1997–2003, in accordance with HELCOM's preliminary burden-sharing formula.

This proposed interim target is based on the same data and methods as the proposal on a new target for phosphorus. It is proposed that the revised target should be based on the reduction requirement, expressed in tonnes of nitrogen, calculated for Sweden within HELCOM. The reduction potential in Sweden is considerably larger for nitrogen than for phosphorus.

The reduction needed for the Baltic proper, Öresund and the Kattegat has been preliminarily estimated at 135,000 tonnes of nitrogen. Sweden's anthropogenic emissions into the seas south of the Åland Sea in 2005 have been estimated at some 42,000 tonnes. The reduction target for Sweden that has been discussed in HELCOM is approximately 20,780 tonnes, i.e. roughly half the anthropogenic emissions of nitrogen entering the sea from Swedish sources. The planned review by HELCOM also includes the required reductions in nitrogen emissions and, accordingly, the expectation is that these will be amended by 2010. The reduction targets are to take into account what is financially and socially reasonable. The present requirement is judged to be very difficult for Sweden to fulfil. But if the airborne load can be reduced in HELCOM and other countries, and also from shipping, the requirements for a decrease in the waterborne load can be reduced to a corresponding degree. Impact-assessed measures aimed at reaching the proposed interim target will be presented by the Swedish Environmental Protection Agency in a report requested by the Government in its appropriation directions for 2008.

What the reduction in nitrogen inputs is intended to avert is an increase in the sedimentation of organic material, since this boosts oxygen consumption on the seabed. This means that the seabed becomes anoxic, which results in phosphorus being released from the sediments and, in turn, promoting eutrophication. The quantity of organic material that forms sediment depends mainly on the size of the spring bloom. This is believed to be determined by the supply of nitrogen. To reduce the intense summer blooms of cyanobacteria ('blue-green algae') in the Baltic, both phosphorus leaching and nitrogen emissions must decrease. The best effect is obtained if the quantities of nitrogen and phosphorus alike entering both the Baltic proper and the Kattegat decrease.

Monitoring and indicators

The revised interim target has a new base year for the reference value, which is based on the measured load of nitrogen instead of model calculations that distinguish between the natural and anthropogenic loads. To date, the interim target has been followed up by means of modelling, but in future progress will need to be tracked by environmental monitoring instead. The revision of the interim target does not require any change in the monitoring programme.

▶ **THE COUNCIL PROPOSES** a revised interim target:

AMMONIA EMISSIONS

By 2015, emissions of ammonia in Sweden will have been reduced by 13% compared with 2005 levels.

The revision of the interim target consists in changes in the target year, the percentage and the base year. Sweden's commitments under international agreements are to be revised, and forecasts have already been made. The proposal in the EU Directive for a new ceiling on Sweden's ammonia emissions is expected to be around 40,000 tonnes a year by the year 2020. The Swedish reduction requirement is not expected to be any larger since European estimates of cost-effective emission decreases to date show that it is not cost-effective to take measures in Sweden (where a great deal has already been done). Forecasts based on decisions already made indicate that Sweden's ammonia emissions will be of the order of 49,000–51,000 tonnes by 2020. This should be compared with a figure of just over 52,400 tonnes in 2005. The Swedish Board of Agriculture has worked out a number of scenarios for the run-up to 2020, showing the effects of changes in agricultural policy and other economic preconditions for farm production. According to these scenarios, emissions may fall by 7–37% in cattle and pig farming, which produces most of the emissions. This applies provided that the assumed changes actually take place and farmers fully adjust to them. The preconditions for the scenarios have partly changed owing to the rise in prices of agricultural produce on the world market.

Monitoring and indicators

The revised interim target has a new percentage and a new base year for the reference value. Follow-up of the target does not require any change in environmental monitoring or another type of data.

▶ **THE COUNCIL PROPOSES** a revised interim target:

NITROGEN OXIDE EMISSIONS

By 2015, emissions of nitrogen oxides to air in Sweden will have been reduced to 130,000 tonnes.

The revision of the interim target consists in changes in the target year and the quantity of nitrogen oxides emitted. For the objective to be met, emissions must fall both in Sweden and in other countries whose emissions affect Sweden. Deposition in Sweden stems largely from emissions in surrounding countries. For the interim target to be in line with Sweden's international commitments under the Thematic Strategy on Air Pollution, it may need to be reviewed once the EU commitments have been decided.

The interim target for nitrogen oxide emissions is the same for both *Zero Eutrophication* and *Natural Acidification Only*.

5.7.5 How far are we from achieving the environmental quality objective?

The Environmental Objectives Council judges that the proposed interim targets, policy instruments and measures are not sufficient to achieve the state of the environment defined in the environmental quality objective by 2020. Nevertheless, nutrient loads may decrease by 2020 so that the objective becomes achievable later. But this is possible only if all the HELCOM countries implement their commitments under the Baltic Sea Action Plan.

With regard to two of the eight current specifications of the environmental quality objective progress has not yet been followed up, and for three of them the basic data needed to do so are lacking.

According to the preliminary assessment, meeting the revised interim target for phosphorus emissions is almost feasible if all the proposed measures are undertaken. On the other hand, achieving the revised target for nitrogen emissions by means of

the proposed measures is judged to be very difficult. However, there are numerous uncertainties.

The key factors affecting the prospects of achieving *Zero Eutrophication* are:

- Agriculture – food and bioenergy demand, EU agricultural policy, and further voluntary efforts (such as the Focus on Nutrients project).
- Forestry – accumulation of nitrogen that can leach out after felling, and increased use of fertilizers on forest land owing to greater demand for biofuels.
- Individual sewage systems – holiday homes becoming year-round homes, insufficient supervision and implementation of the law, and substandard individual sewage systems.
- Municipal sewage treatment – the forthcoming judgment of the European Court of Justice on Sweden's implementation of the Urban Waste Water Treatment Directive.
- The forest industry – demand for pulp and paper governs emissions.
- Fish farming – demand for farmed fish is crucial. Today, this industry is on a small scale in Sweden.
- International negotiations, e.g. in the EU, HELCOM and OSPAR.

5.8 Flourishing Lakes and Streams

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Flourishing Lakes and Streams* can be achieved by 2020, if further measures are introduced. Better environmental stewardship is called for in agriculture and forestry, and efforts to conserve cultural and natural environments need to be stepped up. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim targets for protection of natural and cultural environments and relating to water supply plans will be very difficult to meet within the time frames laid down, even if additional action is taken; that the target for restoration of rivers and streams can be met on time if further measures are introduced; and that the targets concerning releases of animals and plants and action programmes for threatened species had been achieved by the target year 2005.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for the protection of natural and cultural environments with a revised interim target for the conservation of natural and cultural environments, with 2015 as the target year.
- Replace the interim target for the restoration of rivers and streams with a revised interim target for the restoration of lakes and watercourses, with 2015 as the target year.
- Replace the interim target for water supply plans with a revised interim target relating to good-quality drinking water – surface water, with 2015 as the target year.
- Replace the interim target for releases of animals and plants, which is judged to have been met by the target year 2005, with an interim target for releases of species and management of fish populations, with 2015 as the target year.
- Deal with issues relating to the withdrawn interim target concerning action programmes for threatened species under *A Rich Diversity of Plant and Animal Life*.

5.8.1 Progress towards the environmental quality objective

FLOURISHING LAKES AND STREAMS

Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded.

This environmental quality objective is intended to be achieved within one generation.

The Environmental Objectives Council's assessment is that the objective *Flourishing Lakes and Streams* can be attained within the time frame laid down, provided that improved environmental stewardship is achieved in agriculture and forestry, and further action is taken under the interim targets. Since 2006, efforts to protect natural environments and restore rivers and streams have been stepped up. Increased allocations for nature conservation, combined with strategies, an improved knowledge base and future progress towards water management goals, are in the long term expected to enhance biodiversity and ensure greater consideration for natural and cultural heritage assets. Provided that county administrative boards continue to make the environmental objectives a priority, and in certain respects do more in this area, positive progress is expected to be made.

FIGURE 5.8.1 Construction near lake shores and river banks, 2001–2006

SOURCE: STATISTICS SWEDEN

In 2006, in Sweden as a whole (excluding urban areas), 887 new buildings were constructed within 100 m of a lake or a river at least 6 m wide. The pace of new construction in this zone was thus appreciably higher than in the previous five years. The number of buildings erected more than 75 m from existing ones was 122, fewer than in the preceding five years. Such buildings are assumed to take up more new land than others and to result in the development of previously undisturbed sites.

Construction along shores and banks adversely affects outdoor recreation and biodiversity. Not until new build slows down significantly or ceases altogether will the prospects of achieving the environmental quality objective improve. The tendency, however, is for construction on such sites to increase.

5.8.2 Progress towards the current interim targets

INTERIM TARGET 1

PROTECTION OF NATURAL AND CULTURAL ENVIRONMENTS

By 2005 the competent authorities will have identified and drawn up action programmes for natural and cultural environments, in or in the vicinity of lakes or streams, that are of particularly high conservation value and require long-term protection. By 2010 long-term protection will be provided for at least half of these environments, which must be evenly distributed among the five water districts. There must be at least 15 no-fishing areas in every water district.

This interim target is judged to be very difficult to meet within the time frame laid down for it. The basic conditions for protection efforts have to some extent improved, however, partly thanks to increased funding for nature conservation and a national strategy for work in this area. Enhanced allocations are also needed to secure the protection of valuable cultural environments.

Although the pace of work has been stepped up, the target is not expected to be met by 2010 on the

basis of existing resources. Of 537 sites of particular value for nature conservation, 90%, or some 480, were judged by county administrative boards in 2005 to require long-term protection. The interim target calls for half, i.e. 240, of these sites to be protected by 2010. Around 130 such sites have still to be protected. With the current definition of 'long-term protection', moreover, it will be difficult to bring about the necessary measures on the basis of the policy instruments available in the fisheries and cultural heritage sectors.

Of the sites identified as being of particular national value for cultural heritage conservation, 31% have sufficient regulations in place to safeguard the assets they represent. That means that identified assets at 62 sites have still to be given long-term protection by 2010 to meet the interim target.

In addition, there is an overlap between identified sites, making it important to establish how formal protection designations can interact to safeguard the overall values of the landscape.

The interim target's goal of 15 no-fishing areas in each water district is not considered achievable. No-fishing areas have a different purpose from the other elements of the target, and it is therefore proposed that they should be dealt with under a new interim target.

INTERIM TARGET 2

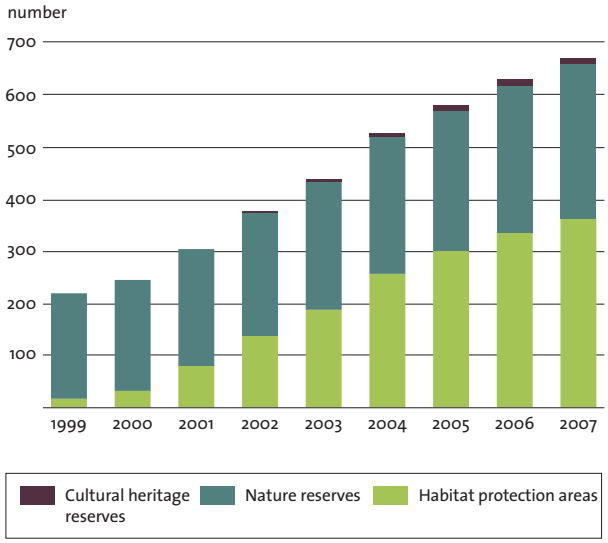
RESTORATION OF RIVERS AND STREAMS

😐 *By 2005 the competent authorities will have identified and drawn up action programmes for the restoration of Swedish rivers and streams of high conservation value or with the potential to acquire high conservation value following remediation. By 2010 at least 25% of valuable and potentially valuable rivers and streams will have been restored.*

It is uncertain whether this target can be met by 2010. A large number of watercourses are in need of restoration, and in some cases the measures required are complex and costly. Around 680 rivers and streams are judged to need restoring. The 25% target means that some 170 of them should be dealt with by 2010.

The national strategy that has been adopted, combined with a practical restoration manual and increased resources, considerably improves the basis for progress towards the target. To achieve it, staffing levels at county administrative boards and funding for restoration measures must be maintained, and greater resources made available to process applications for water operation permits. In addition, the cultural heritage agencies must be given the resources they need to help plan and implement

FIGURE 5.8.2 Number of protected sites with freshwater interest features as a priority, 1999–2007



Note: Nature reserves recorded in the REGDOS database, VIC Natur (Virtual Information Centre for Nature Conservation), with freshwater environments as the reason for designation; habitat protection areas designated under the Forestry Act that include freshwater environments ('riparian or floodplain forests' and 'small streams'); and cultural heritage reserves associated with fresh waters.

SOURCE: METRIA

Physical interference with lakes and watercourses poses a threat to biodiversity. Activities with such effects include river regulation, canalization, clearance, and farming and forestry in riparian zones. Under the Environmental Code (Chapter 7), sites can be designated for the purpose of conserving natural environments, biodiversity and/or cultural landscapes. In such areas, activities that harm natural or cultural assets can be prohibited.

Freshwater nature conservation is a neglected area in Sweden. Only around 2% of nature reserves have been designated for the purpose of protecting freshwater interest features. In the country as a whole, 362 habitat protection areas, 12 cultural heritage reserves and 294 nature reserves have been created to protect lakes and watercourses. To achieve the objective, more sites need to be safeguarded.

measures and to ensure, more generally, that greater attention is paid to cultural assets.

INTERIM TARGET 3

WATER SUPPLY PLANS

☹ *By 2009 water supply plans, including water protection areas and protection regulations, will have been adopted for all public and large private surface water sources. Large surface water sources are defined as surface waters used for the abstraction of water and serving more than 50 persons or providing more than 10 m³ a day as an average.*

This interim target will not be met on time. It will not be possible to establish water supply plans by 2009 and, given the close connection with physical planning and the implementation of programmes of measures and management plans under the Ordinance on Water Quality Management, this part of the target has been questioned.

The Environmental Objectives Council therefore proposes that targets and measures relating to water supply plans, together with corresponding aspects of the objective *Good-Quality Groundwater*, should be transferred to the environmental quality objective *A Good Built Environment*.

Similarly, the aim of establishing water protection areas for all surface water sources will not be achieved by 2009. The deadline for attaining this part of the target should be put back to 2015, when standards under the Ordinance on Water Quality Management are to be met. To comply with those standards, various measures will be required, including the establishment of water protection areas.

In the longer term, the freshwater environment will be affected by climate change, with implications for drinking water supplies and water protection.

INTERIM TARGET 4

RELEASES OF ANIMALS AND PLANTS

☺ *By 2005 releases of aquatic animals and plants will be undertaken in ways which do not adversely affect biological diversity.*

This interim target is judged to have been met. However, illegal and unintentional releases continue unabated, affecting the prospects of achieving the objective *Flourishing Lakes and Streams*.

INTERIM TARGET 5

ACTION PROGRAMMES FOR THREATENED SPECIES

☺ *By 2005 action programmes will have been prepared and introduced for threatened species and fish stocks that are in need of targeted measures.*

This target is judged to have been achieved. The list of species in need of action programmes is revised on a regular basis, but the number of programmes adopted or introduced to date is in line with the original assessment of the number required, made in 2000.

5.8.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Flourishing Lakes and Streams*:

Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

For specifications of the objective, please see overleaf.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Nutrient and pollutant loadings will not adversely affect the basic conditions for biodiversity.	No change.
Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.	No change.
The valuable assets which lakes, shores and watercourses represent in terms of experience of nature and cultural heritage, as well as bathing and outdoor recreation, will be safeguarded and developed prudently and sustainably.	No change.
Fish and other species that live in or are directly dependent on lakes and watercourses will be able to survive in viable populations.	No change.
Structures of great cultural heritage value that use water as a resource will continue to be usable.	No change.
In watercourses that are currently unexploited and largely undisturbed, natural flows and water levels will be maintained, while in watercourses affected by regulation, flows will as far as possible be adjusted to the needs of biodiversity.	No change.
The habitats of threatened, rare or care-demanding species and naturally occurring habitats with features of conservation value will be maintained at a favourable conservation status.	No change.
Threatened species will be able to spread to new sites within their natural ranges, ensuring long-term viable populations.	No change.
Lakes and watercourses will achieve good surface water status with respect to species composition and chemical and physical conditions, as defined in the EU Water Framework Directive (2000/60/EC).	No change.
No releases of genetically modified fish will occur.	No change.
Biodiversity will be restored and conserved in lakes and watercourses.	No change.

5.8.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

CONSERVATION OF NATURAL AND CULTURAL ENVIRONMENTS

By 2015, two-thirds of natural and cultural environments of particular national value, in and in the vicinity of lakes and watercourses, will be conserved on a long-term basis.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Defined conservation objectives will be met in two-thirds of natural environments of particular value.
- By 2015, two-thirds of cultural environments of particular value will have achieved good conservation status.
- The qualities of aquatic environments for recreation and tourism will be used in a sustainable manner.

The aim of this interim target is to maintain or achieve favourable conservation status in natural environments of particular national value, and to maintain or develop the cultural heritage qualities of areas with cultural environments of particular national value. At the same time, the values of such areas for recreation and tourism are to be maintained. A fundamental factor in conserving freshwater habitats and species is that protection needs to be based on an ecosystem and landscape approach. With its present wording and the current definition of long-term protection, the interim target only covers environments of particular value that require long-term protection (in the form of legally binding regulations). To conserve the values identified in many areas of particular national interest, such protection needs to be coupled with flexible management arrangements, including planning, voluntary undertakings, positive site management, conservation measures and sustainable use.

Monitoring and indicators

At present, one indicator to monitor progress regarding protected lakes and watercourses exists, based on the total number of habitat protection areas, nature reserves, cultural heritage reserves and national parks with freshwater interest features that have been designated in Sweden. Additional indicators need to be introduced, including one tracking the number of areas, among those identified as being of particular national value in the 'Valuable Waters' database, that are conserved on a long-term basis.

Follow-up of the target will be linked to monitoring of Natura 2000 sites, nature reserves and national parks (i.e. the 'Monitoring of Protected Nature' project), which includes national monitoring of the external natural environment, follow-up of action-plan species, and status assessment under water management legislation. As a complement, regional environmental monitoring, habitat surveys and inventories carried out under other projects can be used. In the 'Monitoring of Protected Nature' framework, follow-up of outdoor recreation will also be undertaken. Monitoring of cultural heritage buildings and known ancient monuments and remains will be based on various databases and systems at the National Heritage Board.

▶ **THE COUNCIL PROPOSES** a revised interim target:

RESTORATION OF LAKES AND WATERCOURSES

By 2015, good conditions for species and habitats will have been restored in one-third of watercourses and lakes of national value or potential value that are judged to be in need of restoration.

For the interim target to be considered to be met, the following specifications must be fulfilled:

- Restored environments will, in the long term, be able to achieve favourable conservation status.
- Measures will be planned and implemented taking the cultural environment into account and in such a way as to avoid damage to ancient monuments and remains.

The existing interim target does not include restoration of lakes. As part of a collation of data on areas with valuable lakes and watercourses, the county administrative boards have made a rough estimate of how many are in need of restoration. Of a total of 336 lakes, 7% (22) are judged to require extensive and 13% limited restoration. Around a third of the lakes are deemed not to need restoring, while for some 40% (140 lakes) insufficient data are available. If a similar proportion (i.e. around 20%) of lakes identified as being of value for fish and fisheries need to be restored, the total number requiring restoration is 120–190. With the proposed target, which calls for the restoration of a third of sites of national value or potential value that require it, 40–60 of Sweden's lakes will need to be restored by 2015.

Monitoring and indicators

An indicator of progress towards the proposed target for restoration should be developed using data collected for the Measures Database. In the longer term, the biological effects of measures will be tracked, for example, by means of sampling of fish and environmental monitoring, based on existing methods and criteria. The Measures Database will also be used to follow up nature and fishery conservation projects with implications for cultural environments, and to assess the planning and design of such projects. The National Heritage Board has developed a method to evaluate in qualitative terms the effects on cultural heritage of restoration projects undertaken for nature and fishery conservation purposes.

There is also a need for research into restoration methods and techniques and the economic impacts of restoration. Given the large number of waters needing restoring, research on how restoration can be carried out in the most cost-effective way and with the greatest overall benefits could also represent a good economic investment.

▶ **THE COUNCIL PROPOSES** a revised interim target:

GOOD-QUALITY DRINKING WATER – SURFACE WATER

By 2015, all bodies of surface water used for the abstraction of drinking water will meet Swedish water quality standards with respect to pollutants resulting from human activities. There must be no deterioration of the present quality of raw water.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **Water quality standards will have been adopted.**
- **Water protection areas, with relevant regulations and boundaries, will be in place for all bodies of surface water providing more than 10 m^3 a day as an average or serving more than 50 persons.**

To meet quality standards, surface water bodies need to be protected. This protection must be effective, and not a purely legal arrangement. It should also involve information and educational activities. Consequently, the establishment of water protection areas should be retained as one of the requirements for meeting this interim target. The current target also calls for the adoption of water supply plans. The Environmental Objectives Council proposes that, in future, the latter should be dealt with under *A Good Built Environment*, as part of the interim target concerning programmes and strategies for planning. The Council also proposes that guidance on the component elements of a water supply plan should be jointly developed by the National Board of Housing, Building and Planning, the Swedish Environmental Protection Agency, the Geological Survey of Sweden and the water authorities. This could be based on the report on such plans (2006:99) produced by the Västra Götaland County Administrative Board, in consultation with, among others, the agencies mentioned.

The extension of the deadline for this target from 2009 to 2015 is an adaptation to the date by which water quality standards are to be met under the Ordinance on Water Quality Management.

A water protection area remains the single most important form of protection for a water body used for the supply of drinking water. It clearly identifies an area in which precautions of various kinds need to be taken. Both the delineation of such areas and the design of the regulations associated with them are of great importance.

Monitoring and indicators

To assess progress towards the target, the following indicators need to be developed:

- Number and percentage of surface water sources for which water protection areas with effective regulations are in place.
- Number of people supplied with drinking water from protected surface sources.
- Number of local authority areas with water supply plans.
- Number and percentage of drinking water sources achieving good status or better, as defined in the Ordinance on Water Quality Management.

▶ **THE COUNCIL PROPOSES** a revised interim target:

RELEASES OF SPECIES AND MANAGEMENT OF FISH POPULATIONS

By 2015, releases and handling of fish and other organisms, and fishing, will be undertaken in ways that do not adversely affect biodiversity.

For the interim target to be judged to be met, the following specification must be fulfilled:

- **There will be no deterioration in the status of naturally occurring habitats, species and populations in the freshwater system.**

The current target for releases of animals and plants expired in 2005, and was judged to have been met. The Swedish Board of Fisheries has reviewed the regulatory framework for such releases and studied the ecological effects of alien species and fish stocks. Regulations have been tightened up, and the problems have been reduced, but not eliminated. Illegal releases of signal crayfish, which pose a direct threat to the native noble crayfish, are a particular concern.

Two of the specifications of *Flourishing Lakes and Streams* are directly linked to the release of fish and other species. Since the ecological impacts of releases and alien species remain a problem, despite the action taken, the wordings referring to releases should be retained, and measures and monitoring should be stepped up. Local management of fish and fisheries has a key part to play in achieving benefits for recreation and tourism. As fish and fisheries are private resources regulated largely at the local level, local involvement is crucial in ensuring good management of them in the long term. The main tools to bring this about are advice and guidance. An important platform for information on sustainable management of waters with fish populations is provided by the fishery conservation associations. County administrative boards are responsible for permit applications, exemptions, supervision etc. Regulations and policies exist, but they need to be uniformly applied, to ensure better assessments of ecological risks and prevent harmful releases. Operators and citizens must be treated in a similar way throughout the country.

Monitoring and indicators

No indicator for this target exists, as qualitative data are not available. Indicators could be created on the basis of data developed and obtained as follows:

- Data on finds of alien species, from the Swedish Species Information Centre's web-based Species Gateway database. This presupposes that relevant data are supplied from environmental monitoring and interested members of the public.
- Collations of information from international species portals.
- Focused monitoring in high-risk areas for the spread of certain species.
- Board of Fisheries questionnaire surveys on recreational fishing.
- Information on the number and geographical distribution of no-fishing areas.

- Analysis of fish populations and resource exploitation from the standpoint of sustainable long-term use, based on an ecosystem approach.
- Evaluations of the genetic and ecological effects of releases of organisms in aquatic environments.

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.8.5 How far are we from achieving the environmental quality objective?

It is difficult to say whether the proposed interim targets and measures will result in *Flourishing Lakes and Streams* being achieved by 2020. The targets put forward extend only to 2015, and many decisive factors are beyond the scope of the work being done to implement this environmental quality objective.

The most important factors affecting the prospects of achieving *Flourishing Lakes and Streams* are:

- Improved stewardship and management of aquatic environments, especially in agriculture and forestry.
- A reduced level of construction near lake shores and river banks, as development in such areas restricts public outdoor recreation and adversely affects animal and plant life.
- Measures to lessen the impacts of hydroelectric schemes on biodiversity.
- Due consideration for valuable cultural environments in the planning and implementation of ecological restoration projects.
- Implementation of the Ordinance on Water Quality Management (Water Framework Directive), to ensure that water bodies achieve good ecological status.
- Implementation of measures proposed under other environmental quality objectives that have implications for this objective.
- Limitation of the impacts of climate change.

5.9 Good-Quality Groundwater

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Good-Quality Groundwater* can be achieved by 2020, provided that further action is taken. Among the factors affecting groundwater are agriculture, urban development, contaminated land, road maintenance and excessive abstraction. Many water supply sources lack adequate protection. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the three interim targets, concerning protection of water-bearing geological formations, groundwater levels, and good-quality drinking water, will be very difficult to meet within the time frame laid down for them, even if additional measures are introduced.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for the protection of water-bearing geological formations with a revised interim target for the protection of groundwater, with 2015 as the target year.
- Revise the interim target for groundwater levels, setting 2015 as the target year.
- Replace the interim target for good-quality drinking water with a revised interim target relating to good-quality drinking water – groundwater, with 2020 as the target year.
- Introduce a new interim target for private water supplies, with 2020 as the target year.

5.9.1 Progress towards the environmental quality objective

GOOD-QUALITY GROUNDWATER

Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.

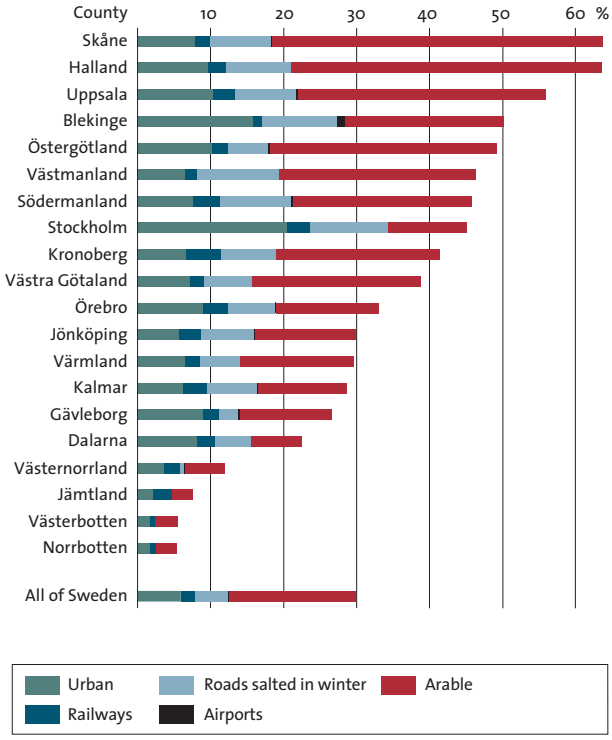
The Environmental Objectives Council's assessment is that this environmental quality objective will largely be achieved by 2020, provided that further action is taken to enhance groundwater protection. This assessment is based on the expected effects of the measures to be introduced.

No clear trend can be discerned in the state of the environment. In many respects, progress is being made: for example, greater care is being taken in road salting and in the use of pesticides and fertilizers, and acid loads are much reduced. But there are considerable gaps in current knowledge about the quality of groundwater with respect to pollutants.

The groundwater objective has been regionalized by the county administrative boards. Most of them have chosen to adopt regional interim targets similar to the national ones, with minor modifications. Several boards have set additional targets, calling for example for water protection areas to be established for all municipal water sources; for regional and local water supply plans to be adopted; and for programmes of measures to be introduced, corresponding to the programmes under the EU Water Framework Directive referred to in what used to be national interim target 4. Other regional targets relate to nitrate, pesticides and private water supplies. All the county boards apart from those of Uppsala and Gotland expect their regional environmental objective for groundwater largely to be met by 2020.

To achieve this environmental quality objective, the water authorities' overall programmes of measures at the regional and local levels will need to meet the requirements of water quality management in terms of reducing the impacts of factors such as agriculture, transport and contaminated land. In their planning, and when addressing water supply, waste-

FIGURE 5.9.1 Land use on sand and gravel deposits containing important groundwater resources



SOURCE: GEOLOGICAL SURVEY OF SWEDEN, SGU REPORT 2006:4

Many activities above ground can affect the quantity or quality of groundwater. Roads, railways and airports are often built on sand and gravel deposits, which provide suitable foundations for such projects. In addition, many towns extend across deposits of this kind, and they are frequently used for farming. Deposits of sand and gravel also hold Sweden's most important bodies of groundwater. In 11 counties, the types of land use shown here occupy more than 30% of the land surface in areas with important groundwater bodies.

water and solid waste issues, local authorities must take into account the need to protect groundwater resources.

Encouragingly, the creation of the water authorities has prompted greater efforts and a greater concern for groundwater on the part of county administrative boards and local authorities. In the road transport, drinking water supply, agriculture and well-drilling sectors, too, work is under way that will help to secure groundwater of good quality.

The long turnover times of soil and groundwater systems mean that, even if the interim targets for the protection of water-bearing geological formations and good-quality drinking water are met, the improvements will not have made themselves felt in every part of the groundwater environment by 2020; nitrate levels, for example, will probably remain high in some groundwater bodies.

To achieve *Good-Quality Groundwater*, effective measures need to be taken to meet other objectives, including *Zero Eutrophication*, *Natural Acidification Only* and *A Non-Toxic Environment*, all of which will be very difficult to attain. Some pollutants and effects on groundwater levels, moreover, are virtually impossible or very costly to remedy. However, under the Ordinance on Water Quality Management, groundwater thus affected must not be allowed to deteriorate further.

5.9.2 Progress towards the current interim targets

INTERIM TARGET 1

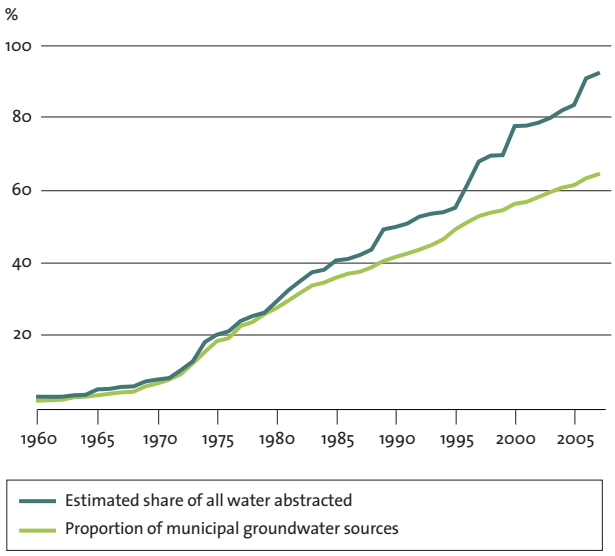
PROTECTION OF WATER-BEARING GEOLOGICAL FORMATIONS

☹ *By 2010 long-term protection from development activities that restrict water use will be provided for water-bearing geological formations of importance in meeting present and future water supply needs.*

In the Environmental Objectives Council's judgement, this interim target will not be met by the target year. Although efforts to enhance protection by establishing and updating water protection areas around existing and reserve sources of supply have been stepped up, many municipal sources still lack adequate safeguards. This is particularly true of smaller water sources. Pending the introduction of the Ordinance on Water Quality Management, county administrative boards failed to give sufficient priority to developing water supply plans and protecting groundwater with a view to safeguarding drinking water supplies.

The possibility of designating groundwater bodies as resources of national interest for water supply purposes has yet to be introduced.

FIGURE 5.9.2 Proportion of municipal groundwater sources with water protection areas, 1960–2007



SOURCE: GEOLOGICAL SURVEY OF SWEDEN, GROUNDWATER DATABASE (DGV)

A water protection area should be established for every municipal or other major groundwater source. Of the almost 1,600 municipal sources so far reported to the Geological Survey of Sweden, 36% still do not have this form of protection. Protection areas are primarily lacking for sources supplying small quantities of water, with less than 10% of all groundwater abstracted coming from sources without such areas. However, many water protection areas are old – roughly half of them date back more than 25 years. Efforts to establish new areas and review older ones need to be stepped up. There is also an urgent need to draw up emergency response plans to deal with acute spills of pollutants. Long-term protection of groundwater should be seen as involving a combination of measures. One important tool is land use planning, for example in the context of local authority planning and permitting procedures. Another is programmes of measures under the Ordinance on Water Quality Management, which are required to describe how good status will be achieved. A power to designate groundwater bodies of importance in meeting water supply needs as resources of national interest would ensure greater attention to groundwater and water supply interests.

INTERIM TARGET 2

GROUNDWATER LEVELS

☹ *By 2010 the use of land and water will not cause changes in groundwater levels that adversely affect the water supply, soil stability, or the animal and plant life of adjoining ecosystems.*

The Council's assessment is that this interim target cannot be met within the time frame laid down. Measures to secure progress towards it have not been implemented on a sufficient scale. It is, for example, necessary to

- identify areas and systems that are sensitive to changes in groundwater levels and flows,
- include more information on sensitive areas in comprehensive and detailed development plans,
- use powers under the Planning and Building Act or the Environmental Code to restrict new abstractions and require notification of existing ones in such areas, and
- establish regional water management plans.

These issues have primarily been addressed in municipalities and counties with problems of over-abstraction and saltwater intrusion.

Sufficient data are still not available to assess to what extent plant and animal life are affected by changes in groundwater levels or flows.

INTERIM TARGET 3

GOOD-QUALITY DRINKING WATER

☹ *By 2010 all bodies of water used for the abstraction of water intended for human consumption, and providing more than 10 m³ a day as an average or serving more than 50 persons, will meet the Swedish standards for good-quality drinking water with respect to anthropogenic pollution.*

The Council judges that this target cannot be met on time. What effects measures to reduce the environmental impacts of agriculture and other activities are having on groundwater is largely unknown, as insufficient data are available to determine trends in relation to the target. Owing to their slow turnover in soil and groundwater systems, the effects of pollutants may persist for decades, as is the case, for example, with residues of pesticides that are no longer allowed to be sold.

Progress towards this interim target is very much dependent on measures to achieve the environmental quality objectives *Natural Acidification Only*, *A Non-Toxic Environment* and *Zero Eutrophication*.

5.9.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Good-Quality Groundwater*:

Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.

▶ **THE COUNCIL PROPOSES** no change to the specifications of the environmental quality objective on a time scale of one generation.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Groundwater quality will not be adversely affected by human activities such as land use, extraction of natural gravel, releases of pollutants etc.	No change.
The quality of discharging groundwater will be such as to contribute to viable habitats for plants and animals in lakes and watercourses.	No change.
Consumption and other human influences will not lower levels of groundwater in such a way as to jeopardize its availability and quality.	No change.
Groundwater will have such low levels of pollutants resulting from human activities that its quality will meet the criteria for good drinking water quality under Swedish drinking water standards and for good groundwater status under the EU Water Framework Directive (2000/60/EC).	No change.

5.9.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

PROTECTION OF GROUNDWATER

By 2015, long-term protection from development activities that restrict the use of water will be provided for water-bearing geological formations of importance in meeting present and future water supply needs.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Geological formations of particularly great importance in meeting water supply needs will be designated as resources of national interest.
- Water protection areas, with associated regulations, will be in place for all municipal water supply sources.
- Water protection areas, with associated regulations, will be in place for all groundwater bodies that could be of importance in meeting future water supply needs.
- County administrative boards or other regional bodies, and local authorities, will have up-to-date water supply plans or the equivalent that can serve as a basis for the elaboration of local authority comprehensive plans and regional development programmes.
- No extended or new permits will be granted for the extraction of natural gravel from deposits that are of great value for the supply of drinking water.
- All water protection areas, including the associated regulations, will be regularly reviewed and, where necessary, revised.

The proposed revision of this interim target concerns the target date. The earlier wording remains relevant. The measures still to be introduced need to be implemented no later than 2015, in order for both the interim target concerning groundwater quality and the environmental quality objective as a whole to be achieved. A target year of 2015 has therefore been chosen, rather than 2020.

Monitoring and indicators

The interim target has not been appreciably altered. Progress towards it will be monitored in the same way as before.

▶ **THE COUNCIL PROPOSES** a revised interim target:

GROUNDWATER LEVELS

By 2015, the use of land and water will not cause changes in groundwater levels that adversely affect the water supply, soil stability, or the animal and plant life of adjoining ecosystems.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Good quantitative status as defined in the Ordinance on Water Quality Management will be achieved.
- All groundwater sources providing more than 100 m^3 a day will be the subject of an environmental court judgment relating to the abstraction of water.
- County administrative boards and local authorities will be aware of groundwater-dependent ecosystems and take them into account when issuing permits.
- Local authorities will be aware of large withdrawals of groundwater.
- Underground construction, drilling for the purposes of water abstraction and extraction of energy, and hard landscaping will not result in harmful changes to groundwater levels.

The proposed revision concerns the target date. The earlier wording of the interim target remains relevant. Achievement of the target is dependent on action being taken to ensure that, when land and water are used, due account is taken of any effects on the quantity or flow of groundwater, and of the consequences of those effects. This action needs to be taken in good time, in order to meet both the interim target concerning groundwater quality and the en-

vironmental quality objective as a whole. 2015 has therefore been chosen as the target year.

Monitoring and indicators

Only the target year has been revised. The proposed specifications of the target will simplify monitoring of progress towards it.

▶ **THE COUNCIL PROPOSES** a revised interim target:

GOOD-QUALITY DRINKING WATER – GROUNDWATER

By 2020, all bodies of water used for the abstraction of water intended for human consumption, and providing more than 10 m³ a day as an average or serving more than 50 persons, will meet Swedish standards for good-quality drinking water with respect to pollutants resulting from human activities.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Good qualitative status as defined in the Ordinance on Water Quality Management will be achieved.
- Programmes of measures, as provided for in particular in the Ordinance on Water Quality Management, will be effective.

The proposed revision relates to the target date. The earlier wording remains relevant, and covers an important aspect of the water supply element of the environmental quality objective. 2020 has been set as the target year for the following reasons:

- Turnover of pollutants in the soil and groundwater system is slow.
- Progress towards the target will depend on, among other things, implementation of the measures needed to meet both the interim target for the protection of groundwater and several of the other environmental quality objectives.
- Achievement of the target will also depend on programmes of measures under the Ordinance on Water Quality Management.

Monitoring and indicators

Monitoring of progress towards this target will be performed as before, but will be simplified by the proposed specifications.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

PRIVATE WATER SUPPLIES

By 2020, drinking water from private water supplies will comply with Swedish guidelines.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- The use of groundwater for private water supplies will not be restricted by pollutants resulting from human activities.
- Groundwater-based drinking water obtained from private supplies will have been tested in accordance with the recommendations of the National Board of Health and Welfare.
- New drilled wells will comply with the requirements set out in the Geological Survey of Sweden's guidance on drilling of heat pump boreholes and water wells, and suitable groundwater will be used for water supplies.
- Guidance will be available on the construction of wells in superficial deposits.
- Drinking water from private supplies will comply with the water quality recommendations set out in the National Board of Health and Welfare's general guidelines on precautionary measures relating to drinking water.
- If treatment of raw water is necessary, easily operated, cost-effective and environmentally sound methods of treatment will be used to comply with the National Board of Health and Welfare's recommendations on drinking water quality.
- Information on areas with a risk of elevated concentrations of harmful substances will be given in local authorities' comprehensive plans, as a basis, for example, for planning permission decisions.

Particular attention needs to be paid to private supplies of water in the context of the environmental objectives, in that groundwater used for this purpose does not always fall within the scope of the Water Framework Directive. The interim target proposed here covers groundwater-based private supplies providing water for single- or two-family dwellings, and other non-public supplies serving up to 50 people. Furthermore, both naturally occurring substances and anthropogenic pollutants are included. The target is intended to cover the groundwater itself, the well and any treatment equipment.

To meet the target, one requirement is improvements in the quality and safety of well constructions (both drilled and dug) and of water treatment systems. Other important factors include protection of non-municipal water sources and a better understanding of how adverse effects arising from single-household sewage systems can be avoided.

An interim target for private water supplies will enable a clearer picture to emerge of the quality of the drinking water used by the roughly 1.2 million people in Sweden who rely on such supplies all year round and the similar number dependent on private wells at their second homes. The use of water from private sources increased by around 5% between 1995 and 2000. This trend is expected to continue, especially in the areas around the major cities, owing to the shortage and high cost of housing in more central locations.

Several counties and local authorities have already introduced regional or local interim targets relating to private water supplies.

Monitoring and indicators

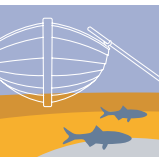
To develop indicators, data from analyses of private well water commissioned by private individuals need to be collected, geo-referenced and, as a minimum, classified in terms of whether they relate to dug or drilled wells. Appropriate methods are currently being tested as part of a project involving the National Board of Health and Welfare. The results will be of use in assessing groundwater quality and identifying areas with quality problems.

5.9.5 How far are we from achieving the environmental quality objective?

The Environmental Objectives Council considers that this environmental quality objective will largely be met by 2020, provided that further action is taken to enhance the protection of groundwater. It is not realistic to believe that good-quality groundwater can be achieved everywhere.

The most important factors affecting the prospects of attaining *Good-Quality Groundwater* are:

- Awareness on the part of government agencies, local authorities, operators and the general public that groundwater exists, and a willingness to take appropriate precautions to protect it from adverse impacts.
- Measures to safeguard water supplies, and patterns in the development of communities and infrastructure. Local authority planners need to take greater account of major groundwater resources. Long-term, overall planning of water supplies is necessary, particularly in the face of a changing climate, which could affect the quantity and quality of surface water and groundwater.
- Reduced extraction of natural gravel, use of crushed rock instead of natural gravel to supply aggregates for construction and civil engineering, and rehabilitation of gravel pits to restore the protective function of the soil.
- Trends in agriculture, since use and handling of fertilizers, pesticides and irrigation are often detrimental to the quality and quantity of groundwater resources. Trends in forestry too, for example an increase in nitrogen fertilization, could adversely affect groundwater.
- Special care in changing rules that could affect groundwater, and the inclusion of groundwater as a factor in risk assessments.
- An improved framework for supervision in the food, environmental and public health sectors, so as to achieve, throughout the country, uniform and effective control of drinking water quality, activities in water protection areas, and drilling of wells.



5.10 A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* will be very difficult or not possible to achieve by 2020, even if further measures are introduced. Inputs of nutrients are declining, but improvements in terms of eutrophication are less clear. The status of cod and eel stocks is critical. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim target for discharges of oil and chemicals can be met within the stated time frame; that the targets for protection of environments and for noise and other disturbance are achievable within the time frame if further action is taken; and that the targets for bycatch and for catches and recruitment of fish will be very difficult to meet on time, even if additional measures are introduced. The interim target concerning action programmes for threatened marine species was not met by the target year 2005. The target for the cultural heritage and agricultural landscapes of coasts and archipelagos was achieved by the target year 2005.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Revise the wording regarding recreation in the specification relating to use and development.
- Broaden the specification referring to the various assets of the coastal and archipelago landscape to include 'recreational assets'.
- Keep the other specifications unchanged.
- Introduce a specification concerning alien species and genetically modified organisms.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for the protection of environments with a revised interim target for the conservation of marine natural assets, with 2015 as the target year.
- Withdraw the interim target for cultural heritage and agricultural landscapes, which was met by the target year 2005.
- Withdraw the interim target concerning action programmes for threatened marine species, which was not met by the target year 2005.
- Revise the interim target for bycatch and set 2015 as the target year.
- Revise the interim target for catches and recruitment of fish and set 2015 as the target year.
- Revise the interim targets for noise and other disturbance and for discharges of oil and chemicals and merge them into a single interim target relating to the impacts of shipping, with 2015 as the target year.
- Introduce a new interim target for the restoration of inshore habitats, with 2020 as the target year.
- Introduce a new interim target concerning use of the coastal and archipelago landscape, with 2015 as the target year.
- Deal with issues relating to the withdrawn interim target on action programmes for threatened marine species under *A Rich Diversity of Plant and Animal Life*.

5.10.1 Progress towards the environmental quality objective

A BALANCED MARINE ENVIRONMENT, FLOURISHING COASTAL AREAS AND ARCHIPELAGOS

The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance.

This environmental quality objective is intended to be achieved within one generation.

The Environmental Objectives Council makes the assessment that it will be very difficult to achieve this environmental quality objective by 2020, even if further measures are introduced. The capacity for recovery of marine ecosystems will crucially determine when the objective as a whole can be attained. The basic conditions for a good marine environment, however, could possibly be achieved by 2020.

Despite considerable efforts over the last 30 years, the environmental status of the Baltic Sea, Kattegat and Skagerrak remains poor. For several fish species and populations, the situation is still very serious: the eel, for example, is now red-listed as critically endangered throughout its range, and bycatch, of fish, birds and marine mammals, continues to be a problem. Fundamentally, the current overexploitation of fish resources is the result of too large and efficient a fishing fleet.

There are some encouraging trends as well, however, such as the progress being made in establishing marine nature reserves and no-fishing areas, and the sustained decrease in illegal discharges of oil into the Baltic.

As regards the goal of flourishing coastal areas and archipelagos, too, major difficulties exist. Areas once made up of second homes, for example, are being transformed into permanent settlements, and the pressures arising both from built development and from recreation and tourism are growing. In other areas, depopulation is a problem. In coastal archipelagos, farming and forestry are at a competitive disadvantage, resulting in more or less overgrown agricultural landscapes and the decay and decline of built heritage and unique amenity values.

Progress towards this environmental quality objective will depend crucially on action also being taken under other objectives, primarily *Zero Eutrophication* and *A Non-Toxic Environment*. Success in tackling problems linked to eutrophication or development affecting important habitats for the marine environment will, in addition, be dependent on measures to achieve *A Varied Agricultural Landscape*, *A Good Built Environment*, *Sustainable Forests*, *Thriving Wetlands* and *Flourishing Lakes and Streams*.

In recent years, several studies have been made of how the problems facing the marine environment should be solved. The Commission on the Marine Environment noted an 'implementation deficit' in this area. Although many measures can and should be undertaken on a national basis, cooperation within the EU and internationally is crucial to attaining this objective. Emission sources in other countries contribute very significantly to the pollution of our seas. Sweden is dependent on regional and other international agreements to reduce inputs of toxic or eutrophying pollutants to the marine environment, to establish necessary controls on fisheries, and to improve safety and environmental practice in the shipping industry.

5.10.2 Progress towards the current interim targets

INTERIM TARGET 1

PROTECTION OF ENVIRONMENTS

By 2010 long-term protection will be provided for at least 50% of marine environments of high conservation value and at least 70% of coastal and archipelago areas with significant natural and cultural assets. By 2005 another five marine areas, plus a further 14 by 2010, will be protected as nature

reserves. Together, these will form a representative network of marine natural habitats.

In addition, an area in which fishing is permanently banned will be established by 2006 for evaluation by 2010. A further three coastal and open sea areas with permanent bans will be established in the Baltic Sea and the North Sea respectively by 2010 for evaluation by 2015.

The Environmental Objectives Council judges that the goal of long-term protection for 70% of identified coastal and archipelago areas can be met within the time frame laid down, provided that additional action is taken to protect cultural heritage.

The target of another 14 marine nature reserves by 2010 is also likely to be achieved. These reserves will probably be spread across all counties and marine geographical regions within Swedish territorial waters. In some respects, though, the geographical distribution of protection is very uneven, with a large share of protected sites in coastal areas of the Quark (Kvarken) Straits, the Sound (Öresund) and the Skagerrak, while in the Gulf of Bothnia and the southern Baltic, for example, less than 3% of the total area is protected. The current distribution of protected areas and that projected for 2010 fall short of the goal of a representative network of different marine habitats. In the exclusive economic zone, no nature reserves are being designated at present, as the procedures for doing so are unclear.

The goal of establishing a no-fishing zone by 2006 was met when the Swedish Board of Fisheries banned all fishing from an area within four nautical miles of Gotska Sandön. Preparations are in hand for the designation of another six no-fishing areas by 2010. The aim is for these areas to be selected on the basis of close regional and local consultation with relevant stakeholders.

INTERIM TARGET 2

STRATEGY FOR CULTURAL HERITAGE AND AGRICULTURAL LANDSCAPES

By 2005 a strategy will have been adopted for the preservation and use of the cultural heritage and agricultural landscapes of coastal and archipelago areas.

This target has been met, in that a strategy is now in place, but a new interim target is proposed relating to use of the coastal and archipelago landscape. The new target is broader in approach, being concerned not only with the cultural heritage and farmed landscapes of archipelago areas, but also with implementing the EU Recommendation on Integrated Coastal Zone Management (ICZM).

INTERIM TARGET 3

ACTION PROGRAMMES FOR THREATENED MARINE SPECIES

By 2005 action programmes will have been prepared and introduced for threatened marine species and fish stocks that are in need of targeted measures.

This interim target was not met by the target year 2005, or during 2006. In its Red List for 2000, the Swedish Species Information Centre identified 17 species associated with marine environments as being in need of special measures. Action programmes currently exist for 14 of these. In 2006, the Board of Fisheries proposed measures for 26 threatened fish species, for which fishing could be one of the threat factors. These measures are to be introduced in stages over the period 2007–10. Protection of threatened marine species and hence the adoption of action programmes are now dealt with under the objective *A Rich Diversity of Plant and Animal Life*, and monitoring of programmes will be undertaken in that framework.

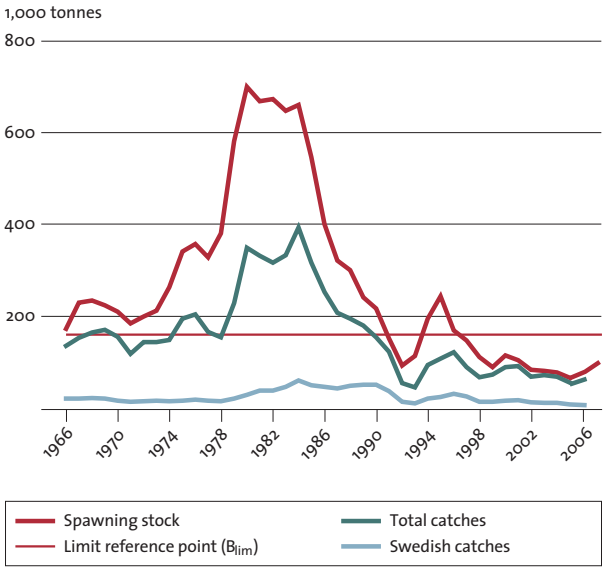
INTERIM TARGET 4

BYCATCH

By 2010 total annual bycatches of marine mammals will not exceed 1% of each population. Bycatches of seabirds and non-target fish species will have a negligible impact on the populations concerned and on the ecosystem.

This target will not be met by 2010 for all marine mammal populations. In particular, there is still a long way to go as regards grey and harbour seals. To achieve the 1% target for grey seals, a large proportion of inshore fisheries would have to be closed. For the common porpoise, bycatch should not be a significant problem in the Kattegat and Skagerrak, chiefly thanks to a dramatic decrease in the scale of gill-net fishing. As for the Baltic, there is a lack of data on both the population and the bycatch of this

FIGURE 5.10.1 Cod and cod fishing in Baltic Sea (eastern stock), 1966–2007



SOURCE: SWEDISH BOARD OF FISHERIES

The cod population of the eastern Baltic is under serious threat. The limit reference point for spawning stock biomass set by the International Council for the Exploration of the Sea (ICES) is 160,000 tonnes. The stock has been below this danger level for the last 11 years. With the proposed EU recovery plan for Baltic cod, it will take at least another 11 years to achieve the intended recovery.

species. More reliable estimates of populations of non-target species and bycatch levels are necessary, along with efforts to win the trust of and improve cooperation with commercial fishermen.

INTERIM TARGET 5

CATCHES AND RECRUITMENT OF FISH

☹ *By 2008 catches of fish, including bycatches of juveniles, will not exceed levels commensurate with maintaining fish stocks of a size and composition sufficient to ensure that the ecosystem's basic structure and functions are preserved. Populations will have been restored to levels well above biologically safe limits.*

This interim target is intended to be achieved by 2008. That will not be possible: for several fish stocks the situation remains very critical, and in some cases it has worsened. The proposed EU recovery plan for Baltic cod can serve to illustrate the difficulties. Under it, the current fishing mortality (F) of 1.1 for the eastern cod stock is to be brought down to 0.3 by means of annual reductions of, at most, 10% of F. It will thus take at least 11 years, i.e. until 2018, to reach the target. Sweden must press for effective measures and a more ambitious plan, so as to meet the target sooner.

INTERIM TARGET 6

NOISE AND OTHER DISTURBANCE

😐 *By 2010 noise and other disturbance from boat traffic will be negligible in particularly sensitive and designated archipelago and coastal areas.*

The county administrative boards of Sweden's coastal counties have drawn up an action plan to establish 'special consideration' zones in archipelago areas. Under the plan, at least three such zones with respect to noise, geographically distributed across the country, are to be designated on a trial basis by the summer of 2008. An evaluation of these zones is to be completed by autumn 2009, and measures to reduce disturbance are to be adjusted, where necessary, by 2010.

In consultation with the Swedish Environmental Protection Agency, the county boards have defined a level of 40 dBA as constituting 'negligible' noise in special consideration zones. In their view, this level may be exceeded for at most 10 minutes per week. For comparison, it may be noted that 25 dBA corresponds to the sound of a light breeze and 65 dBA to a normal conversation.

Very few studies have been made of how animals are disturbed by noise, and in particular of how underwater noise affects marine life. A special research effort is called for in this area.

The interim target does not specify either the number or the size of noise-free areas, or what is meant by 'other disturbance'. Even if county administrative boards are given the extra resources they have asked for, it is uncertain whether it will be possible to restrict boat traffic in time in the three designated zones. The target calls for changes in personal behaviour, which can be difficult to influence and monitor. The overall assessment is that it is uncertain whether this target will be met by 2010.

INTERIM TARGET 7

DISCHARGES OF OIL AND CHEMICALS

By 2010 discharges of oil and chemicals from ships will be minimized and reduced to a negligible level by stricter legislation and increased monitoring.

This target is judged to be achievable within the time frame laid down. The number of discharges of oil in Sweden's zone of responsibility/response region has fallen in recent years, indicating that aerial surveillance by the Swedish Coast Guard, targeted air–sea operations and international cooperation are continuing to produce results. A range of action has also been taken to reduce the number of operational discharges in the HELCOM area.

On the other hand, growing oil tanker traffic has brought with it an increased risk of accidents. A number of risk reduction measures have already been introduced, with more to follow.

Possibly as an effect of the Baltic being classed as a particularly sensitive sea area by the International Maritime Organization (IMO), the number of vessels failing to comply with the recommendation to avoid Hoburg Bank and the Northern Midsjö Bank seems to have decreased in the second half of 2006.

Discharges of chemicals currently occur on a very small scale. Consequently, the risk of future releases can also be judged to be small.

The incidence of oil emissions from recreational craft will remain high, owing to increased boat traffic. Overall, however, the assessment is that this target can be met by 2010.

5.10.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*:

The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Revise the wording regarding recreation in the specification relating to use and development.
- Broaden the specification referring to the various assets of the coastal and archipelago landscape to include 'recreational assets'.
- Keep the other specifications unchanged.
- Introduce a specification concerning alien species and genetically modified organisms.

The current wording of the objective should preferably be retained unchanged, no significant new developments having occurred to justify a revision. As a basis for judging progress towards the objective on a time scale of one generation, the Council proposes the addition of a new specification, and changes to two of the existing ones.

Key aims with regard to outdoor recreation largely coincide with the interests of nature and cultural heritage conservation. They include a varied and visually attractive landscape, and interesting natural and cultural phenomena (vegetation types, plant and animal species, geological formations, agricultural heritage sites, cultural monuments etc.).

Before permits are granted for the introduction of non-native species and genetically modified organisms, the risks should be carefully evaluated. The risk of unintentional introduction and spread of alien species and genes, e.g. with ballast water and on

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Threatened species and stocks will be able to spread to new sites within their natural ranges, ensuring long-term viable populations.	No change.
The habitats of threatened, rare and care-demanding species and naturally occurring habitats of conservation value will be maintained at a favourable conservation status.	No change.
The natural beauty, natural and cultural heritage assets, biodiversity and variation of the coastal and archipelago landscape will be maintained by prudent use.	The natural beauty, natural, cultural heritage *and recreational* assets, biodiversity and variation of the coastal and archipelago landscape will be maintained by prudent use.
Fishing, shipping and other uses of seas and other areas of water, as well as construction and other development in coastal and archipelago areas, will be undertaken with due consideration for the productive capacity, biodiversity, natural and cultural heritage assets and assets for outdoor recreation of the areas of water concerned.	Fishing, shipping and other uses of seas and other areas of water, as well as construction and other development in coastal and archipelago areas, will be undertaken with due consideration for the productive capacity, biodiversity, and natural, cultural heritage *and recreational* assets of the areas of water concerned.
Measures will be taken to achieve low levels of noise.	No change.
Buildings and built environments of particular value in the coastal and archipelago landscape will be safeguarded and enhanced.	No change.
All coastal waters will achieve good surface water status with respect to species composition and chemical and physical conditions, as defined in the EU Water Framework Directive (2000/60/EC).	No change.
	Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.

ships' hulls, should be minimized by the use of the best available technology.

5.10.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

CONSERVATION OF MARINE NATURAL ASSETS
By 2015, a representative network of marine areas of high conservation value, covering at least 15% of Sweden's total marine area, will be established and conserved.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- The areas will be distributed over Sweden's marine geographical regions and will include all habitats occurring in the regions concerned.
- Favourable conservation status will be achieved.
- Long-term protection will be in place for at least 10% of Sweden's marine area.
- For the remaining 5% included in the network, 'marine conservation plans' or corresponding management arrangements will be in place to ensure that the marine natural assets of the areas are conserved.
- By 2010, three no-fishing areas (in inshore and offshore waters) will be established in the Baltic Sea and three in the Kattegat and Skagerrak, for evaluation by 2015.

The proposed revision is intended to focus the target more clearly on measures to conserve marine areas. In addition, the revised target will be easier to follow up than the existing one, some aspects of which are not measurable with existing knowledge.

The aim is to ensure that favourable conservation status is achieved for a network of marine areas of high conservation value, meeting the requirements of representativeness and ecological connectivity. Areas should be chosen on the basis of the established criteria for selecting, and setting priorities for the protection of, marine areas of high nature conservation value, thus ensuring that more 'ordinary' areas are not protected simply to reach the target percentage.

When an area is given protection, an assessment should be made of whether that protection can and should be designed to safeguard other interest features besides the primary ones. It may, for example, be possible to coordinate it with protection of areas for recreation or for their marine archaeological interest. Such coordination can also help to strengthen interest in and understanding of marine assets.

Monitoring and indicators

The following will be used as indicators:

- Total extent of areas meeting the definition of long-term protection.
- Total extent of areas covered by a marine conservation plan or a management plan for a Baltic Sea Protected Area or Ramsar site, or included in a designated Biosphere Reserve.

A gap analysis will be undertaken prior to each in-depth evaluation in order to assess the network's representativeness, in terms of both geographical distribution and the habitats protected. National monitoring of the conservation status of Natura 2000 sites and protected areas should be used as an indicator of favourable conservation status for the purposes of the target. Additional reporting from county administrative boards may be necessary to assess the status of individual sites.

▶ **THE COUNCIL PROPOSES** a revised interim target:

BYCATCH

By 2015, bycatch of marine mammals and seabirds will have no more than a negligible adverse impact on the populations concerned or the ecosystem.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **Bycatch must not threaten favourable conservation status or prevent that status being achieved.**
- **Quantitative milestone targets will be set in conjunction with the drawing up of action plans.**

The existing interim target for bycatch, namely that it should not exceed 1% of each population, has no biological basis if applied generally to all marine mammals. Current bycatches of seals pose no obvious threat to herds. All Swedish seal species have an adequate rate of population growth and satisfactory conservation status. For the common porpoise, bycatch should not be a significant problem in the Kattegat and Skagerrak, chiefly thanks to a dramatic decrease in the scale of gill-net fishing. As for the Baltic, there is a lack of data on both the population and the bycatch of this species.

From an animal welfare point of view, the goal is of course no bycatch at all, not even 1%. At the same time, numbers of the three seal species, and also the cormorant, are growing so rapidly that an assessment should be made of the need for control measures, with a view to limiting damage, reducing competition for commercial fish species and conserving valuable salmonid stocks, the biggest threat to which is predation.

Monitoring and indicators

No indicators exist for this target. Progress towards it will be monitored on the basis of logbooks and other on-board records, telephone interviews and observations. For species covered by the Habitats and Species Directive, monitoring of conservation status will be carried out under the terms of the directive.

▶ **THE COUNCIL PROPOSES** a revised interim target:

CATCHES AND RECRUITMENT OF FISH
By 2015, catches of fish, including bycatch, will have been brought into line with the ecological carrying capacity and resilience of the seas, by means of responsible and sustainable fishing of viable fish populations.

The present interim target 5 is intended to be met by 2008. That will not be possible: for several fish stocks the situation remains very critical, and in some cases it has in fact worsened. Most threatened stocks are managed under decisions reached by the EU Council. Currently agreed or proposed recovery plans have later target years than 2008. The overall target date for the EU's sustainable fisheries policy in the case of fished-out stocks is 2015. Sweden should press for effective measures to be introduced at the earliest opportunity. The proposed revision of the interim target highlights the need for an ecosystem approach and establishes a realistic timetable and measurable criteria for judging when the target is achieved.

The wording of the current target contains an indirect reference to the ecosystem approach. That approach means that ecosystems are to be used, but in ways that balance sustainable use with optimum conservation. Measures should be evaluated in the light of how ecosystem functioning and productivity are affected in the long term. Evaluations thus need to be founded on measurable indicators linked to a measurable target.

Monitoring and indicators

One specific indicator exists for this target: the spawning stock biomass of cod. Progress will also be monitored on the basis of ICES' annual estimates of the status of fish stocks.

▶ **THE COUNCIL PROPOSES** a revision and merger of the interim targets for noise and other disturbance and for discharges of oil and chemicals:

IMPACTS OF SHIPPING
By 2015, shipping will operate in such a way that the spread of alien species is prevented, waste is properly disposed of, discharges of oil and other harmful substances do not occur, and low levels of noise are achieved in sensitive coastal and archipelago areas.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- By 2015, all ships engaged in international trade which call at Swedish ports will have approved technical systems for treating ballast water that prevent the spread of alien species.
- By 2015, ships engaged in domestic trade will have taken suitable measures based on risk analyses performed in accordance with guidelines supporting the Ballast Water Convention.
- The number of waste receptacles, toilets and waste reception facilities in archipelago areas will have increased to meet existing needs.
- The number of illegal discharges of oil will have decreased compared with 2007.
- By 2015, areas with low levels of noise will be established in every county.
- By 2015, we will have a better understanding of the effects of underwater noise on marine mammals and fish.

Spread of alien species

One pathway for the spread of alien (non-native) species is shipping. Over 100 new species have found their way into Swedish waters and established reproducing populations, most of them in the last few decades. An organism released with ballast water can cause serious ecological and economic harm in its new environment, by spreading infections in sources of drinking water, eliminating native species, damaging fish and mussel farms etc. Once an introduced species has established a viable population, it is virtually impossible to eradicate it.

By 2016, all ships covered by the IMO's Ballast Water Convention are required to have phased out the practice of ballast water exchange and to have approved systems for treating ballast water on board, to keep concentrations of organisms and pathogens below specified levels.

Fouling of ships' hulls is another means by which alien organisms can spread. Hull paints often contain various toxic substances to prevent this.

Waste

Marine waste poses a threat to marine life and to humans, both directly and indirectly. It has impacts on wildlife and on visual amenity. Seabirds, seals and fish can become entangled in remnants of nets and plastic materials, or choke on plastics they mistake for food. Sewage supplies additional nutrients to the marine environment, and is an aesthetic as well as a health problem, especially if discharged in archipelago areas or harbours or near bathing spots. Marine litter can also be a vector for alien species. The quantity of waste on the seabed creates problems for the fishing industry, and littered beaches adversely affect tourism. Increased costs, difficulties getting staff etc. could pose an obstacle to future beach clean-up efforts.

It is illegal to discharge waste from a ship. Under current regulations, waste generated on a ship's voyage from its previous port is required to be disposed of ashore, and ports are required to receive such waste.

The Swedish strategy for tackling the problem of waste from recreational craft has been to build up an infrastructure enabling the waste to be disposed of on land. In their proposals for an action plan to establish 'special consideration' zones in coastal and archipelago areas, the county administrative boards of Sweden's coastal counties argue that this work needs to be stepped up, to achieve the aims of better waste management and a ban on discharges in special consideration zones. They also call for a separate review of the availability of toilets and reception facilities for sewage and domestic wastes in the vicinity of these zones, and for appropriate measures to be introduced.

Discharges of oil and other harmful substances

Although the practice is banned, ships sometimes discharge oil in the course of normal operations, from fuel tanks, engine rooms or ballast tanks. Some of these releases are due to carelessness or technical failures, while others are entirely deliberate. The number of discharges in the Baltic and the Kattegat fell from 488 in 1999 to 224 in 2005, despite growth in the volume of shipping. The decrease is due to a number of factors, including increased hours of aerial surveillance, greater awareness among crews, and also improvements in technology on board ships in recent years.

Recreational craft are exempt from the ban on discharges of oil. The simple two-stroke engines which up to now have been the dominant type of outboard motor can release up to a third of their fuel unburnt in their exhaust gases, with around half of this ending up directly in the water.

Low levels of noise

Good access to coasts and archipelagos is important, but individuals and society need to use such areas in ways that minimize disturbance of the natural environment. Noisy recreational boats and jet skis disturb both wildlife and humans. Intrusive boat traffic and, to some extent, aircraft overflights can flush waterbirds and other species from nests, resulting in poorer survival of eggs and chicks. People, too, need undisturbed areas, in order to enjoy key values of the archipelago environment.

The effects of noise disturbance on marine organisms are poorly understood, although there are studies which show that fish, birds and marine mammals can be sensitive to disturbance of this kind. Little is known, moreover, about the depths to which sounds from human activities exert an influence.

Monitoring and indicators

Regarding alien species, progress towards the target will be monitored by measuring:

- The proportion of ships calling at Swedish ports that are able to document that they have approved systems for treating ballast water (this indicator is currently being developed).

- The number of new alien species discovered in the marine environment.

With regard to waste, monitoring will be based on:

- The increase in the number of waste receptacles, toilets and waste reception facilities in archipelago areas.
- Questionnaire surveys and interviews on handling and perceptions of waste in archipelago areas.

Concerning discharges of oil and other harmful substances, progress will be tracked on the basis of:

- The number of illegal discharges of oil.

Progress on noise, finally, will be monitored by measuring:

- Perceptions of noise in noise-free areas (based on questionnaire surveys and interviews).
- Compliance with restrictions in special consideration zones.
- The number of noise-free areas and their regional distribution.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

RESTORATION OF INSHORE HABITATS

By 2020, by means of restoration measures, good conditions will be created for high biodiversity and natural recruitment of fish in shallow inshore environments.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **By 2012, the relevant authorities will have identified disturbed but potentially valuable, shallow inshore habitats important for biodiversity, as well as freshwater habitats important for coastal fish populations, and drawn up regional action programmes for their restoration.**
- **By 2015, half the sites included in action programmes will have been restored.**

Shallow, sheltered inlets are one of the coastal zone's most important habitats for a great many species of fish, birds, invertebrates and aquatic plants. Some 80% of commercial fish species use coastal waters at some point in their life cycle. Shallow soft sediments along the west coast of Sweden, for example, account for over three-quarters of total recruitment to the adult plaice population of the whole of the Skagerrak and Kattegat.

For a long time, the key habitats of coastal fish populations – in coastal rivers, sheltered inlets and inner archipelago areas – have been deteriorating as spawning and nursery grounds, and restoration is therefore important.

Coastal environments have long been exploited by humans, without sufficient account being taken of their natural assets. They have been encroached on, for example, by marinas, quays, fairways and dredging, but also by industrial plants, urban development, filling operations and road embankments.

Restoration measures should focus on recreating the natural functioning (biological integrity) of the habitats concerned, thereby promoting biodiversity in general. At present, restoration of coastal environments for purposes other than fisheries conservation is little understood.

It is very important to take fish, nature conservation and cultural heritage into account when designing action programmes and implementing measures. Prevention and conservation measures come under the interim target for the conservation of marine natural assets. The target proposed here is in part intended as a complement to those relating to protection and restoration under *Flourishing Lakes and Streams* and *Thriving Wetlands*, and measures under these three environmental quality objectives need to be coordinated.

Monitoring and indicators

In 2012 an evaluation will be carried out to establish whether the relevant authorities have drawn up regional action programmes and whether the Board of Fisheries and the Environmental Protection Agency have developed a joint database of state-funded restoration measures in aquatic environments.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

USE OF THE COASTAL AND ARCHIPELAGO LANDSCAPE

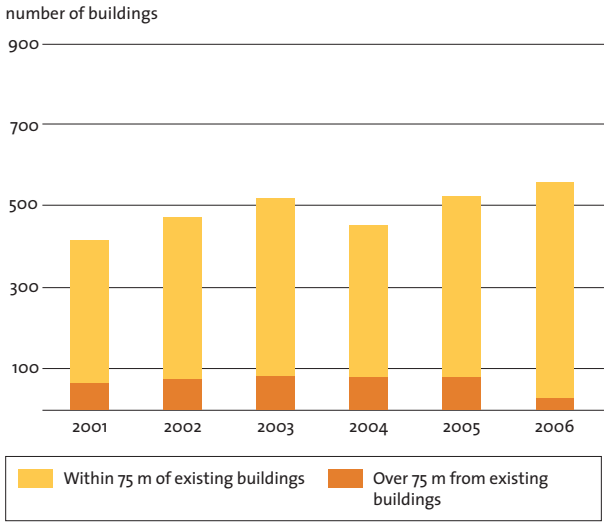
By 2015, the natural, cultural and recreational assets of the coastal and archipelago landscape will be conserved and enhanced through sustainable use.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Local authority comprehensive plans will provide guidance for, and regional development programmes, other instruments and arrangements for regional/local cooperation will lend support to, sustainable use and development within the small-scale structures and diversified economies of coastal and archipelago areas.
- Natural and cultural heritage assets will be known and accessible.
- The coastal and archipelago landscape will be accessible for outdoor pursuits and recreation.
- The area of islands, islets and coastal meadows used for grazing will increase.
- Buildings and built environments from different periods in the coastal and archipelago landscape will be managed in such a way as to maintain diversity.
- The number of particularly valuable environments where cultural assets are conserved on a long-term basis will be no less than 50.

New and intensified efforts are needed in the area of planning and management in order to preserve and develop sustainable use of the natural and cultural environments of coasts and archipelagos. A new interim target with such a focus is therefore proposed. The focus of this target does not mean that lower priority can be given to site protection in coastal and archipelago areas. Strict application of the shore protection regulations is an important means of conserving natural and recreational assets, on land and in water.

FIGURE 5.10.2 New construction within 100 m of the sea, 2001–2006



SOURCE: STATISTICS SWEDEN

In 2006, in Sweden as a whole, 555 new buildings were constructed within 100 m of the sea. The pace of new construction in this zone was thus higher than in the preceding five years. The proportion of buildings erected more than 75 m from existing ones was lower than in previous years. Such buildings are assumed to take up more new land than others and to result in the development of previously undisturbed sites.

Construction along shores adversely affects outdoor recreation and biodiversity. Not until new build slows down significantly or ceases altogether will the prospects of achieving the environmental quality objective improve. The trend, however, is for construction on such sites to increase.

To maintain the distinctive character of Sweden's coasts and archipelagos, traditional livelihoods need to be supported. This means that careful use should have priority over formal protection of farmed landscapes and cultural environments. A lower level of ambition when it comes to protection presupposes that management of such areas is developed and enhanced.

The environmental quality objective attaches great importance to long-term sustainable development and use of both coastal and archipelago areas and the marine environment. To achieve the objective, a cross-sectoral way of working will be required.

The ecosystem approach and the EU ICZM Recommendation represent two important principles in this context. The EU Water Framework Directive and the forthcoming Marine Directive require a coherent, overall approach to planning and resource use in coastal regions.

Numerous projects and inquiries relating to both planning and resource management in the country's coastal areas are under way.

Monitoring and indicators

- Trends for red-listed shore species favoured by grazing or mowing, e.g. marsh dandelions, glasswort and gentians.
- Number and quality of new comprehensive plans and Planning and Building Act decisions, to be reviewed in selected local authority areas.
- Numbers of visitors to visitor marinas and other destinations.
- Area receiving support for the restoration of farmed landscapes, based on grant applications.
- Area of pasture and meadow land receiving agri-environment payments under the Rural Development Programme (RDP).
- Number of natural and cultural environments in receipt of agri-environment payments under the RDP.
- Statistical indicators of flourishing coasts and archipelagos, as set out in National Heritage Board Report 2004:3 (e.g. number of fishing boats, number of agricultural enterprises and proportion of properties used as permanent residences).

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened marine species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.10.5 How far are we from achieving the environmental quality objective?

The interim targets and measures proposed are expected to create a better basis for attaining this environmental quality objective. However, the time scale of recovery in the marine environment is very long, and the objective therefore may not be met until several decades beyond 2020. Both positive and negative trends can be observed in the state of Sweden's seas. As far as commitment to action is concerned, the trend is positive, especially at a national level.

The key factors affecting the prospects of achieving *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* are:

- Climate change – higher temperatures could, for example, result in a dilution of salinity, reduced ice cover, changes in the species composition of ecosystems, and increased leaching of nutrients.
- Eutrophication – high nutrient levels promote algal blooms and exacerbate benthic oxygen depletion.
- Fisheries – if certain fish species disappear as a result of overfishing, the balance of ecosystems could be affected.
- Toxic pollutants – heavy metals and persistent organic pollutants either end up buried in sediments or become concentrated as they move up through food chains.
- Use of coasts and archipelagos – in attractive coastal regions, development pressures are growing.
- Developments in neighbouring countries – Sweden has little chance of influencing the state of its seas by its own efforts alone.

5.11 Thriving Wetlands

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Thriving Wetlands* can be met by 2020 if further action is taken. Wetland conservation and re-establishment are progressing slowly. Environmental stewardship must improve, especially in forestry. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim targets concerning the protection and management strategy and action programmes for threatened species had been met by the target year 2005; that the interim target relating to the Mire Protection Plan will be very difficult to meet within the defined time frame even if further action is taken; that the interim target on forest roads had not been met by 2006, the target year; and that the interim target for wetlands on agricultural land will be possible to meet if additional measures are undertaken.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Withdraw the interim target concerning a strategy for protection and management, which had been achieved by the target year 2005.
- Introduce a new interim target for wetland conservation, with 2015 as the target year. This interim target should include the current interim target relating to the Mire Protection Plan with 2010 as its target year.
- Introduce a new interim target on consideration for wetlands, with 2015 as the target year. This interim target should partially include the interim target on forest roads, which had not been achieved by the target year 2006.
- Revise the interim target for wetlands on agricultural land and set 2015 as the target year.
- Deal with issues relating to the withdrawn interim target on action programmes for threatened species under *A Rich Diversity of Plant and Animal Life*.

5.11.1 Progress towards the environmental quality objective

THRIVING WETLANDS

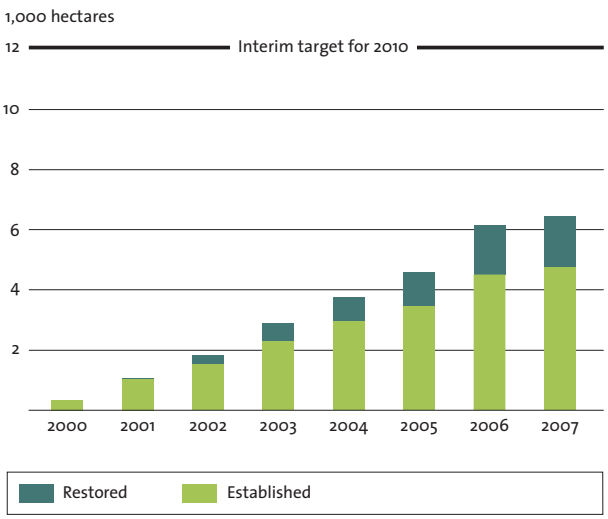
The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.

The Environmental Objectives Council judges that the environmental quality objective *Thriving Wetlands* can be met by 2020 if further action is taken. The interim target on forest roads was not achieved within the defined time frame. Mire protection and re-establishment of wetlands in the agricultural landscape are progressing slowly. Although these three important interim targets will not be met on time, the situation looks fairly promising in the slightly longer term and there are ample indications that efforts to promote wetlands will gather momentum over the next few years. The government agencies most closely involved have adopted a joint National Strategy for Thriving Wetlands, the Mire Protection Plan has been revised, and work in the Natura 2000 network and on action programmes for threatened species is proceeding.

Issues relating to consideration for aquatic environments and wetlands are expected to become more dominant in agriculture, fishing and, especially, forestry during the years ahead. This is largely because of efforts in water management and implementation of the Water Framework Directive. Conservation and re-creation of wetlands may become key tools for mitigating the impact of climate change and changed precipitation patterns.

Much of the responsibility for action rests on the county administrative boards. It is vital for them to receive both adequate resources and scope for freely implementing the requisite measures. More stringent targets, intersectoral cooperation and further action are, however, required for the environmental quality objective to be achievable.

FIGURE 5.11.1 Wetlands established and restored on agricultural land, 2000–2007



Note: Cumulative values.

SOURCES: SWEDISH BOARD OF AGRICULTURE DATABASES, PROST AND DAWA, AND DATA FROM COUNTY ADMINISTRATIVE BOARDS, SWEDISH WETLAND FUND AND WWF

The area of wetlands created and restored in the farmed landscape is increasing at a fairly steady rate. The greater part of the wetlands in southern Sweden have been funded by the Rural Development Programme (RDP) for Sweden. Some changes have been made in the new RDP (2007–13), and these will probably boost the rate of progress in wetland promotion. The area for 2007, however, is relatively small (some 290 hectares) because initiating activities during the first year of the programme took time.

5.11.2 Progress towards the current interim targets

INTERIM TARGET 1

STRATEGY FOR PROTECTION AND MANAGEMENT

A national strategy for the protection and management of wetlands and wet woodlands will be drawn up by 2005.

This target was met in December 2005, when the Swedish Environmental Protection Agency, the Forest Agency, the Board of Agriculture and the National Heritage Board jointly adopted a National Strategy for Thriving Wetlands. The Strategy reflects these agencies' common view of how to boost current efforts and what measures are required to meet the environmental quality objective. The Strategy has been distributed to many different stakeholders and, for example, is reflected in the new RDP. Achievement of this interim target is not being monitored

further, since it is itself a measure aimed at improving various aspects of work on *Thriving Wetlands*.

INTERIM TARGET 2

MIRE PROTECTION PLAN

By 2010 long-term protection will be provided for all the wetland areas listed in the Mire Protection Plan for Sweden.

The 'Mire Protection Plan for Sweden' was adopted in 1994 for the purpose of identifying the wetland areas most worthy of protection (in terms of nature conservation value) and to pave the way for systematic protection. On 1 October 2006 a total of 276 sites remained to be protected by 2010. During the period 1995–2006, 92 of the mires listed in the Plan – an average of just under eight a year – became subject to protection. For the interim target to be achieved on time, the pace at which new sites are protected needs to be increased almost tenfold.

This target will thus not be met within the defined period. Only in five counties (Blekinge, Gotland, Stockholm, Västmanland and Örebro) do the respective county administrative boards judge that it will be achieved within the appointed time. Implementing the current interim target 2 and protecting all the mires listed in the 1994 Mire Protection Plan by 2010 is expected to cost roughly SEK 1.8 billion, which is somewhat lower than the Government's previous estimate. The average annual cost would then be SEK 464 million during the period 2007–10.

The Environmental Protection Agency and the county administrative boards jointly revised and supplemented the Mire Protection Plan in 2006. However, the interim target covers only the sites included in the 1994 Plan and those that superseded original ones in the revised version. The new Plan was adopted in March 2007. In conjunction with the revision of the Mire Protection Plan, the county administrative boards drew up timetables for its implementation, and several stated their view that 2015 would be a more realistic target year.

INTERIM TARGET 3

FOREST ROADS

By 2006 forest roads will not be built over wetlands with significant natural or cultural assets or in such a way as to adversely affect such wetlands.

This interim target is reflected in regional targets in every county except Östergötland. Ten counties have adopted a more stringent wording, for example including drainage and other types of exploitation, and/or identified wetland types or wetlands in nature conservation value categories 1–3.

The interim target defines a zero vision: that no forest roads are to be laid across wetlands and wetland forest areas of high natural or cultural value. Forest roads near wetlands of high value must not cause damage. For the monitoring of progress towards this target, the term 'wetlands with significant natural assets' has been restricted to wetlands and wetland forest in nature conservation value categories 1 and 2. Which wetlands of high cultural value are covered has not been defined, since the knowledge base is inadequate.

The target on forest roads was not met by the target year 2006. The Swedish Forest Agency's analysis, which excludes cultural heritage assets, shows that forest roads have been built across 89 of the 7,600 wetlands surveyed. Several counties, including Norrbotten, Jämtland and Västernorrland, are not included in this analysis. Only six of the 17 county administrative boards (Värmland, Örebro, Västmanland, Gotland, Kalmar and Skåne) judge that their regional target has been met. For the four major forest counties (Norrbotten, Västerbotten, Jämtland and Dalarna) and four other counties, the county administrative boards concerned judge that the regional target has not been achieved.

Since the mid-1990s, long-term planning of the road network has deteriorated. It is rare for forest owners to engage in cooperation. The high felling rates of the present day exert continued pressure to build forest roads across wetlands. During this century to date, some 1,700 km of roads have been laid annually. The need is most marked in northern Sweden. In the south, the road network is already extensive, but maintenance of existing roads is expected

to increase. This may exacerbate the impact on wetlands. Climate change and mild winters may make it more difficult to use temporary winter roads and further increase the need for forest roads.

INTERIM TARGET 4

WETLANDS ON AGRICULTURAL LAND

At least 12,000 hectares of wetlands and ponds will be established or restored on agricultural land by 2010.

Over the period 2000–6, 4,505 ha of wetlands were created and 1,641 ha restored. Accordingly, at the present rate, some 9,500 ha will have been established or restored by 2010. This is far short of the national area target. The indicator of established and restored wetlands shows that the rate has been fairly steady, averaging 878 ha a year. The peak in 2006, when 1,069 ha of wetlands were created and 490 ha restored, was probably due to the completion of many projects during the last year of the old Rural Development Programme (RDP).

The largest area of wetlands created, just under 900 ha, has been in Skåne. This is nonetheless far below the regional target of 2,500 ha. Only the county administrative boards of Kronoberg and Blekinge judge that their regional interim targets will be met. In Södermanland and Östergötland, wetlands corresponding to more than 70% and 80% of the respective regional area targets were established up to and including 2006. In several other counties, very slow progress has been made.

The 6,510 ha of wetlands established in Sweden in 1995–2006 have an aggregate estimated reduction effect of a good 600–650 tonnes of nitrogen a year. To achieve the target of a further 12,000 ha of wetlands (with 1995 as the base year) altogether trapping 2,100–2,400 tonnes of nitrogen annually, an additional 8,500 ha of wetlands need to be established in 2007–20. This is based on the assumption that they remove an average of 175 kg of nitrogen per hectare.

Uniform methods of evaluating the effect of man-made wetlands on biodiversity are lacking. However, a number of studies including inventories of various groups of organisms show that such wetlands often serve as the habitat for a highly varied array of species, and that species on the Swedish Red List are found in a high proportion of them. Monitoring of the impact of artificial wetlands in terms of the cultural environment indicates that the majority of ponds to date are of minor or negligible benefit in that respect.

The forecast for this target is cautiously favourable. The new RDP for 2007–13 includes creation and restoration of wetlands and wet pasture land and hay meadows in a scheme that allows county administrative boards to set priorities for the measures to be undertaken on the basis of regional conditions. The Government allocated extra funds for county wetland promotion in 2007, as previously.

INTERIM TARGET 5

ACTION PROGRAMMES FOR THREATENED SPECIES

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

The list of species in need of action programmes is revised regularly. This interim target is based on the statement in the Environmental Objectives Bill that 3–19 species may need special initiatives. Action programmes now exist for 19 species associated with wetlands and for one habitat, rich fens; and more programmes are to be developed. The interim target has thereby been attained. Issues relating to threatened species and action programmes will henceforth be assigned to the environmental quality objective *A Rich Diversity of Plant and Animal Life*.

The measures that are to be carried out, according to these programmes, often include restoration of habitats. These measures are being implemented both in protected areas and in the wider countryside. Although the situation for several species associated with wetlands has improved slightly in recent years, there will be a need for measures focusing on particular species in the future as well. Re-establishing wetlands or restoring their hydrology favours many of the red-listed wetland species and also the wetlands' water-conserving and nutrient-removing functions in the landscape. Biotopes like rich fens, as well as the majority of threatened species, are in need of long-term management or maintenance measures.

5.11.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Thriving Wetlands*:

The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.

▶ **THE COUNCIL PROPOSES** no change to the specifications of the environmental quality objective on a time scale of one generation.

For specifications of the objective, see opposite.

5.11.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the introduction of a new interim target that partially includes the interim target for forest roads:

CONSIDERATION FOR WETLANDS
By 2015, the natural and cultural heritage assets of valuable wetlands will no longer be adversely affected by human activities.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Land drainage, peat extraction and damage from off-road driving will not occur.
- Felling and other forestry measures will be carried out with ample consideration for the environment.
- Roads will be constructed in such a way as not to cause damage.

Roughly a quarter of Sweden's original wetland area is judged to have disappeared owing to drainage and cultivation. Nevertheless, with more than 10 million ha remaining, this is one of the world's countries with the most abundant wetlands. Those that survive today make up around a quarter of Sweden's land area.

The National Wetland Inventory (*Våtmarksinventeringen*, VMI) has shown that more than 80% of the remaining wetlands are affected by human intervention to a varying degree. The commonest interventions are drainage, clear-felling in adjoining areas, and building various types of roads in, or connecting with, wetlands. As a result, hydrology is altered to some extent in 78% of wetlands. Almost a fifth of Swedish wetlands are entirely or locally subject to strong hydrological disturbance or judged to be destroyed. The inventory generally covers only larger wetlands, amounting to more than 10 ha in the south and 50 ha in the north of Sweden.

The proposed interim target is crucial to achieving *Thriving Wetlands*. Legislation and economic instruments in the past few years have changed from facilitating exploitation to protecting wetlands. But Sweden's wetlands are still subject to various activities that are jeopardizing their values and functions, such as ditch clearance, off-road driving and road-building.

The interim target focuses on preventing an adverse impact on identified valuable wetlands. A sound knowledge base and clear demarcation will enhance the prospects of doing that. The aim is to bring about greater concern for wetlands in general.

Monitoring and indicators

Qualitative monitoring is based on a continuous satellite-based surveillance system, initiated by the Environmental Protection Agency in 2007. This remote-sensing system is supplemented by random sampling as part of the National Inventory of Landscapes in Sweden (NILS). In addition, low-frequency monitoring of selected indicative species groups in wetlands is under way.

Some quantitative monitoring of pressures on wetlands and action by the supervisory authorities should be introduced. Examples of what should be monitored are the number of consultations on forest roads taking place and the number of applications and notifications relating to drainage projects submitted.

Indicators based on change analysis of satellite data, which also monitor consideration for wetlands in forestry, need to be introduced. Geographical registration of cases for monitoring of pressures and of action by the supervisory authorities should permit an indicator of encroachment on valuable wetlands.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
There will be wetlands of various kinds all over the country with preserved biodiversity and cultural heritage assets.	No change.
Threatened species will be able to spread to new sites within their natural ranges, ensuring long-term viable populations.	No change.
Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.	No change.
Peat extraction will not be carried on at sites of high nature conservation or cultural heritage value or in such a way as to have significant adverse effects on biodiversity.	No change.
As far as possible, wetlands will be protected against drainage, peat extraction, road construction and other development.	No change.
The recreational value of wetlands will be protected.	No change.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target that includes the current interim target relating to the Mire Protection Plan:

WETLAND CONSERVATION

By 2015, the natural and cultural environment of particularly valuable wetlands will be conserved.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- The conservation objectives adopted will be met for at least 90% of wetlands.
- All mires listed in the Mire Protection Plan for Sweden will enjoy long-term protection.
- Cultural traces will be identified and documented.

Wetlands of particular value need to be conserved in the long term, and this requires special measures of protection and management. Sweden also has an international responsibility for conserving wetlands under, for example, the Ramsar Convention on Wetlands, the Convention on Biological Diversity, and the Habitats and Bird Directives. Long-term protection and management measures on a continuous basis need to be more clearly linked to the environmental quality objective. The Natura 2000 network and the Mire Protection Plan constitute the basis for the long-term conservation of a representative selection of the finest examples of various wetland types around the country. Implementing the revised Mire Protection Plan means that long-term protection will be afforded to 381 sites with a total area of more than 378,000 ha.

Very much thanks to the introduction of the Habitats Directive and of Natura 2000, a monitoring system for nature conservation and biodiversity is now being developed. Accordingly, the interim target now also includes the quality to be attained in wetlands.

All traces, both cultural and biological, that combine to show how wetlands have been used as a natural resource over the centuries constitute the wetlands' cultural heritage. The intangible cultural heritage comprises naming customs, traditions and old methods of wetland use. An improved knowledge base is needed to draw attention to the importance of wetlands as cultural heritage and to ensure that cultural traces in wetlands are preserved and looked after. Continued management is often one requirement.

Monitoring and indicators

Monitoring of the conservation status of habitat types and species in Natura 2000 areas and protected areas takes place by means of a target-oriented monitoring system based mainly on biological parameters. It should

be possible to use monitoring of structures, functions and species in random area sampling, as well as the proposals for conservation objectives on a biogeographic (national) level for habitat types and species. The habitats that should be covered by this interim target include mires, springs, wetland forests, shoreline habitats, wet grasslands and small lakes and ponds.

Methods of monitoring cultural traces in particularly valuable wetlands are being developed by the National Heritage Board.

Protection measures in the areas covered by the Mire Protection Plan are monitored annually. In its annual survey of progress towards this interim target, the Environmental Protection Agency has previously reported mire sites that are at least 75% protected as nature reserves or national parks, or under Natura 2000. In the future, follow-up will be based on county administrative boards' assessments of whether long-term protection is in place for individual sites in their entirety. A qualitative indicator for monitoring the conservation status of wetlands in national parks, nature reserves and Natura 2000 sites needs to be developed.

▶ **THE COUNCIL PROPOSES** a revised interim target:

WETLANDS ON AGRICULTURAL LAND

By 2015, at least 5,000 hectares of wetlands will be established or restored on agricultural land.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **Biodiversity will be fostered through habitat creation and improvement.**
- **At least eight large (>150 ha) wetland areas or lakes in the agricultural plains will be re-established.**
- **Wetlands will be designed with reference to the natural and cultural environment of the surrounding landscape.**
- **Cultural traces will be preserved and exposed to view.**
- **The nitrogen removal effect will amount to at least 650 tonnes a year.**

Here, the interim target is revised with respect to the target year and the area of wetlands to be established and/or restored. To achieve national targets for biodiversity and reduced emissions of nitrogen and phosphorus to the sea, wetland re-establishment needs to continue after 2010 as well. The proposed interim target is on the same level of ambition as the current one (1,100 ha/year), but clarifies the aim of establishing and restoring various kinds of wetlands in order to improve water quality and provide habitats for plants and animals, and also the aim that this should take the cultural environment into consideration and strengthen associations with Sweden's cultural history.

Action to establish and restore wetlands is important in a landscape perspective, not only for biodiversity but also to make water flows more even and for recreational purposes. Wetlands close to urban areas are of key educational importance and, with their bird observation towers and information material, attract frequent visitors.

Wetlands can raise the groundwater level, slow down the progress of water through the landscape and reduce variation in water flows. The risk of high flows and flooding thereby decreases, especially if floodplains and their capacity to contain natural fluctuations in water levels are re-established.

Historically, wetlands have been crucial to fodder production in large parts of the country. This may be difficult to discern from the present-day landscape. Accordingly, only marginal losses of wetlands of high cultural value are acceptable from the cultural heritage point of view.

Nitrogen removal

Since wetlands are largely financed under the agri-environment scheme, the focus has hitherto largely been on establishment of wetlands as sinks, i.e. for nutrient retention. To achieve the Swedish Board of Agriculture's target for nitrogen removal in wetlands (2,100 tonnes a year by 2020), the wetlands established or restored in the years 2010–20 need to retain an additional 1,200–1,300 tonnes of nitrogen per year. By 2010, the reduction rate is expected to be 800–900 tonnes of nitrogen a year.

Nitrogen abatement can be improved by placing wetlands in such a way as to give them a larger drainage area with a high proportion of arable land. If they can remove 175 kg of nitrogen per hectare annually, some 7,500 ha of wetlands need to be established for this purpose between 2011 and 2020. A certain portion of the nitrogen retention aimed for should be achievable through restoration and performance improvements in existing wetlands. The needs analysis should be supplemented to include phosphorus removal.

Biodiversity – wetland birds

The Board of Agriculture has carried out a gap analysis for wetland birds. The results show a need to restore 30–40 lakes in the agricultural plains, a large number of small lakes and ponds, and at least 32,000 ha of wet heaths and meadows, and to adapt management for the benefit of corncrake and other species in 6,000 ha of arable land or shoreline meadow.

The varying habitat and management requirements of these birds suggest that conditions for many other species will also improve if the proposed measures are implemented.

The area target of 5,000 ha of restored wetlands for the period 2011–15 will probably not fully satisfy needs in terms of biodiversity, the starting point now being the requirements of wetland birds. The latter can be partially met by changing the management intensity or regime, for example late-mown meadow instead of pasture, which is not included in the area of restored land.

Biodiversity – fish

Wetlands for nutrient retention often need to be placed near the coast to afford a high removal effect. They can then serve as environments for many coastal fish species. Estimates indicate that 4,000 ha of wetlands, suitably located, could yield an annual production of 10–100 million perch fry.

Monitoring and indicators

The area of wetlands created and restored in the agricultural landscape is monitored on an annual basis. Data on wetlands funded through the RDP are taken from the Board of Agriculture's databases. Information about wetlands established or restored with other funding is obtained from the county administrative boards, the Swedish Wetland Fund and the WWF.

It is essential to monitor qualitative aspects, too, of the wetlands established and restored since 2002, especially after the planned changes in the RDP for 2007–13 have come into force. A large-scale evaluation should be implemented around 2009–10 to permit changes to payment rates and rules. It is also important for evaluation of individual new wetland complexes and restoration projects to take place, especially where these are on a large scale.

A method of carrying out inventories of biodiversity before and after implementation of measures needs to be devised. The Environmental Protection Agency is developing its monitoring within the framework of action programmes for threatened species and habitat types. Assessment of improved conservation status will take place less frequently, in line with the monitoring in Natura 2000. A simple model for estimating the nutrient removal effect of wetlands needs to be developed.

The National Heritage Board has developed a method for monitoring the establishment of wetlands. A system of monitoring the overall impact of wetland creation and restoration on the cultural environment in a landscape perspective needs to be devised. The 'Established wetlands' indicator is being revised to cover created and restored wetlands, instead of monitoring how the actions are funded. Qualitative indicators for nutrient retention, biodiversity and cultural heritage values need to be developed.

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.11.5 How far are we from achieving the environmental quality objective?

The interim targets, policy instruments and measures now proposed are not entirely sufficient for the environmental quality objective *Thriving Wetlands* to be met. It is essential for the Habitats and Species Directive to be implemented and for progress to be made in national efforts to bring about sectoral responsibility and sustainable use.

Thriving Wetlands focuses on the physical condition of wetlands and use of land in and around them. Wetlands are affected by climate change and emissions of nitrogen, in particular, to air and water.

The interim targets now proposed are milestone targets focusing on particularly urgent issues where specific actions are needed. An example of one such target is the area target of 5,000 ha of created wetlands on agricultural land for the period 2011–15. This will probably not cover the entire need in terms of biodiversity. The starting point now is wetland birds' requirements. There is also a need for restoration of mires, wetland forests and small lakes and ponds in the forest landscape.

The key factors affecting the scope for achieving *Thriving Wetlands* are:

- Compliance, and supervision of compliance, with existing legislation and guidelines. In particular, environmental stewardship in forestry must be improved.
- Combined effects of human wetland use and climate change, such as old ditch systems and changed precipitation patterns.
- Implementation of measures in forestry and agriculture.
- Policy decisions on resources for land purchase, compensation payments and nature conservation agreements, and for management and restoration of protected areas.
- Policy decisions on resources for administrative staffing at the county administrative boards.
- Knowledge accumulation and surveys of the cultural heritage assets of wetlands.
- Policy decisions on government and EU-funded payments for restoration and management of wetlands after 2013, when the current RDP comes to an end.
- Landowners' interest in wetlands, which may decrease if growing cereals or energy crops is regarded as a more attractive option.

5.12 Sustainable Forests

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *Sustainable Forests* will be very difficult or not possible to meet by the target year 2020, even if further action is taken. For dead wood, large trees and mature forest with a large deciduous element, the trends are in the right direction. Nevertheless, forests of very high nature conservation value are being felled and cultural remains in forest areas are being damaged. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim targets for long-term protection of forest land and protection of cultural heritage will be very difficult to achieve within the defined time frame even if additional measures are taken; that the interim target for enhanced biological diversity can be met within the time frame; and that the interim target concerning action programmes for threatened species had been met by 2005, the target year.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for long-term protection of forest land with a revised interim target for conserving forest land of high conservation value, with 2020 as the target year.
- Introduce a new interim target for management of formally protected and voluntarily conserved forest land, with 2011–20 as the target years.
- Introduce a new interim target for structures of biological value on productive forest land, with 2020 as the target year. This interim target partially includes the interim target for enhanced biological diversity, which will be withdrawn after its target year 2010.
- Revise the interim target relating to protection of cultural heritage and set 2015 as the target year.
- Introduce a new interim target for the environment in and around water in the forest landscape, to be met from 2010 onwards.
- Deal with issues relating to the withdrawn interim target on action programmes for threatened species under *A Rich Diversity of Plant and Animal Life*.

5.12.1 Progress towards the environmental quality objective

SUSTAINABLE FORESTS

The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded.

This environmental quality objective is intended to be achieved within one generation.

The assessment made is that this environmental quality objective will not be achieved by 2020. Regarding the state of the environment, several opposing trends are noted. In part, biological diversity in forests continues to decline. The felling rate in forests is very high, partly because demand for biofuels is rising. Use of forest resources is intensive.

Forests of very high nature conservation value are still being felled, and regeneration felling with a continuing lack of proper attention to conservation is also impairing diversity. Several common forest species are declining. Regeneration felling of near-natural or semi-natural forest stands is the single measure that is judged to threaten the largest number of species. At the same time, some basic preconditions for biodiversity are improving: examples are the quantity of dead wood, the number of large trees, mature forest with a large deciduous element, etc.

The cultural heritage assets of Sweden's forests incur an unacceptable degree of damage due to forestry. Environmental consideration in forestry is inadequate, and natural assets and cultural remains alike are therefore being damaged.

One general conclusion is that more stringent interim targets are needed. Current target levels would entail continued felling in high-value areas, resulting in major difficulties in achieving *Sustainable Forests* even in the long term. For this objective to be met, the requisite measures need to be taken without delay.

5.12.2 Progress towards the current interim targets

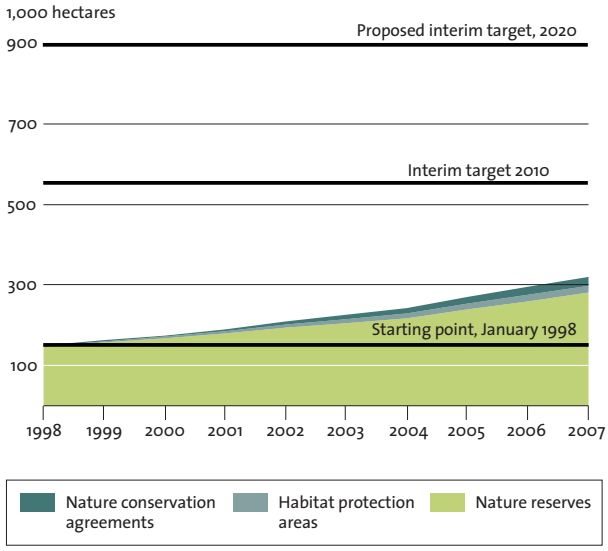
INTERIM TARGET 1

LONG-TERM PROTECTION OF FOREST LAND

A further 900,000 hectares of forest land of high conservation value will be excluded from forest production by the year 2010.

The Environmental Objectives Council judges that this interim target cannot be met by the target year 2010. At the present rate, an area totalling some 250,000 ha is expected to be excluded from production by means of formal protective instruments up to 2010. As for voluntary conservation, the forest

FIGURE 5.12.1 Total area of formally protected forest outside montane forest zone, 1998–2007



SOURCES: NATURE RESERVES, 1999–2007: SWEDISH ENVIRONMENTAL PROTECTION AGENCY. HABITAT PROTECTION AREAS AND NATURE CONSERVATION AGREEMENTS: SWEDISH FOREST AGENCY

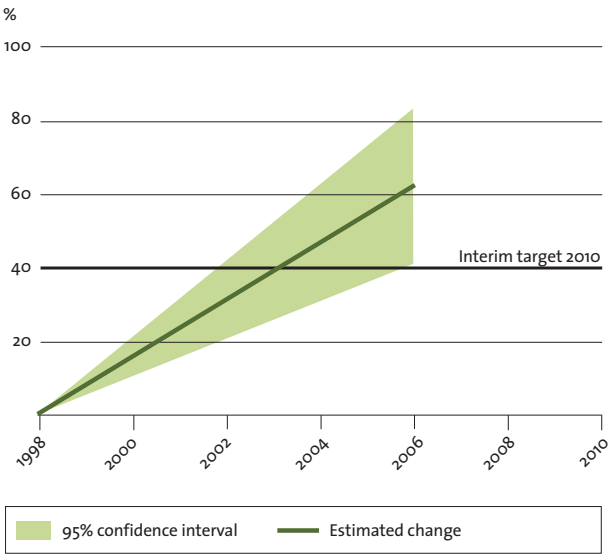
Under the current interim target, with 2010 as the target year, a further 400,000 ha of forest land is to be given formal protection, bringing the total target to some 550,000 ha (see diagram). Under the proposed interim target for 2020, 1,600,000 ha of forest land nationwide is to have formal protection. Note that the diagram relates only to forest below the montane forest zone. Within this zone there is, at present, some 600,000 ha of formally protected forest and, under the proposal, an additional 100,000 ha is to be protected. Combined with the target level in the diagram (900,000 ha), this makes a total of 1,600,000 ha.

industry has made major contributions. The target is considered not to have been fulfilled yet. The failure to extend formal protection on time is judged to be serious, since it exacerbates the risk of Sweden losing forest of high conservation value.

The interim target relates to forest land outside the montane forest zone. Of the total area excluded from forest production, nature reserves are to account for 320,000 ha and habitat protection areas for 30,000 ha of productive forest land, while nature conservation agreements are to cover 50,000 ha. Forest owners are expected to set aside at least a further 500,000 ha on a voluntary basis, making a total of at least 730,000 ha of productive forest land subject to voluntary protection by 2010.

In efforts to extend long-term protection of forest land to date, cultural heritage assets have not been taken into consideration on a sufficient scale.

FIGURE 5.12.2 Change in volume of hard dead wood in 1998–2006, excluding effects of winter storm Gudrun in 2005



Note: The confidence interval shows the range within which there is a 95% probability of the true change lying.

SOURCES: SWEDISH NATIONAL FOREST INVENTORY, SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES, AND SWEDISH FOREST AGENCY.

The volume of hard dead wood is continuing to increase throughout Sweden. Owing to winter storm Gudrun, the scheduled processing of dead wood did not take place during 2005. The figure for this year has therefore been excluded and replaced by the mean for 2004 and 2006.

INTERIM TARGET 2

ENHANCED BIOLOGICAL DIVERSITY

By 2010 the amount of dead wood, the area of mature forest with a large deciduous element and the area of old forest will be maintained and increased by:

- *increasing the quantity of hard dead wood by at least 40% throughout the country and considerably more in areas where biological diversity is particularly at risk;*
- *increasing the area of mature forest with a large deciduous element by at least 10%;*
- *increasing the area of old forest by at least 5%;*
- *increasing the area regenerated with deciduous forest.*

With the current trend, these targets will be met with a very ample margin. The volume of hard dead wood and the areas of old forest and mature forest with a large deciduous element are increasing sharply, in all cases more in the south than in the north of the country, where progress is very slow. Up to and including 2005, the volume of hard dead wood rose by some 60%, the area of old forest by more than 30% and the area of mature forest with a large deciduous element by some 15%. The area regenerated with deciduous forest appears to have become larger as well.

INTERIM TARGET 3

PROTECTION OF CULTURAL HERITAGE

By 2010 forest land will be managed in such a way as to avoid damage to ancient monuments and to ensure that damage to other known valuable cultural remains is negligible.

This target is considered not to be achievable by 2010. The levels of damage being caused to ancient monuments and other cultural remains in conjunction with forestry are still unacceptably high. The situation reported in the in-depth evaluation of 2004 persists to this day, in all essentials. Site preparation is still the measure that causes the most severe damage; at the same time, it is often a precondition for achieving good regeneration. As far as ancient monuments are concerned, good data to track the impacts of foresty are available. Regarding other cultural remains, data are poorer in quality.

INTERIM TARGET 4

ACTION PROGRAMMES FOR THREATENED SPECIES

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target is judged to have been met. By the end of 2005, a total of 23 action programmes for threatened species had been drawn up. These contained action proposals concerning 52 threatened species. The programmes are expected, in the long term, to benefit a large number of other species as well. Many forest owners state that they attach value to aspects other than timber production in the management of their forests.

5.12.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *Sustainable Forests*:

The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
The natural productive capacity of forest land will be preserved.	No change.
The natural functions and processes of forest ecosystems will be maintained.	No change.
Natural regeneration will be practised where the land is suitable for this method.	No change.
The natural hydrology of forests will be protected.	No change.
No remedial measures will be taken against the effects of forest fires.	No change.
Forests with valuable natural and cultural heritage assets, and in need of management, will be managed in such a way as to preserve and enhance those assets.	No change.
Forests where there is great variation in the age of trees and composition of tree species will be protected.	No change.
Cultural monuments and environments will be protected.	No change.
The importance of forests as means of experiencing nature and enjoying outdoor recreation will be safeguarded so that forests contribute to good public health.	No change.
Threatened species and habitat types will be protected.	No change.
There will be viable populations of native plant and animal species living in natural conditions.	No change.
Threatened species will be able to spread to new sites within their natural ranges, ensuring viable populations.	No change.
Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.	No change.

5.12.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

CONSERVING FOREST LAND OF HIGH CONSERVATION VALUE

By 2020, the area of productive forest land of high conservation value that is excluded from forest production will amount to 1,600,000 ha with formal protection and 1,000,000 ha subject to voluntary conservation.

The basis for this proposed interim target is the general aims specified in the *Sustainable Forests* objective. Three areas relating to formal protection and voluntary conservation of forest land are included:

- Conservation of biodiversity.
- Safeguarding of cultural heritage.
- Protection of recreational assets.

The aim of conserving biodiversity is broad and far-reaching. It includes, for example, all species groups, and every species should be able to survive in the long term and be dispersed throughout its natural range. The landscape perspective is central. The natural functions and processes of the forest ecosystem must be preserved.

The general aims within *Sustainable Forests* tally with the international commitments Sweden has made, mainly by ratifying the UN Convention on Biological Diversity. Sweden is also covered by the objective defined in the Sixth Environment Action Programme of the European Community, whereby losses of biodiversity are to be halted by 2010. The level proposed is underpinned by modern knowledge of biological conservation.

Monitoring and indicators

Monitoring of forested areas voluntarily conserved by the forest industry and the notion of 'forest land of high conservation value' need to be developed in consultation with the stakeholders involved. Data on formal protection are obtained from the responsible public agencies' statistics on their own activities.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

MANAGEMENT OF FORMALLY PROTECTED AND VOLUNTARILY CONSERVED FOREST LAND

During the period 2011–20, forest land in need of management in formally protected and voluntarily conserved areas will be provided with the management required.

Several of the Government's specifications of the environmental quality objective on a time scale of one generation call for management.

Some 4% of productive forest land in Sweden is formally protected. Approximately three-quarters of this area is in the montane zone and comprises near-natural or semi-natural forest. In the rest of the country, too, such forest makes up the greater part of the forested area subject to formal protection.

These formally protected areas require the kind of management that is necessary to retain high-priority features of conservation interest and to attain the specific purpose of the protection. Protected forest areas below the montane region constitute just over 1% of forest land. In relation to the need for awareness of natural, cultural and recreational assets in the forest landscape as a whole, the need for management action in protected forest areas is relatively minor.

Management that involves conservation and development of natural and cultural heritage assets in high-value areas is essential. The biological cultural heritage of forests depends on active management measures to preserve its value. Coupled with the natural assets of forest areas, such measures enhance their recreational value.

Monitoring and indicators

This interim target will be monitored by means of summarized statistics on activities from the public agencies responsible (the Environmental Protection Agency and the Forest Agency). For voluntary conservation, the Forest Agency's monitoring system should also include management actions that have been carried out.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target, to include parts of the current interim target on enhanced biological diversity:

STRUCTURES OF BIOLOGICAL VALUE ON PRODUCTIVE FOREST LAND

By 2020, in order to enhance and preserve biologically valuable structures, the volume of hard dead wood will increase by at least 30 million cubic metres standing volume nationwide. By the same year, the area of young and semi-mature forest with a large deciduous element will be at least maintained, and the area of mature forest with a large deciduous element will increase by at least 10%.

This interim target refers to two factors, dead wood and forest with a large deciduous element. Both these factors are of high biological relevance in forests, with a direct or indirect bearing on conservation or enhancement of biodiversity in the forest landscape. Every forest owner can, in managing forest land, make a direct contribution to meeting the targets.

Monitoring and indicators

This interim target will be monitored through the National Inventory of Forests (RIS).

▶ **THE COUNCIL PROPOSES** a revised interim target:

PROTECTION OF CULTURAL HERITAGE

Forest land will be managed in such a way that traces of historical human use and presence are preserved and ancient monuments and the sites they occupy are not damaged. By 2015, compared with 2010, the number of other cultural remains that are damaged annually in conjunction with forestry operations will be halved.

Preserving the cultural heritage of forests is a key element in *Sustainable Forests*. Despite measures to date, ancient monuments and cultural remains continue to be damaged on an unacceptably large scale as a result of forestry.

Monitoring and indicators

The intention is to obtain data on damage to ancient monuments from the damage inventories compiled by the National Heritage Board and the Swedish Forest Agency. For other cultural remains, monitoring is intended to take place by means of the Forest Agency's revised Polytax system.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

ENVIRONMENT IN AND AROUND WATER IN FOREST LANDSCAPE

From 2010, forestry operations will not entail run-off of organic or inorganic material into watercourses. When watercourses are crossed, the natural bed of the watercourse will be preserved and no barriers to migration will be created. At least 90% of the length of watercourses and lake and marine shorelines affected by forestry operations will have buffer zones, the ecological functions of which will be preserved or enhanced.

The effects of neglected or poor conservation practice in and around aquatic environments in the forest landscape are numerous and severe in relation to the area affected. They may consist in direct physical disturbances in the form of increased exposure to the sun, barriers to migration or hydrological changes. They may also consist in chemical influence in the form of, for example, increased inputs of sediment, nutrients, metals or acid water. All these disturbances may have a negative impact on water-living organisms.

Since 2000, mercury leaching from forest land in connection with forestry operations has attracted attention. Measures that affect turnover of the mor layer of the soil, such as felling, site preparation, driving and ditching, usually also boost the outflow of humus (organic matter) into water. The metals bound to the humus, such as mercury, then enter lakes and watercourses.

Retaining a buffer zone, with its vegetation, around lakes and along watercourses exerts favourable effects on the aquatic environment. Forested

buffer zones appear to reduce run-off by slowing the water down and through the trees' absorption of water. This also helps to prevent erosion of banks. Buffer zones in the forest landscape have also proved to absorb large quantities of the nutrients released during regeneration felling, including nitrogen and phosphorus.

More than a quarter of the species (some 1,160 out of 4,120) on the Swedish Red List are found in coastal and riparian environments, wetlands, freshwaters or marine areas. Buffer zones are also highly important to the diversity of living organisms on land and in water alike. Current instruments affording protection in the form of habitat protection areas and nature conservation agreements are insufficient to meet the overall protection needs of aquatic environments in the forest landscape, i.e. some 100,000 km of small watercourses. Since these watercourses constitute long lines of contact between exploited forest land and water, forest production greatly influences both water quality and habitats here.

The main emphasis used to be on major watercourses in the forest landscape. Scope for influencing general water quality in both minor and major watercourses is now improving, and it is becoming easier to preserve sensitive habitats.

Lakes and watercourses are also of major recreational value, for example for fishing, hunting and bird watching. These are large-scale activities that all depend on good water quality and fish production, a wealth of bird life and a varied, attractive landscape. Moreover, these environments contain numerous cultural remains from, for example, watermills, sawmills and stamping (ore-crushing) mills, log flumes, ponds, bridges and paths.

Monitoring and indicators

The Forest Agency's new Polytax system will make it possible to monitor, simply and at relatively little cost, the issue of how far buffer zones are spared and watercourses crossed in conjunction with regeneration felling and associated measures.

Damage to buffer zones and watercourses in the course of thinning will not be monitored by means of Polytax inventories. However, this partial monitoring should not initially impede follow-up of the target, since:

- environmental awareness in regeneration felling probably affords an indication of such awareness in other measures as well, and
- thinning probably does not entail the same risk of major effects on land and water as regeneration felling.

Inventory systems for monitoring damage to soil, water and buffer zones in connection with thinning and ditch clearance or temporary drainage of felled areas need to be developed in the long term. Surveys of environmental stewardship in the forestry sector are also needed to monitor the effects of measures proposed under environmental quality objectives such as *Flourishing Lakes and Streams* and *Thriving Wetlands*.

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.12.5 How far are we from achieving the environmental quality objective?

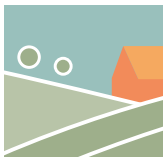
The environmental quality objective *Sustainable Forests* will not be met within the defined time frame, even with the interim targets and measures proposed by the Council, but they will pave the way for achieving the objective later. Overall, the gap is judged to be fairly large and to relate to at least three aspects:

- Forest land in the order of 500,000 ha needs restoration to recreate the requisite quantity of forest types that are lacking at present. This is expected to take place mainly after 2020.

- The volume of dead wood needs to increase further, over and above the level that is proposed for 2020.
- There is a pressing need to devise a financially viable alternative to clear-felling to satisfy many forest species' need for long-term continuity and the human wish to avoid clear-felled areas, and also to provide a better basis for addressing cultural issues, as well as those of land and water management. Current knowledge is not considered sufficient to allow an interim target for this matter to be defined.
- With improved knowledge, additional aspects may come to be considered.

The key factors affecting the scope for achieving *Sustainable Forests* are that:

- Demand for forest raw materials and products, including biofuels, is strong.
- There are sufficient government funds to compensate landowners for formal forest protection.
- The forest industry operates on the international market, with severe cost pressure, which results in a high degree of rationalization.
- More than half the forest industry is now operating within the framework of the forest certification systems (those of the Forest Stewardship Council, FSC, and the Programme for the Endorsement of Forest Certification, PEFC). This improves the chances of meeting several of the interim targets.



5.13 A Varied Agricultural Landscape

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Varied Agricultural Landscape* can be met by 2020 if further measures are undertaken. Natural and cultural assets are threatened by both scrub encroachment and intensification of farming. Future development of agricultural policy is uncertain. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim targets for meadow and pasture land, small-scale farmland habitats, culturally significant landscape features, and plant genetic resources and indigenous livestock breeds are possible to meet within the time frame if further action is taken; and that the interim targets for action programmes to save threatened species and for farm buildings of cultural heritage value were attained by the target years 2006 and 2005 respectively.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of this environmental quality objective on a time scale of one generation:

- Revise the specification on the buildings and built environments of the agricultural landscape to require them to be 'protected and developed', and delete the phrase 'particularly valuable' to clarify that the specification covers the rural built environment as a whole.
- Clarify the specification concerning habitats and dispersal routes for wild plant and animal species on farmland by changing 'non-domesticated' to 'wild', and add a passage about cultural heritage.
- Keep the other specifications unchanged.
- Introduce a new specification concerning the importance of the agricultural landscape in terms of contact with nature and outdoor recreation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Revise the interim target for meadow and pasture land and set 2020 as the target year.
- Withdraw the interim target for small-scale habitats, which was partially met by the target year 2005; include small-scale farmland habitats in the proposed new interim target for the arable landscape.
- Withdraw the interim target for culturally significant landscape features, with 2010 as the target year, after 2010; include cultural traces in the proposed new interim target for the arable landscape.
- Revise the interim target for plant genetic resources and indigenous breeds and split it into two interim targets: one for cultivated diversity with 2015 as the target year, and one for livestock genetic resources with 2020 as the target year.
- Withdraw the interim target for farm buildings of cultural heritage value, which was attained by the target year 2005.
- Introduce a new interim target for the arable landscape, with 2020 as the target year.
- Introduce a new interim target for buildings and built environments, with 2020 as the target year.
- Introduce a new interim target for organic production, with 2020 as the target year.
- Deal with issues relating to the withdrawn interim target concerning action programmes for threatened species under *A Rich Diversity of Plant and Animal Life*.

5.13.1 Progress towards the environmental quality objective

A VARIED AGRICULTURAL LANDSCAPE

The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.

The Council's assessment is that the environmental quality objective can be met by 2020, provided that further measures are taken. Despite uncertainty about how agricultural policy will develop in the future, and also about the trends for biodiversity and the cultural environment, progress is considered to be under way.

The value of the agricultural landscape depends on the land being used and on the attractions of living and working in the countryside. The form taken by the EU's Common Agricultural Policy (CAP) is therefore crucial to the prospects of achieving the objective.

For biodiversity and cultural heritage assets, improvements such as increased areas of high-value land under management are taking place. At the same time, many species of the agricultural landscape are threatened or declining. The diversity of buildings and built environments is subject to major changes, and many farm buildings are disused.

The status of arable land and its long-term productivity are satisfactory. Cadmium contamination and compaction of subsoil (the layer beneath the topsoil) should, however, be kept under supervision. Measures to ensure that the input of cadmium to arable land is low help to restrict levels of this metal in food.

Use of farmland for urban development and infrastructure has increased in the past ten years.

5.13.2 Progress towards the current interim targets

INTERIM TARGET 1

MEADOW AND PASTURE LAND

By 2010 all meadow and pasture land will be preserved and managed in such a way as to preserve its value. The area of traditionally managed meadow land will increase by at least 5,000 hectares and the area of managed pasture land of the most endangered types will increase by at least 13,000 hectares by 2010.

The assessment is that this interim target can be met on time if further measures are taken. It is, however, uncertain how the assets of these areas are developing. The total area of meadow and pasture land has grown in the past decade according to official agricultural statistics. Nevertheless, there are no definitive figures concerning the area of meadow and pasture land in Sweden. Since 2000, the area of meadow and pasture land included in the agri-environment scheme has increased at a good rate. Some 458,000 hectares (ha) of pasture land and approximately 8,500 ha of hay meadows were covered by the payment scheme in 2007 (the figures for 2007 are preliminary). For meadow land, the target is for at least 10,000 ha to be managed by 2010. In 2007, the area of pasture land qualifying for agri-environment payments decreased, while there was no further increase in the meadow area. This trend is explained by changes in support for agriculture and by the expiry of a programme period. The area target for the threatened types of pasture land appears to be attainable. However, there are no data on Calluna heathland.

INTERIM TARGET 2

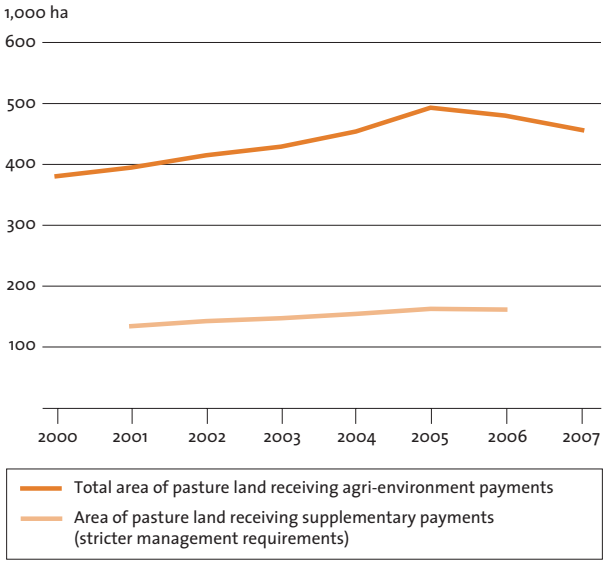
SMALL-SCALE HABITATS

Small-scale habitats on farmland will be preserved to at least the same extent as today throughout the country. By 2005 a strategy will have been adopted to increase the number of such habitats on the agricultural plains of Sweden.

With the strategy for the agricultural plains of southern and central Sweden adopted by the Swedish Board of Agriculture in 2004, the target for 2005 calling for a strategy to increase the number of small-scale farmland habitats has been achieved. In the new Rural Development Programme (RDP), there will be scope for implementing certain measures proposed in the strategy.

The target of preserving the number of small farmland features and habitats on at least the same scale as in the year 2000 can, in the Council's view, be met with further measures. However, this assess-

FIGURE 5.13.1 Area of pasture land receiving agri-environment payments, 2000–2007

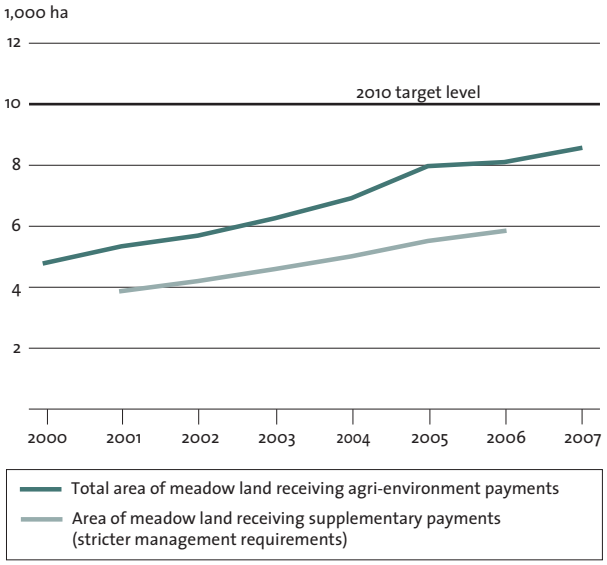


SOURCE: SWEDISH BOARD OF AGRICULTURE, DAWA DATABASE

Note: The figure for 2007 is preliminary. For that year, no distinction has been drawn between basic and supplementary payments.

The area of pasture land managed under the agri-environment payments scheme has increased at a good rate since 2000. In 2007, the scheme covered some 458,000 ha. This represents a slight downturn compared with 2006 (but note that the figure for 2007 is preliminary). Since 2001, when supplementary payments were introduced for management of high-value land, the area of pasture land receiving such payments has increased. This increase is welcome, and it is essential for more areas to be included. Future trends are uncertain, but the assessment is that a continued enlargement of the area of pasture land will take place.

FIGURE 5.13.2 Area of meadow land receiving agri-environment payments, 2000–2007



SOURCE: SWEDISH BOARD OF AGRICULTURE, DAWA DATABASE

Note: The figure for 2007 is preliminary. For that year, no distinction has been drawn between basic and supplementary payments.

The area of meadow land managed under the agri-environment payments scheme has increased at a good rate since 2000. In 2007, the scheme covered some 8,500 ha (note that the figure for 2007 is preliminary). Since 2001, when supplementary payments were introduced for management of high-value land, the area of meadow land receiving such payments has increased. It is essential for a substantial number of additional areas to be included. Restoration measures may help to achieve this.

ment is highly uncertain because of insufficient data on the numbers of habitats disappearing and coming into existence. The quality of small-scale farmland habitats, or their capacity to serve as habitats of valuable species, is another matter that needs to be clarified. The primary intention of the interim target is to reverse the negative trend for species associated with the farmed landscape. Small farmland features and habitats are important to biodiversity on and around arable land, but variation in crops and forms of management also has a major bearing on prospects of reversing the adverse trend for farmland species.

INTERIM TARGET 3

CULTURALLY SIGNIFICANT LANDSCAPE FEATURES

😐 *The number and extent of culturally significant landscape features that are managed will increase by about 70% by 2010.*

The assessment is that the interim target can be met within the time frame, but that additional measures are required. The trend is not clear-cut. The interim target relates to culturally significant landscape features on arable land. Since 2000, the quantity of linear features managed under the agri-environment scheme has increased satisfactorily, while there has

been a smaller increase in the number of point features. The take-up of the scheme varies from one region to another. In 2006 the number of landscape features covered by the scheme decreased because many undertakings expired. The number is expected to rise once more when the new RDP starts.

INTERIM TARGET 4

PLANT GENETIC RESOURCES AND INDIGENOUS BREEDS

By 2010 the national programme for plant genetic resources will be fully developed and there will be sufficient numbers of individuals to ensure the long-term conservation of indigenous breeds of domestic animals in Sweden.

In the Environmental Objectives Council's view, the interim target relating to the national programme for plant genetic resources can be met within the time frame. Results to date of the ongoing inventories of Sweden's plant genetic resources show that the prospects of a well-functioning programme are good. Seed material is stored at the Nordic Gene Bank, and work is under way to resolve the question of how to conserve vegetatively propagated material. Related wild varieties can, to some extent, be conserved *in situ* through preservation of meadow and pasture land. Within the Programme for Cultivated Diversity (POM), work relating to use, research and development, education and publicity is under way, as are international initiatives concerning plant genetic resources.

There are not, as yet, enough individuals of indigenous livestock breeds to ensure their conservation. This applies particularly to breeds of poultry. To achieve the target, further action is needed to foster and increase interest in breeding and husbandry of endangered breeds.

INTERIM TARGET 5

ACTION PROGRAMMES FOR THREATENED SPECIES

By 2006 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target was achieved in 2006: 68 action programmes had been introduced, with measures affecting more than 150 species in the farmed landscape, including species associated with trees of high conservation value. The Environmental Objectives Council proposes that, henceforward, work on action programmes for threatened species should be dealt with under another objective, *A Rich Diversity of Plant and Animal Life*.

INTERIM TARGET 6

FARM BUILDINGS OF CULTURAL HERITAGE VALUE

By 2005 a programme will have been prepared for the conservation of farm buildings of cultural heritage value.

The interim target was met by the target year. A strategy for future efforts to safeguard working farm buildings was presented in 2005. What remains now is to implement this strategy.

5.13.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Varied Agricultural Landscape*:

The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.

▶ **THE COUNCIL MAKES** the following proposals regarding the specifications of the environmental quality objective on a time scale of one generation:

- Revise the specification regarding the buildings and built environments of the farmed landscape to require them to be 'protected and developed', and delete the phrase 'particularly valuable' to make it clear that the specification covers the rural built environment as a whole.
- Clarify the specification on habitats and dispersal routes for wild plant and animal species in farmland by changing 'non-domesticated' to 'wild', and add a passage about cultural heritage.
- Keep the other specifications unchanged.
- Introduce a new specification concerning the importance of the agricultural landscape in terms of contact with nature and outdoor recreation.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Arable land will have a well-balanced nutrient status, good soil structure and humus content, and contaminant concentrations low enough not to threaten ecosystem functioning and human health.	No change.
The farmed landscape will be managed in such a way as to minimize adverse environmental impacts and promote biodiversity.	No change.
Land will be cultivated in such a way as to sustain the long-term productivity of the soil.	No change.
The farmed landscape will be open and varied, with substantial elements of small-scale habitats and aquatic environments.	No change.
Biological and cultural heritage assets in the farmed landscape that have arisen as a result of long-standing traditional management will be conserved or improved.	No change.
Particularly valuable buildings and built environments in the farmed landscape will be conserved and developed.	~~*Particularly valuable*~~ Buildings and built environments in the farmed landscape will be *protected* and developed.
Threatened species and habitat types, and also cultural environments, will be protected and conserved.	No change.
The habitats and dispersal routes of non-domesticated plant and animal species in the farmed landscape will be safeguarded.	*The farmed landscape will be of such a character that* the habitats and dispersal routes of its *wild* plant and animal species will be safeguarded *and its cultural heritage can be understood*.
Genetic variation in domesticated animals and plants will be conserved. Cultivated plants will as far as possible be conserved in their historical locations.	No change.
Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.	No change.
	Good use will be made of the scope for contact with nature and outdoor recreation afforded by the farmed landscape, so that it benefits public health.

For *A Varied Agricultural Landscape* to be judged to be met by 2020, the specifications set out on the previous page must be fulfilled.

To draw attention to the role of agriculture as a land-based industry and means of managing natural and cultural heritage assets in the environment, revision of the specification concerning buildings in the farmed landscape, to cover the rural built environment as a whole, is proposed. This broadened specification does not mean that each individual building should be conserved in every situation but, rather, that the built environment of the countryside should receive attention in order to continue adding value to the agricultural landscape and enhancing the attractiveness of such areas for living in, as a stimulus to regional development for example.

The specification on habitats and dispersal routes of wild plant and animal species in the farmed landscape concerns the nature of the landscape, which also includes its cultural heritage aspects. This is clarified in the draft revised specification.

The Environmental Objectives Council also proposes the introduction of a new specification, regarding the importance of the farmed landscape for contact with nature and outdoor recreation. Variation in the farmed landscape is of great value for outdoor life and recreation, and also entails positive effects on the tourist industry. Outdoor recreation is important to not only our physical but also our mental health. Spending time in natural surroundings affords relaxation and tranquillity, and helps to prevent stress and burnout. This applies in the agricultural landscape as a whole, too. To ensure that the specifications cover every aspect of the objective, this specification should therefore be introduced.

5.13.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

MEADOW AND PASTURE LAND

By 2020, meadow and pasture land will be conserved in such a way as to preserve and enhance its biodiversity and cultural heritage assets.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- At least 550,000 ha of meadow and pasture land will be conserved.
- The area of hay meadows will increase to 30,000 ha and road verges with meadow species will increase in extent so as to represent at least 10% of the road network in the farmed landscape.
- The conservation status of habitat types and species will be improved.
- The number of trees of high conservation value will not decrease.
- Cultural traces will be conserved and exposed to view.

Of the 550,000 ha of meadow and pasture land that is to be conserved, at least 500,000 ha should comprise areas identified in the National Survey of Semi-Natural Pastures and Meadows and other pasture land of high biological and cultural heritage value, or where such assets can be developed. The interim target means that variation of habitats is to be retained. Outlying pasture land in, for example, forest, upland and alvar areas is included. The term 'conserved' includes exposure to view of cultural traces in meadow and pasture land.

Management is a precondition for conservation. Since there has been a decline in the importance of meadow and pasture land in farming, there is a major risk of such areas not being managed, with scrub encroachment as a result. To enhance biodiversity, management must be generally improved.

At present, there are some 460,000 ha of meadow and pasture land in the agri-environment scheme, but not all such areas are included. Thus, it is reasonable to adopt a target of at least 550,000 ha for meadow and pasture land, including at least 500,000 ha of high, or potentially high, value.

The expansion in the area of hay meadows is to take place in land that is at least partially meadow-like in character, where this characteristic can be enhanced. The area consists solely of land managed as meadow. Road verges with meadow species should not be regarded as static; rather, the target relates to the total length nationwide where such species are present during specific periods. The figure of 10% corresponds to a doubling of present-day verges with meadow species that are under government management. Road verges in the farmed landscape are significant both as habitats and as dispersal corridors for meadow species, since this is a type of land providing the basic conditions required: a seed bank, regular cutting and a nutrient-poor environment. Although the area of managed meadow land has increased in the past few years, it is thought to be below a level at which biodiversity is sustainable in the long term. In about 1880, it measured some 1.2 million ha; today, it is less than 1% of that area. The National Survey of Semi-Natural Pastures and Meadows identified just over 19,000 ha of pasture land as containing hay-meadow features. Theoretically, these areas could be restored to meadow by means of changed management. Attaining an interim target of a total of 30,000 ha is thus both necessary and entirely feasible.

The areas of meadow and pasture land that have been identified in the National Survey must achieve and retain a favourable conservation status, in terms of both individual sites and the landscape as a whole. For other areas, conservation status should be improved and an endeavour made to enhance the quality of the land, where possible.

The species referred to are both those that are threatened, whose conservation status must be improved, and common species whose decline must not be allowed to continue in the long term. The interim target relates to species with meadow and pasture land as their main habitat, or which are dependent on meadow and pasture land during part of their life cycle. There must be a good supply of the essential substrates of meadow and pasture land. These substrates are well-managed and unfertilized grassy swards; bare ground with a thin layer of humus; flowering plants; valuable trees and shrubs; and dung from livestock.

Trees of high conservation value are very large trees with trunks exceeding one metre in diameter at breast height; very old trees and large hollow trees; avenue trees; and pollard trees. The interim target also involves ensuring that tree regeneration takes place. Certain trees on meadow and pasture land are of great value in biological and cultural terms. Trees in the farmed landscape are often exposed to light, which means that they provide favourable habitats for numerous lichens, fungi and insects. Flowering trees are important to pollinating insects and birds. Pollard trees show historical land use. There are also many trees that have been significant to people in other ways, those forming avenues being one example. Trees of this type are also of value as cultural heritage, and often lend character to farms and landscapes. Similarly, avenues of trees are valuable in terms of biodiversity.

'Cultural traces' refers to historical features from previous land use, such as clearance cairns, stone walls and other enclosures, old roads, avenues, prehistoric remains, relict farmed landscapes and ruins. Avenues should not be regarded as static; rather, the target relates to the total number in Sweden in a given period. 'Exposed to view' means that it is possible to discern what types of cultural traces they are, in such a way as to reveal context in the landscape. Cultural traces make it possible to perceive the historical content of the landscape, and they should form part of the overall management of land, taking both biological and cultural heritage interests into account.

Monitoring and indicators

The area of meadow and pasture land is monitored using statistical data from the agri-environment scheme for pasture land and hay meadows, and offi-

cial agricultural figures and data connected with the RDP. Variation in payment rates for land needing more and less management means that the figures for agri-environment payments can also provide an overview of the quality of meadow and pasture areas.

The National Survey of Semi-Natural Pastures and Meadows (2002–4) provides a basis for monitoring the characteristics of these areas. Monitoring of changes in the quality of meadow and pasture land began in 2006 as part of the National Inventory of Landscapes in Sweden (NILS). Road verges will be monitored by random sampling in the Swedish Road Administration's operating areas.

Monitoring based on the National Survey of Semi-Natural Pastures and Meadows and NILS can provide indications of whether a favourable conservation status is being sustained or attained in various habitat types. The Swedish Red List of threatened species and also national environmental monitoring programmes, such as the ongoing study of population change in bird species associated with farmland, can be used to assess the situation for species in the agricultural landscape.

Trees of high conservation value are monitored to some extent in NILS through observations of quality changes in meadow and pasture land. They can also be monitored by means of focused surveys and by following up the action plan for trees with high conservation values in the cultural and urban landscape.

Agri-environment payments for pasture land and hay meadows also entail management of cultural traces. Accordingly, the size of areas under management is monitored through the agri-environment scheme. Ongoing, coherent qualitative monitoring of the cultural heritage assets of the farmed landscape is lacking, but development work is being undertaken by the National Heritage Board.

Besides monitoring environmental status, following up measures taken to date is an urgent priority. These measures involve management, skills development, and other actions and instruments. The environmental effects of various payments in the RDP will be evaluated within the framework of the project 'The Environmental Effects of the CAP'. Data from RDP payment schemes can also provide a picture of the regional distribution of measures taken.

The regional monitoring carried out by the county administrative boards provides highly significant documentation.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

ARABLE LANDSCAPE

By 2020, the biodiversity and cultural heritage assets of arable land will be conserved and the scope for enhanced diversity will be increased.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- The total number of small-scale farmland habitats will not diminish.
- Cultural traces will be conserved and at least half will be exposed to view.
- The conservation status of threatened species will be improved.
- The adverse trend for common species will be reversed.
- The number of trees of high conservation value will not decrease.
- In the agricultural plains, the area of land set aside to promote biodiversity will be increased to 80,000 ha.

'Arable land' refers here to actual fields and land immediately adjacent to fields. 'Enhanced diversity' means increased variation owing to the existence of areas that favour biodiversity; to more extensive use of varied cultivation methods that favour diversity and preserve cultural traces; and to greater variation of crops cultivated.

With the rationalization of farming, the landscape has become less varied. Uncultivated areas have decreased in both number and size. In most cases, this has adversely affected the species that inhabit the arable landscape. There has also been a decrease in management of uncultivated areas. How fields are cultivated, too, has a bearing on biodiversity.

'Small-scale farmland habitats' refers to small land or water areas that are, or can be, habitats for valuable plant and animal species associated with the agricultural landscape. They may be sites subject to habitat protection, or they may be cultural traces, valuable trees, uncultivated areas, road verges, field margins, edge zones, wetlands, small watercourses and water bodies, water sources meeting household needs, and remains of old village sites. If small-scale habitats disappear, they must be replaced by new ones; it is the total number that must not decrease. Any decrease is in relation to the base year, 2005. It is probably most cost-effective to create temporary small-scale farmland habitats in locations where their effects are optimized.

'Cultural traces' refers to historical features from previous land use, such as clearance cairns, stone walls and other enclosures, old roads, avenues, prehistoric remains, relict farmed landscapes and ruined buildings. 'Exposed to view' means that it is possible to discern what types of cultural traces they are, in such a way as to reveal context in the landscape. On arable land as well, there are indications of previous land use in the form of cultural traces. Here, too, they constitute a tiny remainder that should be conserved and managed in a manner that is sustainable in the long term. For cultural traces to be regarded as managed, half of them should be exposed to view. It is important for management to take place in such a way that biological and cultural heritage interests work together.

The species referred to in the interim target have their main habitats in and around arable land, or are dependent on arable land for their survival (e.g. resting migrant birds). For threatened species, conservation status must improve. The focus is on long-term changes, and not what happens in particular years.

Trees of high conservation value are very large trees with trunks exceeding one metre in diameter at breast height; very old trees and large hollow trees; avenue trees; and pollard trees. Avenues should not be regarded as static; rather, the target relates to the total number in Sweden in a given period. The interim target also involves ensuring that tree regeneration takes place. Trees are important on arable land just as they are on meadow and pasture land: they are of value in both biological and cultural terms. Gardens, parks and churchyards containing old trees can, especially in the agricultural plains, have a bearing on diversity in arable land.

'Land set aside to promote biodiversity' means land on which the soil is not tilled, while management is nevertheless such as to prevent scrub encroachment. Both permanent structures like newly created wetlands and more temporary structures, such as various types of fallow land, are included. Well-developed forest edges are another structure that promotes diversity in the arable landscape. It is desirable for the total area of such land to be distributed around Sweden: this means an approximate distribution of 22,000 ha in the southern agricultural plains of Götaland, 4,000 ha in the mixed forest and farming regions of Götaland, 20,000 ha in the northern plains of Götaland and 33,000 ha in the plains of Svealand.

Monitoring and indicators

The NILS programme involves compiling data that provide, for example, a basis for monitoring how the number of small-scale farmland habitats is changing over time, and how cultural traces in arable land are being conserved and exposed to view as a result of management. Data from the agri-environment scheme for natural and cultural environments in the farmed landscape provide information about cultural traces in arable areas. They can also be used to estimate the number of small-scale farmland habitats in arable regions, since cultural traces are among such habitats.

The Swedish Red List of threatened species can be used as a basis for assessing the situation for species of the agricultural landscape. National environmental monitoring also provides data for follow-up, e.g the monitoring of population changes in common bird species associated with the farmed landscape, undertaken by the Swedish Bird Survey.

Monitoring of action programmes for threatened species can provide a picture of how the situation is changing for these species.

Trees of high conservation value can be monitored with focused surveys, through the agri-environment

schemes for natural and cultural environments in the agricultural landscape, and by following up the action programme for trees with high conservation values in the cultural and urban landscape.

Besides monitoring of the state of the environment, it is imperative for action taken to be followed up. This applies to management measures and skills development, as well as to other action and instruments. The environmental effects of various RDP payments will be evaluated within the framework of 'The Environmental Effects of the CAP'. Data from RDP schemes can also provide a picture of the regional distribution of measures taken.

The regional monitoring carried out by the county administrative boards is another important source of data for assessing national target fulfilment.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

BUILDINGS AND BUILT ENVIRONMENTS

By 2020, the buildings and built environments of the farmed landscape from various periods will be managed in such a way as to maintain their diversity.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- At least half of the redundant buildings on farmland will be conserved and managed in such a way as to retain their qualities.
- The negative trend for working and redundant buildings that lend character to an area will be reversed.
- The number of shielings in use will not be below 230.
- The number of particularly valuable coherent agrarian environments that are conserved will not be below 60.

Henceforth, as to date, the agricultural landscape must convey a narrative about how people lived and worked locally, and there must be a varied range of habitat types and cultural settings where the buildings make up a complementary part of the landscape. The proposed interim target is also intended to cover certain categories of buildings and built environments in the farmed landscape that are particularly threatened.

'Buildings and built environments of the farmed landscape' refers to the diverse range of production buildings and settings that have arisen in the course of active farming, both on actual farms and in remoter locations. The phrase also covers buildings erected for small-scale agrarian industry. The buildings and built environments of the agricultural landscape are unique sources of knowledge about our cultural environment and cultural history. They reflect changes in farm technology and new directions in farm management, and they are clearly connected with agricultural and rural economics.

'Diversity' refers here mainly to retaining a mix of buildings and built environments, including many that have lost their original function as part of agrarian production. There are major regional differences in how radical change in the basis for agriculture has affected the use and status of these buildings. The target vision must therefore be based on the relatively heterogeneous regional and local situation regarding buildings and built environments in the farmed landscape in various parts of Sweden.

'Managed' refers here to a comprehensive approach to the agricultural landscape involving, for example, improved intersectoral coordination among the various activities that affect this environment. Through active management, the resource that exists in a diversified stock of buildings, notably in their technical building characteristics, can be developed now and in the future.

'Redundant buildings' are farm buildings that are no longer used in farming operations, and 'in such a way as to retain their qualities' means, in this case, that the buildings should be in positions free from scrub encroachment and have non-leaking roofs and stable foundations.

'Working and redundant buildings that lend character to an area' are those that constitute key regional and local identity factors. Present-day requirements of market adjustment and often, by the same token, large scale or specialization are contributing to the deterioration or elimination of valuable cultural heritage in

the form of buildings, farm environments, small-scale farmland habitats and landscape elements. Rapid technological development is generating new, modified requirements concerning the buildings and built environments of the farmed landscape.

'Particularly valuable agrarian environments' refers to areas that clearly show how buildings, cultural traces and land use relate to human use and exploitation of the landscape. 'Shielings in use' are those that retain the traditional buildings and where the land is used for pasture.

Cultural heritage reserves serve as reference areas for management of valuable landscape features in a way that is sustainable in the long term. They also contribute to the preservation and running of various types of activity, such as traditional small-scale farming and handicraft production. Since cultural heritage reserves are used for educational purposes, and are often well visited, they play a key role in helping the public to understand how action by the individual can promote attainment of environmental objectives as a whole.

Monitoring and indicators

Through NILS, monitoring of the cultural environment should follow rural building development and provide answers to questions about what exists and its status, functional change and surrounding vegetation. Such monitoring is also intended to answer questions about the scope for protecting and developing buildings and built environments of the farmed landscape. Feedback on the scale and cost of monitoring the cultural environment through NILS was given to the Swedish Government by the National Heritage Board in February 2008.

Monitoring could include setting up a database for restoration of small redundant farm buildings. This database could be used for recurrent monitoring and evaluation. Measures in the RDP will be evaluated within the framework of the project 'The Environmental Effects of the CAP'.

Conservation of particularly valuable coherent agrarian environments can be partially followed through the Heritage Board's monitoring of compliance with the Heritage Conservation Act (SFS 1988:950) and formation of cultural heritage reserves under Chapter 7, Section 9 of the Swedish Environmental Code. Starting monitoring of the impact of both cultural heritage and nature reserves on the cultural environment is an urgent priority. Use of shielings will be evaluated within the framework of the RDP. Data from RDP schemes can also provide a picture of the regional distribution of measures taken.

The regional monitoring carried out by the county administrative boards is a key basis for assessing national target fulfilment.

▶ **THE COUNCIL PROPOSES** that the present interim target be revised and split into two. One of the proposed targets is:

CULTIVATED DIVERSITY

By 2015, valuable cultivated diversity will be conserved in a manner that is sustainable in the long term.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Conservation systems for all plant groups will exist, and the material will be easily accessible to users.
- Criteria for determining what is worth conserving in the long term will have been adopted.
- Conservation will take place with a view to long-term sustainability of use.
- Documentation and information about the material will exist and be easily accessible.
- The biological cultural heritage that the material represents will be brought to life.

'Valuable cultivated diversity' refers to what has been judged worth conserving within the framework of the Programme for Cultivated Diversity (POM). Special criteria for what is to be conserved have been devised for POM. 'Conservation systems' are gene banks or other forms of conservation that are fit for purpose, where the material is kept safely and which permit the material to be used. 'Long-term sustainability of use' means use with a view to future food

security, cultural heritage value, health and the environment. The documentation must be accessible both to researchers and to the public. The material is 'brought to life' when it is used and shown in the right setting.

The various categories of cultivated diversity in Sweden are to be surveyed between now and 2010. The tasks of description, prioritization and evaluation will then remain. At present, cultivars (cultivated plant varieties) are conserved in various ways. Conserving living material demands considerable resources and should be made more efficient, both technically and financially. A revised interim target should focus on safe, effective conservation with a view to future utilization. The material must be able to provide the characteristics needed for our future food supply. A sustainable Swedish food supply in the long term depends on continuous addition of new, well-suited cultivar material for adaptation to changes in cultivation systems and also any climate change that may take place.

Monitoring and indicators

The system required to enable collected material to be conserved in the long term must be established and organized in such a way that the material can be used. Conservation can then also be monitored.

For the conserved material to be usable, it must be well documented and the information must be easily accessible. Monitoring can take place through development of SKUD (*Svensk kulturväxtdatabas*, a national reference database of Swedish cultivars) and of SESTO, a gene-bank management tool developed by the Nordic Gene Bank.

Progress in the Programme for Cultivated Diversity as a whole will be monitored by means of reports on programme activities by those involved.

▶ **THE COUNCIL PROPOSES** that the present interim target be revised and split into two. The second of the new proposed targets is:

LIVESTOCK GENETIC RESOURCES

By 2020, the livestock breeds that Sweden is responsible for conserving will be conserved for the long term and be sustainably used.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- No later than 2020, the majority of the livestock breeds that Sweden is responsible for conserving will be in the FAO's 'Not at risk' category.
- Other breeds are those whose status in 2007 was categorized as 'Critical' or 'Critical–maintained' and breeds for whose conservation Sweden has recently become responsible. These will, at worst, have attained the status of 'Endangered–maintained'.
- The rate of inbreeding in commercial breeds should not rise by more than 1% per generation.

The breeds for which Sweden has a conservation responsibility meet certain defined criteria. The classifications relate to animals included in gene banks or pedigree records. Conservation programmes need to be developed, i.e. breeding plans that are sustainable in the long run for the breeds concerned. Such a plan should list the aims adopted for the short and long term to ensure that the breed is conserved and/or used sustainably. The plan will also detail genetic variation in the population.

Where breeding is entirely focused on saving the breed concerned from extinction, it will be conducted in such a way as to distribute the representation of 'founder animals' evenly in the population and retain genetic variation.

Livestock genetic resources have, to date, been dealt with in conjunction with cultivated diversity under the interim target for plant and livestock genetic resources, which expires in 2010. The proposed interim target for livestock genetic resources originated partly in the need for an interim target

for the period 2010–20 and partly in the fact that the diversity of domesticated breeds may be said to have been given lower priority than cultivated diversity on the one hand and wild plants and animals on the other.

Monitoring and indicators

Data for the various breeds will be collected from the breed associations or organizations in charge of registering the breeds in question. Figures on the number of cattle, sheep, goats and pigs of endangered breeds for which agri-environment payments are made, and also particulars of the genetic material collected for the frozen gene bank, will supplement the monitoring data.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

ORGANIC PRODUCTION
By 2020, at least 20% of farmland will be certified for organic production.

For the interim target to be judged to be met, the following specification must be fulfilled:

- Certified organic production in accordance with the interim target will be practised virtually throughout Sweden.

This target relates solely to laying the foundations for organic production, i.e. land for cultivation and pasture. What is produced should be governed by market demand. Nor does the target refer to organic animal husbandry. The latter is linked to certified pasture land, which must be managed in such a way as to conserve its natural and cultural assets. In other respects, market forces should determine the scope of organic livestock production. The target is not intended to supersede government decisions concerning organic production; those decisions cover more than environmental aspects.

Certified organic production must be well represented throughout Sweden, in both the agricultural plains and forested areas. Production can be certified under either EU or Swedish KRAV regulations, and products may then be marked with the EU or KRAV label for organic production.

Organic production is good for biodiversity, since it promotes greater variation. For farming as a whole, variation is most limited and specialization most far-reaching in the agricultural plains. Organic cultivation may therefore be assumed to have the best prospects of benefiting biodiversity, compared with conventional production, in those areas.

Monitoring and indicators

The interim target for organic production will be monitored by means of figures concerning the area in which certified organic production takes place, and statistics from the agri-environment scheme. The geographical extent of organic farming will be monitored by means of figures from the agri-environment scheme.

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.13.5 How far are we from achieving the environmental quality objective?

At present, it is impossible to say how much work still needs to be done for this environmental quality objective to be attained. It is unknown how much land is needed, or how far-reaching measures must be, to conserve natural and cultural assets in the agricultural landscape in the long term. Stepping up research is a key measure for obtaining this knowledge.

The new RDP, covering the years 2007–13, represents greatly increased efforts to promote business and rural development. The scale of purely environmental measures remains approximately the same as before, but the programme also affords scope for new initiatives in the environmental sector. Background

policy analysis has clearly shown that measures needed to attain *A Varied Agricultural Landscape* will not be implemented unless economic instruments continue to be deployed after 2013. Further funding of measures is therefore necessary for this objective to be met. It is assumed that the current RDP will be succeeded by another after 2013, even if no such decisions have yet been taken.

The key factors affecting the prospects of attaining *A Varied Agricultural Landscape* are:

- The EU's Common Agricultural Policy and the economic conditions governing the current structural rationalization of agriculture.
- Technological development; cultivation techniques in agriculture, such as plant improvement and genetic modification; and the trend towards increasingly specialized production, which tends to make the landscape more uniform.
- Rural development policy and general rural development, i.e. community services, job opportunities and social factors, which affect people's ability and willingness to remain and run businesses in the countryside.

5.14 A Magnificent Mountain Landscape

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Magnificent Mountain Landscape* can be met by 2020 if further measures are undertaken. Damage to soil and vegetation caused by off-road vehicles has increased to a negligible extent. Knowledge of cultural assets is lacking in both protected and unprotected areas. The trend in the state of the environment is positive.

▶ **THE COUNCIL JUDGES** that the interim targets for damage to soil and vegetation and for noise can be achieved within the defined time frame if further steps are taken; that the interim target for natural and cultural assets will be very difficult to meet within the time frame; and that the interim target relating to action programmes for threatened species had been attained by the target year 2005.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of this environmental quality objective on a time scale of one generation:

- Introduce a specification on using mountain ecosystems in a manner that is sustainable in the long term.
- Withdraw the specification on mechanical damage to mountain vegetation and lichen cover.
- Keep the other specifications unchanged.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Replace the interim target for damage to soil and vegetation with a revised interim target for damage to assets in mountain areas, with 2015 as the target year.
- Replace the interim target for noise with a revised interim target for noise in mountain areas, with 2015 as the target year.
- Replace the interim target for natural and cultural assets with a revised target on protection of assets in mountain areas, with 2020 as the target year.
- Introduce a new interim target for the mountain landscape, with 2015 as the target year.
- Deal with issues relating to the withdrawn target concerning action programmes for threatened species under *A Rich Diversity of Plant and Animal Life*.

5.14.1 Progress towards the environmental quality objective

A MAGNIFICENT MOUNTAIN LANDSCAPE

The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.

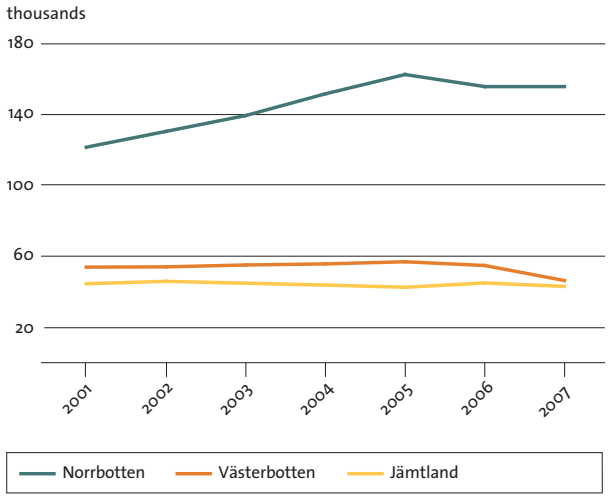
The overall assessment is that the environmental quality objective *A Magnificent Mountain Landscape* can be met if the sectors concerned, and society as a whole, show the consideration required by the interim targets. However, it is already essential to heed, and take steps to prevent, the adverse effects of climate change on Sweden's mountain environment.

Regarding the state of the mountain environment, a positive trend is discernible. The interim target regarding action programmes for threatened species has been achieved. The proportion of sales of light off-road vehicles with low noise ratings rose markedly in 2006, and if this trend continues noise levels in mountain areas will decline.

The regional environment and sustainable use programme drawn up jointly by the county administrative boards concerned began to be applied in 2006. Its purpose is to improve prospects of sustainable development in the mountain environment. The proposed model for collaboration on mountain issues, resource and development plans geared to mountain conditions, and further fact-finding efforts are particularly important.

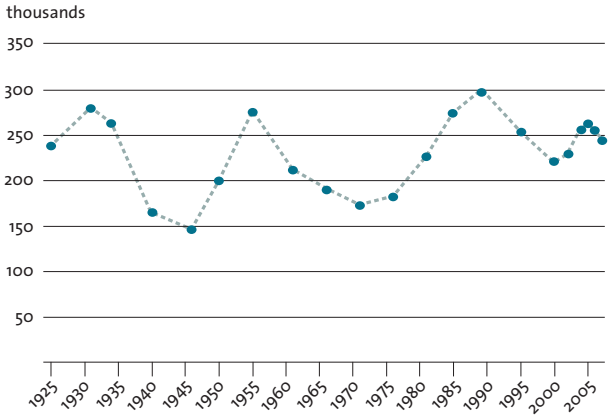
New, in-depth knowledge of the vegetation and cultural settings of the Swedish mountains is greatly needed. More knowledge about the extent of noise and soil damage is also required. Together, the county administrative boards' programme and the reindeer-herding districts' environmental plans are essential aids to resolving land-use issues in mountain areas. Preserving a landscape characterized by

FIGURE 5.14.1 Number of reindeer by county, 2001–2007



SOURCE: SAMI PARLIAMENT, 2008

FIGURE 5.14.2 Number of reindeer in Sweden, 1925–2007



SOURCE: SAMI PARLIAMENT, 2008

Variations in reindeer numbers may be partially explained by the fact that slaughter is more intensive in some years than in others. Other reasons may be natural attrition due to harsh winter grazing conditions or the impossibility of carrying out a complete reindeer count owing to external circumstances. The number of reindeer may be seen as a key indicator of the trend in grazing pressure in the mountain region.

Note: The 'number of reindeer' refers to the total number remaining after the winter slaughter. Data are based on the reports submitted annually to the Sami Parliament by all the reindeer-herding districts.

grazing impact calls for reindeer husbandry that is managed and developed sustainably in environmental terms.

5.14.2 Progress towards the current interim targets

INTERIM TARGET 1

DAMAGE TO SOIL AND VEGETATION

By 2010 damage to soil and vegetation caused by human activities will be negligible.

Meeting this interim target is judged to be feasible if measures are taken to channel off-road driving, and other activities that damage the terrain, away from sensitive areas. Regional efforts to fulfil environmental objectives play a large part in enabling the target to be achieved.

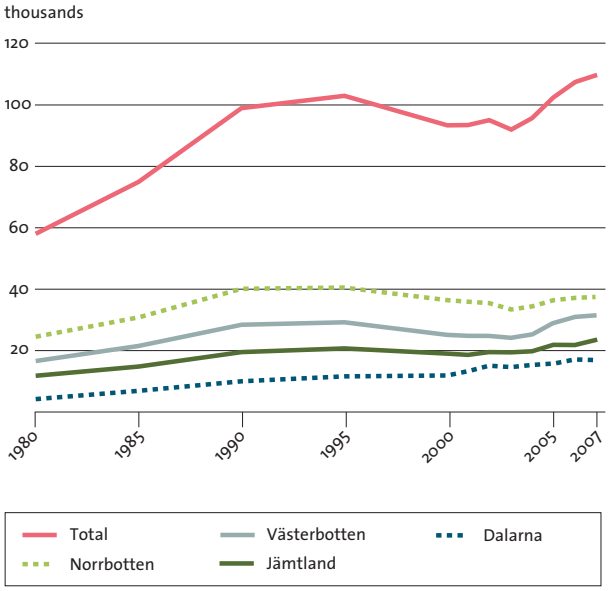
Failing better documentation, risks of damage to soil and vegetation have been assessed indirectly to date, on the basis of reindeer and off-road vehicle numbers. The reindeer population has fallen by 1.4% since 2005, while these vehicles (snowmobiles and all-terrain vehicles, ATVs) have shown an insignificant increase in the past few years.

Various surveys were conducted as part of the National Inventory of Landscapes in Sweden (NILS) during 2003–4. In the field inventory work, individual vehicle tracks were found in or near eight of the 28 grid squares surveyed. From aerial photographs of two areas surveyed, numerous linear elements (i.e. tracks) were identified. A questionnaire survey revealed no clear pattern in the scale of these tracks, other than finding that they traverse most of the mountain region. In many cases, drainage ditches were found to have formed in the tracks on slopes, and in numerous places this damage was perceived as severe. The questionnaire survey also suggested that there are large areas with vehicle-track damage that fall outside the NILS grid squares.

Altogether, throughout the mountain region, a study carried out in summer 2007 found approximately 1 km of paths, tracks or trails broader than 20 cm, i.e. made by trampling or vehicles, per square kilometre. One in eight of these paths, tracks or trails had been caused by four-wheel ATVs.

The results of the earlier questionnaire survey suggest that there are larger areas affected by damage from off-road vehicles than the 2007 survey revealed. The smaller number of observations in 2007 may reflect relatively limited damage from off-road driving and overestimation of its impact by the questionnaire survey. Alternatively, it may suggest that a larger number of NILS areas in the mountains need to be surveyed for the field inventories to detect off-road driving to a larger extent.

FIGURE 5.14.3 Number of light off-road vehicles in use in counties in the mountain region, 1980–2007



Note: 'Light off-road vehicles' are those weighing up to 400 kg (ready-for-use weight). In practice, they are three- and four-wheeled ATVs and (in the great majority of cases) snowmobiles.

SOURCE: STATISTICS SWEDEN

Cross-country driving on snow-free ground damages soil and vegetation. Ancient cultural remains in mountain areas can also be shattered by the weight of vehicles. Off-road driving in exposed and snow-covered mountain areas also produces noise and exhaust fumes that may disturb the fauna and impair the value of the mountain environment for recreation. At the same time, snowmobiles can be important to the tourist industry. Legal off-road driving in snow-free terrain in the Swedish mountains takes place mainly for reindeer-herding purposes, as well as in the Armed Forces and the telecommunications and energy sectors.

Broader studies, methodological development of aerial-photograph interpretation, greater knowledge of the degree of recovery and correlation of field data from line-transect inventories with vegetation maps are needed. It will then be possible to determine how far the mountain region is affected by the growing use of off-road vehicles, identify the areas where action is necessary and select the most suitable steps to take in these areas.

INTERIM TARGET 2

NOISE

Noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced to meet the following requirements:

- *by 2015 at least 60% of light off-road vehicles will meet stringent noise standards (below 73 dBA);*
- *by 2010 the noise from aircraft will be negligible both in class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the national park area.*

This interim target is judged to be achievable within the time frame if further measures are taken. To meet the target for light off-road vehicles, however, one requirement is for noise limits for new vehicles of this kind to be inserted in Directive 2000/14/EC, in line with the proposal submitted to the European Commission by the Swedish Environmental Protection Agency in 2005. For progress towards this interim target to be monitorable, the Swedish vehicle register must contain particulars of noise levels for the types of vehicles concerned. This registration issue is being investigated by the Swedish Road Administration.

The proportion of light off-road vehicles with four-stroke engines, which are normally quieter, has risen sharply in the last year, to almost half the vehicles sold. To meet the target, however, older models of light off-road vehicles must be phased out more rapidly than at present.

In very remote parts of the mountain region, where only natural sounds are expected, all extraneous noises are disturbing. The requirement in these areas should be that the level of anthropogenic noise, such as noise from off-road vehicles and aircraft, must be so low as to be, in principle, inaudible.

In areas of intensive reindeer herding or where there is other off-road transport, and close to mountain facilities, maintaining a low noise level is not feasible. Here, then, the existence of anthropogenic noise must be accepted.

INTERIM TARGET 3

NATURAL AND CULTURAL ASSETS

By 2010 long-term protection, including where necessary management and restoration measures, will have been provided for the majority of mountain areas with representative and significant natural and cultural assets.

The Environmental Objectives Council judges that achieving this interim target within the time frame is not feasible. Regional environmental work relating to the Sami cultural heritage and improved knowledge of mountain cultural environments are crucial factors. Resources are required to enhance knowledge, both regarding the nature reserves and national parks that have already been set up and to enable long-term protection to be provided for new sites in the future.

In 2007, the Swedish Environmental Protection Agency drafted a new plan for the country's national parks. This plan is to form the basis for renewed efforts to set up national parks in Sweden.

INTERIM TARGET 4

ACTION PROGRAMMES FOR THREATENED SPECIES

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

This interim target is judged to have been met by the target year 2005. Originally, five action programmes were envisaged, covering species to be found in both mountain and forest areas. The target is considered to be met when a proposed action programme has been adopted or circulated for comment.

For the mountain region, action programmes for Arctic fox, wolverine and great snipe (*Gallinago media*) have now been adopted. Three programmes of relevance to the region have also been completed: for rich fens, wolf and brown bear. In all, there are thus six action programmes. A total of nine species

and an equal number of action programmes have been identified for the mountain landscape.

It is proposed that issues relating to conservation of threatened species should be tackled within *A Rich Diversity of Plant and Animal Life*.

5.14.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Magnificent Mountain Landscape*:

The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.

▶ **THE COUNCIL MAKES** the following proposals regarding the specifications of the environmental quality objective on a time scale of one generation:

- Introduce a specification on using mountain ecosystems in a manner that is sustainable in the long term.
- Withdraw the specification on mechanical damage to mountain vegetation and lichen cover.
- Keep the other specifications unchanged.

Habitat diversity in the mountain region is reflected in a great wealth of species, especially vascular plants, mosses and lichens. Some species are unique to the Scandinavian mountains. Others are, in fact, Arctic but this area is the southern limit of their range.

In connection with regional monitoring of progress towards the environmental objectives in the county of Norrbotten, the county administrative board and the Swedish Biodiversity Centre initiated a joint project in 2003. The purpose was both to supplement national monitoring by adding biodiversity and generally to illustrate the objective concerning the mountain landscape in terms of biodiversity. The county administrative boards of Västerbotten and Jämtland, too, have been periodically involved in this project.

Conclusions from the project are as follows.

A high proportion of the biodiversity to be found in the mountains is in areas of high, exposed and bare ground and in other disturbed small-scale environments. Periods of hard grazing may be required to control willows and dwarf shrubs.

The categories of species and organisms that benefit from grazing are often competitively weak and need disturbance to become established. They are often dependent on warmth. All the plants grazed are harmed by the actual damage but they can also benefit by having more space to live in when more competitive plants decrease. Lichens and many mosses spread by being fragmented owing to trampling. Grazing also contributes to heterogeneity, which results in more possible habitats. Their existence, in turn, favours more organisms.

A range of factors combine to bring about grazing pressure that is optimal (in terms of biodiversity). The key factors are the vegetation and productivity of the area grazed; the number of grazing animals; the season and the duration of the animals' grazing; and winter snow cover, which depends on the topography of the pasture land concerned.

The results showed clearly that reindeer grazing is among the most important processes in promoting biodiversity in the mountain region. Nevertheless, the analysis of the environmental quality objective showed that national conservation efforts focus, rather, on the possible adverse effects of reindeer on the mountain environment.

Climate change, too, is affecting the Swedish mountains both locally and regionally. A changed climate will probably entail a risk of mountain

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
A majestic mountain landscape, characterized by grazing and with extensive continuous open spaces, will remain intact.	No change.
The biodiversity of mountain areas will be conserved and enhanced.	No change.
Alien species and genetically modified organisms that could threaten biodiversity will not be introduced.	No change.
Cultural heritage assets, in particular the Sami cultural heritage, will be conserved and enhanced.	No change.
Reindeer husbandry, tourism, hunting, fishing and other use of the mountains, as well as construction and other development, will be carried on with regard for the long-term productive capacity, biodiversity, natural and cultural heritage assets and recreational assets of the areas concerned.	No change.
Measures will be taken to achieve low levels of noise.	No change.
Mechanical damage to mountain vegetation will be reduced and the extent and thickness of the lichen cover will increase.	Withdraw this specification.
Threatened species and those that have suffered a significant decline will be able to spread to new sites within their natural ranges, ensuring long-term viable populations.	No change.
Local populations of fish and other aquatic species in mountain lakes and streams will be maintained.	No change.
There will be an increase in areas of great recreational value or with valuable natural and cultural assets that are free from noise and other disturbance.	No change.
	Mountain ecosystems will be used in a manner that is sustainable in the long term.

species dying out, since they have little scope for migrating to more northerly latitudes or higher up on mountain peaks. On a local scale, climate change may cause the field layer dominated by lichens and mosses to be superseded by grasses and herbs. On a more regional scale, mountain birch (*Betula pubescens* ssp. *czerepanovii*) will advance ever higher above the existing tree line, affecting both the area and extent of bare mountainsides. This will also affect biodiversity and amenity value in terms of outdoor recreation.

Since the issues of mechanical damage to mountain vegetation and the extent of lichen cover are local and do not apply to the mountain region as a whole, the related specification can be withdrawn.

5.14.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

DAMAGE TO ASSETS IN MOUNTAIN AREAS

Damage to natural and cultural assets caused by human activities will be reduced so that, by 2015, it is negligible in the mountain region as a whole and has ceased in valuable natural and cultural environments.

Knowledge, monitoring and supervision need to be developed to channel tourism away from sensitive natural and cultural heritage areas. Damage is judged to be due mainly to the pressures of development, tourism, outdoor recreation, hunting and fishing. For wetlands in the mountain region, off-road driving on snow-free ground is particularly harmful. There are many stakeholders with various interests in the mountain region. Owing to the rising proportion of off-road vehicles in the mountains that are driven across country, noise and damage have increased in the past five years. Summer and winter trails alike therefore need more maintenance. Regional work to fulfil environmental objectives plays a major part in making it possible to achieve the interim target.

Monitoring and indicators

There is a need to develop environmental monitoring of vegetation change, ground disturbance and damage to ancient remains and other cultural heritage in the mountain region.

The National Inventory of Landscapes in Sweden (NILS), a programme of environmental monitoring, and satellite-based remote sensing should be coordinated regionally and nationally. The penalties for off-road driving on snow-free ground should be jointly reviewed by the Environmental Protection Agency and the county administrative boards in the mountain region.

▶ **THE COUNCIL PROPOSES** a revised interim target:

NOISE IN MOUNTAIN AREAS

By 2015, noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- By 2015, at least 60% of light off-road vehicles will meet stringent noise standards (below 73 dBA).
- By 2015, the noise from aircraft will be negligible both in Class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the area of each national park.

Given the unclear points both in the EU's treatment of new limit values for snowscooter noise and in the noise performance characteristics of new snowmobile models, the Environmental Objectives Council proposes an unchanged wording for the target for noise from off-road vehicles. It also proposes a five-year postponement of the target year for noise from aircraft, since that target will not be possible to achieve by 2010 unless further action is taken.

The current interim target states that noise from aircraft will be negligible in at least 90% of the national park area. The Council's interpretation and proposed wording are that absence of noise will be attained within 90% of the area of each national park.

Monitoring and indicators

The impact of off-road driving in snow-free terrain is included in environmental monitoring of the Swedish mountains and montane forests. Coordination of the NILS environmental monitoring programme should be feasible, and it should be stepped up to cover the whole mountain region or at least the environmental zone above the tree line.

Monitoring of progress towards this interim target should also include summaries based on the Swedish Road Administration's vehicle register, extended to incorporate information about noise levels for various types of off-road vehicle.

Supervision of compliance with the Off-Road Driving Ordinance has proved inadequate. The supervision issue should therefore be reviewed to see whether, through amendments to current ordinances, a better division of responsibility for supervision among the government agencies concerned is obtainable.

▶ **THE COUNCIL PROPOSES** a revised interim target:

PROTECTION OF ASSETS IN MOUNTAIN AREAS

By 2020, long-term protection will be provided for 90% of environments with valuable natural, cultural and recreational assets.

With the proposed revision extending long-term protection to the greater part of areas with valuable recreational assets, the specifications of the environmental quality objective will be fulfilled better than with the current interim target.

Today, a relatively high proportion of mountain areas with valuable natural assets are already protected as nature reserves or national parks. Considering the very high proportion of natural and cultural environments in the Swedish mountains where 'favourable conservation status' needs to be achieved, protection is still lacking for a number of highly valuable natural, cultural and recreational areas. Inadequate management and restoration are also a significant problem in areas containing valuable cultural assets. Support for activities involving management of cultural assets is deemed particularly important.

Knowledge of the cultural environments, ancient remains and built environments of the mountain region, and of recreational environments of high value, needs to be supplemented.

Monitoring and indicators

Payments under the agri-environment scheme of the new Rural Development Programme for 2007–13, for management of natural and cultural environments in the reindeer husbandry region, should be monitored. The allocation for the grant scheme for cultural heritage conservation should also be monitored and evaluated.

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

MOUNTAIN LANDSCAPE

By 2015, the area of extensive open mountain landscape characterized by reindeer grazing will not be decreasing.

The Swedish mountains are a sensitive environment with extremely valuable assets in terms of nature and the experiences they offer. The region is, at the same time, a unique cultural landscape in which people have lived and conducted reindeer husbandry for millennia.

A Magnificent Mountain Landscape is a regional objective that requires reindeer herding for the preservation of a landscape characterized by the impact of grazing. Since reindeer husbandry is carried on in most of the mountain region, it occupies a highly significant position in relation to the environmental quality objective.

For the proposed interim target to be achieved, specific measures will be needed in the most vulnerable areas. An increase in reindeer grazing can, for example, prevent ascent of the tree line. However, a strategy is needed to select appropriate measures and the areas where such climate-oriented measures should be carried out.

Monitoring and indicators

Environmental monitoring of the mountain region should be reviewed by the Environmental Protection Agency to provide data for monitoring trends in terms of biodiversity status. Methods of implementing a reindeer-pasture inventory and following it up by means of indicators, and the question of whether changes in the structure of reindeer grazing can help to combat the adverse impact of climate change on the mountain environment, should also be explored.

▶ **THE COUNCIL PROPOSES** that issues relating to the withdrawn interim target concerning action programmes for threatened species should be dealt with under *A Rich Diversity of Plant and Animal Life*.

5.14.5 How far are we from achieving the environmental quality objective?

The Environmental Objectives Council judges that this environmental quality objective can be met by 2020 if further measures are taken, with a reservation for adverse effects of climate change on the mountain environment. Knowledge is insufficient to assess how much remains to be done before the objective is met.

The key factors affecting the prospects of achieving *A Magnificent Mountain Landscape* are:

- Mineral exploration and test quarrying, since applications are on the rise.
- Wind power, because interest in expanding the use of this energy source is growing.
- Disturbance from off-road vehicles, given that vehicle use is expected to increase as a result of growing tourism and other factors.

5.15 A Good Built Environment

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Good Built Environment* will be very difficult or not possible to achieve by 2020 even if further action is taken. This assessment differs from that of previous years. Noise and a poor indoor environment are major problems for human health. Cultural heritage assets in the built environment are not protected on a sufficient scale. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim targets concerning programmes and strategies for planning, noise, extraction of natural gravel, waste and energy use etc. in buildings are achievable within the time frame if further measures are adopted. The interim targets for built environments of cultural heritage value and a good indoor environment, on the other hand, will be very difficult to achieve even if additional measures are applied.

▶ **THE COUNCIL MAKES** the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Add to the specification regarding a sustainable urban structure a supplementary requirement that buildings should be of an environmentally sound design.
- Keep the other specifications unchanged.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Revise the interim target concerning programmes and strategies for planning, with 2015 as the target year.
- Revise the interim target for built environments of cultural heritage value, with 2020 as the target year.
- Revise the interim target for noise, with 2020 as the target year.
- Revise the interim target for extraction of natural gravel, with 2020 as the target year.
- Revise the interim target for waste, with 2015 as the target year.
- Retain unchanged the interim target for energy use in buildings, with 2020 and 2050 as the target years.
- Retain unchanged the interim target for a good indoor environment, with 2020 as the target year. The Council proposes a revision of this interim target in connection with the publication, in December 2008, of a Government-commissioned study of the technical design of buildings.

▶ **THE COUNCIL PROPOSES** a study of how a new interim target on environmentally sound building might be framed.

5.15.1 Progress towards the environmental quality objective

A GOOD BUILT ENVIRONMENT

Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.

The Environmental Objectives Council considers that the environmental quality objective *A Good Built Environment* will be very difficult to achieve within the time frame laid down. The trends have been essentially unchanged for the past few years. The Council's assessment has changed since the follow-up reported in *de Facto 2007*, when the objective was considered achievable, provided further action was taken.

The new assessment is based partly on the fact that several of the specifications of this objective on a time scale of one generation will be difficult to achieve on time. Several of the interim targets that are connected with the fundamental values on which the environmental objectives rest, too, are difficult to achieve. This applies, in particular, to the impact on human health of a poor indoor environment, and also to cultural heritage, since the cultural assets of the built environment are not being identified and protected.

The interim targets for built environments of cultural heritage value and a good indoor environment will thus be very difficult to achieve in the defined time frame. The other interim targets are expected to be achievable provided further measures are taken.

5.15.2 Progress towards the current interim targets

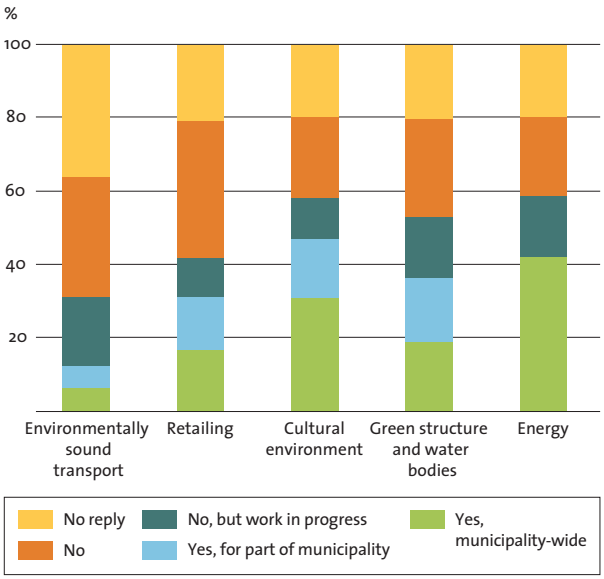
INTERIM TARGET 1

PROGRAMMES AND STRATEGIES FOR PLANNING

By 2010 land use and community planning will be based on programmes and strategies for:

- *achieving a varied supply of housing, workplaces, services and cultural activities, in order to reduce transport demand and improve the scope for environmentally sound and resource-efficient transport;*
- *preserving and enhancing cultural and aesthetic assets;*
- *preserving, maintaining and enhancing green spaces and water bodies in urban and suburban areas for nature conservation, cultural and recreational purposes, and ensuring that the proportion of hard-surface areas in these environments does not increase;*
- *promoting more efficient energy use – thereby reducing it over time – and promoting use of renewable energy resources and development of production plants for district heating, solar energy, biofuels and wind power.*

FIGURE 5.15.1 Proportion of municipalities with programmes and strategies dealing with environmental issues covered by the interim target concerning programmes and strategies for planning in 2007



Note: The Swedish Energy Agency's questionnaire survey of 2006 indicates that a considerably higher proportion of municipalities have energy plans.

SOURCE: ENVIRONMENTAL OBJECTIVES SURVEY 2007, NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING AND REGIONAL MONITORING SYSTEM (RUS)

The diagram shows the percentages of municipalities which, in a survey in 2007, replied that they had one or more current documents that, together, presented values, strategies and actions for the issues concerned. There are still many municipalities, especially among those with the smallest populations, that lack documents of this kind as a basis for land use and community planning.

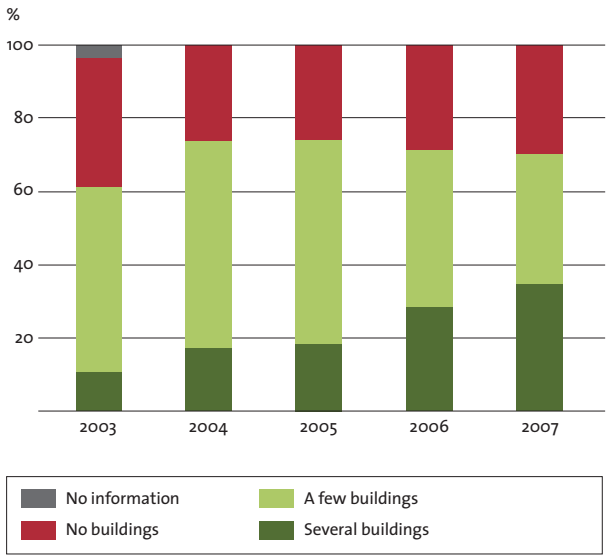
The proportion of local authorities reporting that they have up-to-date programmes and strategies is rising, but slowly. The municipalities with the smallest populations, in particular, lack documentation of this kind. Resource scarcity, in both municipalities and county administrative boards, makes it uncertain whether the interim target can be achieved on time. Vigorous action must be taken for efforts to be successful.

INTERIM TARGET 2

BUILT ENVIRONMENTS OF CULTURAL HERITAGE VALUE

By 2010 built environments of cultural heritage value will be identified and placed under long-term sustainable management.

FIGURE 5.15.2 Proportion of municipalities that have used demolition prohibitions to protect different numbers of buildings in 2003–2007



SOURCES: HOUSING MARKET SURVEY OF NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING UP TO 2005; NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING AND REGIONAL MONITORING SYSTEM (RUS) FROM 2006

The diagram shows the percentages of municipalities stating that they have protected 'no', 'a few' and 'several' buildings by means of demolition prohibitions in their detailed development plan or local area regulations. Demolition prohibitions are a narrow aspect of protection of the cultural environment but nonetheless a useful indication of how actively municipalities tackle cultural heritage issues. Since 2003, the proportion of municipalities that have protected 'several' buildings has risen; but the rise in the number of protected buildings is only gradual and is taking place from a low level. In 2007, 29% of the municipalities stated that they had not protected any buildings with demolition prohibitions.

This interim target will be very difficult to achieve to a sufficient degree within the time frame laid down. The knowledge base concerning cultural heritage assets in the built environment shows major gaps at both central and local level. At present, the selection of areas of national interest for their cultural heritage value is widely perceived as outdated. Most areas of national interest lack formal protection, and few municipalities use the scope afforded by the Planning and Building Act for protecting built environments of cultural value on an appreciable scale. Local authorities often lack expertise regarding the cultural environment and, as a result, cultural assets are not taken into account in physical planning. Requirements imposed on the authorities' property management sometimes have adverse repercussions on cultural heritage, whose values are often not identified as part of environmental activities.

INTERIM TARGET 3

NOISE

By 2010 the number of people who are exposed to traffic noise in excess of the guide values approved by Parliament for noise in dwellings will have been reduced by 5% compared with 1998.

Owing to major uncertainties in the monitoring of this interim target, it is difficult to predict whether it can be achieved on time. Levels of environmental noise are unchanged or rising, but over the period 1998–2005 some 150,000 people among those most exposed to noise have benefited from mitigation measures costing a total of around SEK 1.7 billion. The Swedish Road Administration's assessment is that the target will be hard to attain in the time frame envisaged with respect to noise from road traffic. The long-term target of a good soundscape for all remains remote. Noise reduction must be systematic and focus more on measures at source. Mitigation measures will continue to be needed for those who are worst affected by noise.

INTERIM TARGET 4

EXTRACTION OF NATURAL GRAVEL

By 2010 extraction of natural gravel in the country will not exceed 12 million tonnes per year.

This interim target is considered achievable if further action is taken. The quantity of natural gravel extracted has long been decreasing, especially as a proportion of total extraction of aggregates. Increased building entails a rise in the use of aggregates. The rise in the rate of construction over the past few years means that the decline in natural-gravel extraction is too gradual for the target to be achieved without further action.

INTERIM TARGET 5

WASTE

😐 *The total quantity of waste generated will not increase and maximum use will be made of its resource potential while minimizing health and environmental effects and associated risks. In particular:*

- *The quantity of waste disposed of to landfill, excluding mining waste, will be reduced by at least 50% by 2005 compared with 1994.*
- *By 2010 at least 50% of all household waste will be recycled through materials recovery, including biological treatment.*
- *By 2010 at least 35% of food waste from households, restaurants, caterers and retail premises will be recovered by means of biological treatment. This target relates to food waste separated at source for both home composting and centralized treatment.*
- *By 2010 food waste and comparable wastes from food processing plants etc. will be recovered by means of biological treatment. This target relates to waste that is not mixed with other wastes and that is of such a quality as to be suitable, following treatment, for recycling into crop production.*
- *By 2015 at least 60% of phosphorus compounds present in wastewater will be recovered for use on productive land. At least half of this amount should be returned to arable land.*

Varying progress is being made on the various bullet points of this interim target. The points concerning landfill disposal and materials recovery of household waste have been or will probably be achieved. The target of ensuring that the total quantity of waste generated does not increase will be very difficult to attain, as will those concerning recovery of food waste and recovery of phosphorus. In all, the Environmental Objectives Council nonetheless judges that the interim target is possible to meet if further, vigorous action is taken.

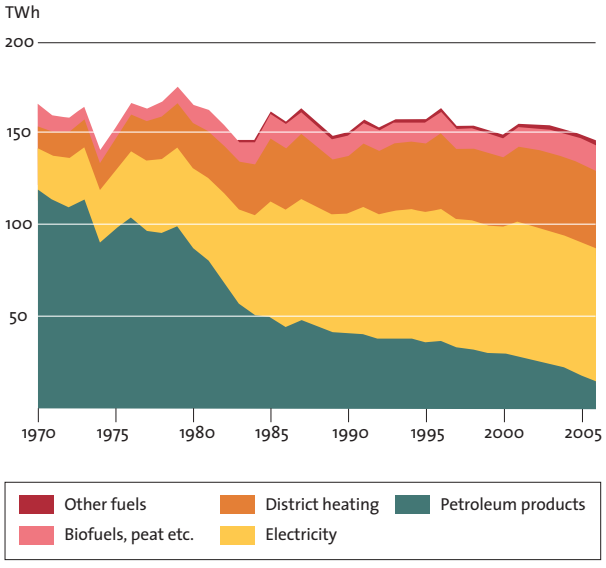
INTERIM TARGET 6

ENERGY USE ETC. IN BUILDINGS

😐 *Total energy consumption per unit area heated in residential and commercial buildings will decrease, with target reductions of 20% by 2020 and 50% by 2050, compared with consumption in 1995. By 2020 dependence on fossil fuels for the energy used in the built environment sector will be broken, at the same time as there will be a continuous increase in the share of renewable energy.*

Additional measures are needed for the target levels to be reached on time. Total energy use per heated unit of area in homes and business premises fell by 2–7% (depending on the calculation method) between 1995 and 2005. Good progress is being made in reducing dependence on fossil energy sources, with a decrease of almost 50% in the use of

FIGURE 5.15.3 Energy use in the housing and service sector, 1970–2006



SOURCES: STATISTICS SWEDEN AND SWEDISH ENERGY AGENCY

Total energy use in the housing and service sector has decreased every year since 2000. Part of this trend may be due to conversion losses taking place in previous stages, and therefore not being included in the statistics for this sector. Another explanation is that an increase in energy efficiency has actually taken place, owing to various energy-saving measures. Oil consumption has steadily declined, but as yet Sweden still has some way to go before reaching the target of energy use in the sector including no oil or other fossil fuels by 2020.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
The built environment will provide aesthetic experiences and well-being and offer a wide range of housing, workplaces, services and cultural activities that give everybody the opportunity to live a full and stimulating life, while reducing everyday transport needs.	No change.
The cultural, historical and architectural heritage in the form of buildings and built environments, as well as places and landscapes of special value, will be protected and enhanced.	No change.
A sustainable urban structure will be developed, in connection both with the siting of new buildings, structures and industries and with the use, management and conversion of existing buildings.	A sustainable urban structure will be developed, in connection both with the siting of new buildings, structures and industries and with the use, management and conversion of existing buildings. *Building design will be environmentally sound, in terms of both project planning and execution.*
The living and leisure environment, and wherever possible the work environment, will meet society's requirements in terms of design, freedom from noise and access to sunlight, clean water and clean air.	No change.
Areas of unspoiled nature and green spaces close to built-up areas, which will be easily accessible, will be protected in order to meet the need for play, recreation, local cultivation and a healthy local climate.	No change.
Biodiversity will be conserved and enhanced.	No change.
Transport services and facilities will be located and designed in such a way as to limit interference with the urban or cultural environment and so as not to pose health or safety risks or be otherwise detrimental to the environment.	No change.
Environmentally sound, good-quality public transport systems will be available, and there will be ample facilities for safe pedestrian and cycle traffic.	No change.
People will not be exposed to harmful air pollutants, noise disturbance, harmful radon levels or other unacceptable risks to health or safety.	No change.
Land and water areas will be free from toxic and dangerous substances and other pollutants.	No change.
The use of energy, water and other natural resources will be efficient, resource-saving and environmentally sound, and will be reduced in the long term; the preferred energy sources will be renewable.	No change.
The share of energy from renewable sources will have increased and this energy will, in the long term, account for most of the supply.	No change.
Natural gravel will be used only where it is not possible to use substitutes in specific applications.	No change.
Deposits of natural gravel that are of great value for the drinking water supply and the natural and cultural landscape will be conserved.	No change.
The total quantity and hazardousness of waste will be decreasing.	No change.
Wastes and residues will be separated so that they can be treated in accordance with their properties and recycled on a cooperative basis by urban areas and the surrounding rural areas.	No change.

fossil fuels from 1995 to 2005. Over the same period, the share of renewable energy increased by 16 percentage points.

INTERIM TARGET 7

A GOOD INDOOR ENVIRONMENT

By 2020 buildings and their characteristics will not have adverse impacts on health. It must therefore be ensured that

- *all buildings in which people frequently spend time or spend extended periods of time have ventilation of documented efficiency by 2015,*
- *radon levels in all schools and pre-schools are below 200 Bq/m³ air by 2010 and that*
- *radon levels in all dwellings are below 200 Bq/m³ air by 2020.*

This interim target is judged to be very difficult to achieve within the defined time frame. This is both because the process of surveying the problems concerned is proceeding slowly and because the incentives to remedy these problems are not perceived as sufficiently strong, although a poor indoor environment is a widespread health problem. The target for radon concentrations in schools and pre-schools is, however, considered achievable.

5.15.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Good Built Environment*:

Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.

THE COUNCIL MAKES the following proposals regarding the Government's specifications of the environmental quality objective on a time scale of one generation:

- Add a supplementary requirement to the specification regarding a sustainable urban structure.
- Keep the other specifications unchanged.

For specifications of the environmental quality objective, see the previous page.

One of the Government's specifications of the objective should be supplemented since the Environmental Objectives Council considers it desirable to introduce an interim target on ecofriendly building. The question of how an interim target of this nature might be framed should be studied, partly on the basis of current projects on environmental classification of buildings.

5.15.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** a revised interim target:

PROGRAMMES AND STRATEGIES FOR PLANNING

By 2015, land use and community planning will be based on programmes and strategies for an environmentally sound and healthy structure of the built environment.

For the interim target to be judged to be met, the programmes and strategies must, in the light of local and regional needs and conditions, cover the following questions:

- how to achieve a wide range of housing, workplaces, services and cultural activities, with a view to reducing transport needs and improving the scope for environmentally sound and resource-efficient transport;

- how to protect and enhance cultural heritage assets;
- how to protect and enhance aesthetic assets;
- how to conserve, care for and enhance green spaces and water bodies in urban and suburban areas, for nature conservation, cultural heritage and recreational purposes, and how to continue restricting the proportion of hardened surfaces in these environments;
- how to ensure that energy use becomes more efficient and is reduced, how to make use of renewable energy resources, and how to promote expansion of production facilities for district heating, solar energy, biofuels and wind power;
- how to safeguard water supply and wastewater disposal in a healthy, resource-saving and environmentally sound manner;
- how to address risks of flooding, subsidence, landslides etc. in the light of climate change.

Besides the minor revisions to the previous bullet points of this interim target, the Environmental Objectives Council proposes the addition of the last two points above. Safeguarding water supply and wastewater disposal is vital, and plans for these matters should therefore be in place. The new bullet point reflects the Government's specifications of the environmental quality objective. Similarly, strategies must be devised for tackling the safety risks mentioned, given ongoing climate change.

The existence of programmes and strategies alone does not guarantee that land use and community planning will be based on them. Nevertheless, the process of developing them and keeping them up to date means that the issues in question are periodically on the agenda. It also affords better scope for coordination among various sectors of society and concerted action among the stakeholders concerned when it comes to environmental measures.

For the issues covered by the interim target, conditions differ from one part of Sweden to another. For this reason, the target will continue to focus on the basic knowledge and documents needed for decision-making. The new bullet points and the fact that many municipalities still lack programmes and strategies mean that the target year needs to be postponed until 2015. After 2015, the time may be ripe to draw up a target that focuses on sustainable structures, i.e. expresses a desired state of the environment.

Monitoring and indicators

Since it is primarily local authorities that are responsible for land use and community planning, monitoring has focused on municipal programmes and strategies. In an annual web-based questionnaire survey of municipalities, there are several questions that provide a basis for tracking progress towards the interim target. The environmental objectives survey of 2007 also includes questions about the supply of drinking water. Monitoring should be supplemented by indicators that relate to the new bullet points about water supply and waste water, on the one hand, and risks of flooding, subsidence and landslides, on the other.

▶ **THE COUNCIL PROPOSES** a revised interim target:

BUILT ENVIRONMENTS OF CULTURAL HERITAGE VALUE

By 2020, there will be good prospects of protecting and enhancing the cultural and historical value and diversity of our built heritage.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Skills and knowledge relating to cultural heritage will be used by the authorities concerned and by property owners in their management and modification of the built environment.
- Municipal and regional knowledge in this area will have full geographical coverage and be continuously enhanced and used.
- At least 30% of all buildings considered particularly valuable under the Planning and Building Act will enjoy formal protection.

The current interim target, with its broad wording, has proved virtually impossible to achieve and monitor. The revised version of the target proposed by the Council focuses on the responsibilities of stakeholders (including property owners) and municipalities, under the Planning and Building Act, to protect and enhance the built heritage.

Knowledge and interest are often the most efficacious incentives to protect and enhance the cultural values of the built environment. In areas where development pressures are intense, for example, formal protection is also needed. Protection must be related to the values represented by the buildings concerned and the threats to which they are subject. A protected area can serve as a good management model and source of inspiration for creating attractive environments.

Monitoring and indicators

The interim target and its specifications can be monitored at a general level by means of the existing indicators. Data are obtained through the survey of municipalities' progress towards the environmental objectives that the Swedish National Board of Housing, Building and Planning conducts in cooperation with the Regional Monitoring System (RUS). For a higher level of detail and to verify whether the objective is being met, further enhanced data are required. Moreover, formal protection must be monitored locally.

▶ **THE COUNCIL PROPOSES** a revised interim target:

NOISE

By 2020, levels of transport noise outdoors in housing environments will be at least 5 dBA lower than in 1998, mainly as a result of noise reduction at source. The emphasis will be on the most effective ways of reducing noise disturbance, on the people and housing environments exposed to the most noise, and on achieving the guide values for indoor residential spaces.

The proposed wording of this interim target is a compromise that covers the key aspects. Very substantial measures will be needed for it to be achieved. The long-term objective of a good soundscape for all will, however, not be possible to meet by 2020.

The base year for the target reflects the transport authorities' reports to the Government in which they have cited the numbers of people exposed to noise. These reports have certain shortcomings; for example, the number of people said to be exposed to noise from the municipal road network is a highly uncertain estimate. The numbers exposed to the other guide values, i.e. maximum levels and levels of indoor noise, are unknown. Accordingly, there are major uncertainties in the interpretation of this interim target.

Monitoring and indicators

For monitoring of this target to be feasible, further development of indicators and monitoring methods is required. One suitable way of reviewing progress towards it in general terms is, as a reference scenario, to use the monitoring carried out under the Ordinance on Environmental Noise. National monitoring of progress towards this target is probably not dependent on calculations and measurements at individual level.

▶ **THE COUNCIL PROPOSES** a revised interim target:

EXTRACTION OF NATURAL GRAVEL

By 2020, extraction of natural gravel will take place only to meet essential needs and in areas where conflicting interests, in the form of drinking-water requirements and natural and cultural assets, are limited.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Natural gravel will be used only where it is not possible to use substitutes in specific applications.
- No extraction of natural gravel will take place in deposits that are of great value for the drinking-water supply and the natural and cultural landscape.

For a revised interim target to become practicable, applications and geographical areas must be specified. This will be an essential aspect of working towards it over the four-year period ahead. To facilitate the transition to a supply of aggregates other than natural gravel and, at the same time, secure good management of natural resources, there is a great need for up-to-date regional documentation in this area.

With the proposed measures, it should be possible to reach some two-thirds of the targets set on a time scale of one generation. To achieve the remainder, further changes in valuation and/or policy instruments that directly address the use of natural gravel are needed.

Monitoring and indicators

The indicator that will be used as a measure of target fulfilment is based on figures on aggregate deliveries published by the Geological Survey of Sweden (SGU). These figures are based on the annual statements submitted by producers to the county administrative boards.

▶ **THE COUNCIL PROPOSES** a revised interim target:

WASTE

By 2015, maximum use will be made of the resource potential of waste, while its impacts on and risks to health and the environment will be minimized. Waste management will be efficient for society and simple for consumers.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- **The total quantity of waste and its hazardousness will be reduced in comparison with 2004 (excluding mining waste).**
- **Collection will take place in an aesthetically satisfactory way, with good accessibility and safety for households, and separate collection of hazardous waste will be ensured. At least 90% of households will be satisfied with the collection systems.**
- **Litter in outdoor areas to which the public have access will have decreased by 50% compared with 2008.**
- **At least 35% of food waste from households, restaurants, catering establishments and retail premises will be disposed of in such a way that the plant nutrients can be used.**
- **At least 60% of the phosphorus compounds in waste water will be used as plant nutrients. At least half will be restored to arable land.**

The Environmental Objectives Council thus proposes a revision of the interim target for waste, with the adoption of 2015 as the target year. The proposed target describes the overarching focus of waste efforts. The Council proposes supplementing the existing target with the statement that waste management must be 'efficient for society and simple for consumers'.

The interim target is given five concrete, measurable specifications to be met by 2015. Three of them correspond to parts of the existing target.

The specification on the reduction of quantities of waste has been revised in such a way as to make it clear that the reduction should take place between 2004 and 2015. The year 2004 is chosen as the reference year since it was the first year of reporting under the EU's new Waste Statistics Regulation. Preventing waste reduces environmental impact 'upstream' and is also the first step in the EU waste hierarchy. The addition about the hazardousness of waste decreasing is included in the Government's specifications of *A Good Built Environment*.

The specification of the target concerning recycling of food waste from households has been revised to make it clear that it is the plant nutrients in the waste that are to be used. The target year is postponed to 2015.

The specification on phosphorus in waste water has been revised, with the removal of the term 'productive land' and its replacement with the statement that phosphorus compounds will be used as plant nutrients. Accordingly, phosphorus from waste water

must be used as a fertilizer in order for the interim target to be judged to be achieved.

Waste in well-sorted fractions is a precondition for sustainable waste management. Collection services should be of a high and even standard throughout Sweden. Collection should be aesthetically satisfactory and characterized by good safety and accessibility. The Environmental Objectives Council considers that a suitable target would be for at least 90% of households to be satisfied with their collection services.

Litter is tending to increase, and society should treat this issue as a higher priority. Besides the fact that refuse is an eyesore, both people and animals can be injured by litter lying on the ground. As a reasonable and measurable specification, the Council proposes a reduction of at least 50% in litter over the period 2008–15. The reason for choosing 2008 is that there will then probably be good methods of measuring the scale of litter in the urban environment.

The Environmental Objectives Council also proposes removing the reference to reducing landfill from the interim target. There are powerful policy instruments that are continuing to bring about a reduction in landfill. The Council proposes no new specification for materials recovery of household waste after 2010 since there is inadequate evidence for specifying the proportion of this waste that should be recovered.

Monitoring and indicators

The quantity of waste generated will be monitored by means of waste statistics that, since 2004, have been submitted to the EU every other year. Scope for using the Swedish Chemicals Agency's Products Register for monitoring the hazards associated with waste should be investigated.

It is appropriate to base monitoring of the part of the interim target concerning households' satisfaction with collection systems on questionnaire surveys. To monitor the separate collection of hazardous waste, random sampling should be used.

Statistics Sweden, on behalf of the Keep Sweden Tidy Foundation, has developed a method of measuring litter in the urban environment (pavements and parks). This method should be extended to cover other areas as well.

Monitoring of the part relating to food waste will be based on statistics from Swedish Waste Management. The quantity of phosphorus restored from waste water is to be monitored by means of the statistics compiled every two years.

▶ **THE COUNCIL PROPOSES** an unchanged interim target:

ENERGY USE IN BUILDINGS

Total energy consumption per unit area heated in residential and commercial buildings will decrease, with target reductions of 20% by 2020 and 50% by 2050, compared with consumption in 1995. By 2020 dependence on fossil fuels for the energy used in the built environment sector will be broken, at the same time as there will be a continuous increase in the share of renewable energy.

The Riksdag adopted this interim target in 2006 (see Report 2005/06:BoU9 and the decision in Riksdag Communication 2005/06:365). The target wording then superseded that stated in Government Bill 2004/05:150. Since this interim target was adopted recently, the Environmental Objectives Council is refraining from revising it.

The sentence in the interim target stating that Sweden must end its dependence on fossil fuels is to be interpreted in accordance with the definition of the Commission on Oil Independence. This means that heating of homes and premises must take place entirely without fossil fuels by 2020.

Health issues, such as the indoor environment and air quality, as well as cultural heritage assets in buildings, must not be forgotten in this context. These issues are just as important as environmentally sustainable systems of energy use. Previous experience shows that they may easily come to be neglected in favour of measures to improve energy efficiency and encourage conversion.

▶ **THE COUNCIL PROPOSES** an unchanged interim target, pending a report in December 2008 on a Government-commissioned study of the technical design of buildings:

A GOOD INDOOR ENVIRONMENT

By 2020 buildings and their characteristics will not have adverse impacts on health. It must therefore be ensured that

- *all buildings in which people frequently spend time or spend extended periods of time have ventilation of documented efficiency by 2015,*
- *radon levels in all schools and pre-schools are below 200 Bq/m³ air by 2010 and that*
- *radon levels in all dwellings are below 200 Bq/m³ air by 2020.*

Many public inquiries have discussed the interim target of a good indoor environment. Poor ventilation, radon, damp, mould, noise and chemical substances from building materials are problems that are important to deal with. But current knowledge has been judged to be inadequate to permit formulation of exact targets on matters other than ventilation and radon, as in the present interim target. Accordingly, the National Board of Housing, Building and Planning has been commissioned to compile data on the technical design and other aspects of buildings, in consultation with several other agencies. The purpose is to draw up documentation that will enable, for example, the interim target for the indoor environment to be monitored and possibly supplemented or revised. This documentation is also intended to enable new interim targets to be drawn up and the connections, if any, between shortcomings in the indoor environment and perceived ill-health clarified. The final report on this study is to be issued in December 2008.

▶ **THE COUNCIL PROPOSES** a study of how a new interim target on environmentally sound building might be framed.

5.15.5 How far are we from achieving the environmental quality objective?

The Environmental Objectives Council judges that it will take longer than until 2020 to achieve *A Good Built Environment* even if the measures now proposed are implemented. A rough estimate is that this environmental quality objective might be met by 2050 if further action is taken.

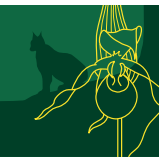
This assessment is due partly to the durability of buildings and structures in the built environment, and to the fact that the problems that exist at present, in terms of noise, the indoor environment and location of transport-generating activities, will persist. It is also important to note that some of the Government's specifications of the objective are worded as goals for the local or regional political process rather than as targets that are to be attained in a literal sense, for example regarding aesthetic experiences, well-being and variation, and environmentally sound systems of public transport. Several of the proposed measures concern better coordination, more effective knowledge transfer and strengthened skills. These are measures that are expected to have a major bearing on the scope for achieving the objective, but whose effects are difficult to estimate in absolute terms.

Accordingly, it is difficult to describe and assess, in either chronological or percentage terms, the 'gap' between the effects of the proposed interim targets and measures and successful attainment of the objective.

The essential factors affecting the prospects of achieving *A Good Built Environment* are:

- Urbanization, in the form of an increasingly dense built environment, may reduce transport requirements and favour environmentally sound modes of transport. Locally, however, it may mean that green spaces and cultural heritage assets are exploited and more people are exposed to noise and air pollution. Urbanization also results in other regions becoming depopulated and the economic basis for maintenance of buildings being eliminated.

- Enlargement of regions means that existing locations are being given greater cohesion, with improved communications and larger labour catchment areas. This enables people to remain in rural areas and small towns. Transport is, however, expanding. How well the rise in commuting can be channelled into public transport varies from one region to another. Generally, regional enlargement brings about more road travel.
- Knowledge of the status of the building stock is poor with respect to technical standards, renovation needs, the indoor environment, cultural values etc. A better knowledge base is needed for cost-effective improvement of the indoor environment.
- Climate change will impose new requirements on the siting and design of buildings. Roofs and drainage systems will, for example, be subjected to greater and more intense precipitation.
- Technological development is bringing new forms of ecofriendly construction, such as low-energy and zero-energy ('passive') buildings, to the fore. With respect to noise from vehicles and roads, too, technological development may assume great importance.
- Environmental commitment among the public and decision-makers will have a crucial bearing on the scope for achieving the objective. Decisions that are often minor for the individual, concerning mode of transport, purchases and energy conservation, will have major aggregate effects.



5.16 A Rich Diversity of Plant and Animal Life

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL'S ASSESSMENT** is that the environmental quality objective *A Rich Diversity of Plant and Animal Life* will be very difficult or not possible to achieve by 2020 even if further action is taken. Despite measures to date the loss of biodiversity, in terms of species and ecosystems alike, continues. The current use of biological resources is not sustainable. No clear trend in the state of the environment can be seen.

▶ **THE COUNCIL JUDGES** that the interim targets concerned with halting the loss of biodiversity and with sustainable use will be very difficult to meet within the time frame adopted, and that the interim target for fewer species under threat can be fulfilled within the time frame if additional measures are undertaken.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

▶ **THE COUNCIL MAKES** the following proposals regarding interim targets:

- Keep unchanged the interim target on loss of biodiversity, with 2010 as the target year.
- Keep unchanged the interim target concerning fewer species under threat, with 2015 as the target year.
- Replace the interim target for sustainable use with a revised interim target for sustainable use in a landscape perspective, with 2015 as the target year.
- Introduce a new interim target for nature in and near urban areas, with 2015 as the target year.

5.16.1 Progress towards the environmental quality objective

A RICH DIVERSITY OF PLANT AND ANIMAL LIFE

Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being.

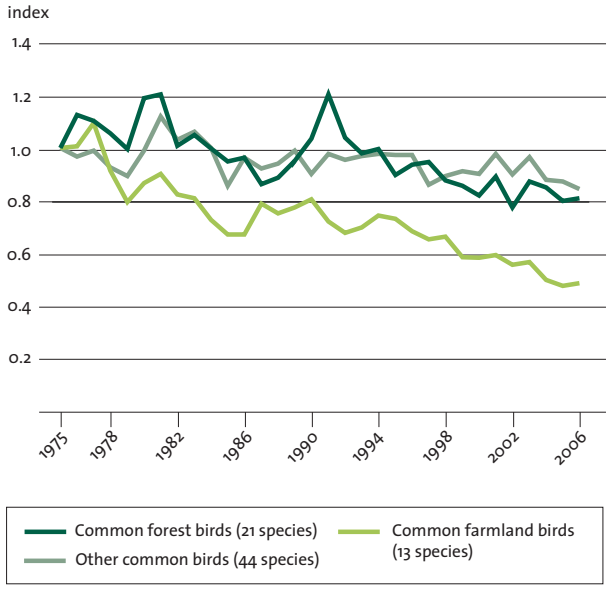
The Environmental Objectives Council judges that the environmental quality objective *A Rich Diversity of Plant and Animal Life* will be very difficult to achieve by 2020. There are ample indications that the loss of biodiversity is continuing, although the rate has decreased somewhat and measures taken to reduce the loss have been stepped up. There are many species whose current populations are not viable in the long term. For these species, it is not enough for the decline to be halted: their populations must then increase before they can be regarded as having long-term viability. Today, however, the trend for threatened species is the opposite, i.e. they are becoming more threatened.

Knowledge of the functions and processes of ecosystems remains, in many cases, inadequate. A one-sided focus on certain ecosystem services may have adverse repercussions on other functions and processes. Future climate change may subject ecosystems to new or more severe strains that cause a loss of ecosystem services.

Biological processes are often prolonged. Even if trends at all levels were pointing in the right direction at present, the objective might not necessarily be achieved by 2020. For species (and habitat types, ecosystems or processes) that are dependent on, for example, old, hollow trees or large areas characterized by long-term continuity, it may take a very long time to regain or re-establish habitats in the quantity considered necessary. In addition, the issue of an 'extinction debt' requires our attention. This means that certain species can remain in the landscape a long time after their habitats have lost what they require, in quantitative or qualitative terms, for long-term survival.

A great deal of work is under way at EU and global level to define indicators for biodiversity with reference to the global target of significantly reducing loss of biodiversity by 2010. For this environmental quality objective, the Swedish Environmental Protection Agency has devised a monitoring system that includes common pan-European indicators.

FIGURE 5.16.1 Population trends for some common bird species in Sweden, 1975–2006



SOURCE: SWEDISH BREEDING BIRD SURVEY, 2006

Many species still classified as 'common' have declined sharply in number, owing to changes in their habitats. The diagram shows the trends, since 1975, for three Swedish bird indicators. Farmland birds are doing worst, with their continued decline, but the trend is worrying for forest species as well. The fact that not all trends are downward, however, is shown by the 'Other common birds' indicator. It is important to point out, especially for forest birds, that the indicators cover common species. Many of the species that require older, undisturbed forest or forest with specific characteristics are not included in the list. If they had been, the decline would have been even steeper.

5.16.2 Progress towards the current interim targets

INTERIM TARGET 1

HALTING THE LOSS OF BIODIVERSITY

By 2010 loss of biological diversity in Sweden will have been halted.

The Environmental Objectives Council now makes a more pessimistic assessment than in its progress report *de Facto 2007*, regarding this interim target as very difficult to achieve within the time frame envisaged. Nearly three-quarters of the natural habitat types and roughly half the species covered by the EU Habitats and Species Directive do not enjoy favourable conservation status at present. For the habitats, the problem is usually shortcomings in quality (structures and processes) rather than quantity. The trend for species on the Swedish Red List still points in the wrong direction, and several commoner species, too – including birds of the farmed landscape – continue to decline. Work to halt the loss of genetic diversity is still in its infancy.

Trends for various drivers and pressures are unclear and divergent. There has been a growing response in the form of keener interest, larger financial commitments to date, more measures and new efforts, but it is insufficient. This is both because of the inherent inertia of the system and because extensive measures are required that cannot be implemented within such a short time frame. Another reason is that, in certain areas (such as preservation of genetic diversity and sustainable use), it has not yet been determined what action needs to be taken.

INTERIM TARGET 2

FEWER SPECIES UNDER THREAT

By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.

The Council judges that this interim target is achievable, provided further measures are undertaken. Verified, genuine changes in the natural environment indicate that the proportion of species under threat rose between 2000 and 2005. Vascular plants, macrofungi, butterflies and beetles are groups of flora and fauna containing particularly large numbers of threatened species, and the proportions of such species among brachiopods, amphibians, reptiles, anthozoa (sea anemones and corals) and mammals are especially high. Forest land and the agricultural landscape contain a large share of threatened species. In marine environments, the situation has deteriorated for a particularly high proportion of species. Similarly, in farmland, mountain areas and urban environments, and on seashores, species whose status has deteriorated outnumber the ones whose situation has improved.

Technical adjustments to the Red List process may entail shifting proportions of threatened species between two lists, but monitoring of the interim target is based on analyses of genuine changes in the natural environment. To improve monitoring, a Swedish Red List index should be developed by 2010. Such an index can be used to compare changes in the whole Red List as well as for individual species groups.

For the interim target to be achievable by 2015, the measures proposed in the action programmes for threatened species must be implemented and protection and management of areas of high nature conservation value must be in line with the objectives for specific habitat types. The Swedish Environmental Protection Agency embarked on a large-scale set of action programmes for threatened species in 2004 and will have adopted some 200 programmes by 2010. These will serve as guides for action to conserve and promote some 400 species that have been singled out. The measures include restoration of these species' habitats, which will favour considerably more species than those specifically identified in the programmes. For example, the action plan for trees of high conservation value in the cultural and urban landscape is expected to benefit at least 400 species on the Swedish Red List.

INTERIM TARGET 3

SUSTAINABLE USE

By 2007 follow-up methods will have been developed with a view to ensuring that biological diversity and biological resources, both terrestrial and aquatic, are used in a sustainable manner. By 2010 biological diversity and biological resources, both terrestrial and aquatic, will be used in a sustainable manner, so that biodiversity is maintained at the landscape level.

The Council now makes a more pessimistic assessment than in *de Facto 2007*, considering this interim target to be very difficult to achieve within the time frame laid down. Several common species, such as farmland birds, are still declining. The first analysis of the species and natural habitat types covered by the EU Habitats and Species Directive shows that for nearly three-quarters of these habitats and approximately half the species, conservation status is not favourable at present. These are strong indications that the current use of biological resources is not sustainable.

Restructuring in sectors such as agriculture, forestry, fisheries, industry and urban development takes time to implement. Even if the notion of 'sustainable use' is interpreted in such a way as to result in clear, usable guidelines in these sectors, it is hardly likely that all operators will have time to adjust to them by 2010. Moreover, for this interim target to be fulfilled, the landscape approach must permeate the work undertaken so that the effects of operators' actions outside the areas directly concerned can be taken into account.

5.16.3 Wording and interpretation of the environmental quality objective

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** the following unchanged wording of the environmental quality objective *A Rich Diversity of Plant and Animal Life*:

Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being.

▶ **THE COUNCIL PROPOSES** no change to the Government's specifications of the environmental quality objective on a time scale of one generation.

For specifications of the objective, please see overleaf.

5.16.4 Proposed interim targets

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** an unchanged interim target:

LOSS OF BIODIVERSITY
By 2010 loss of biological diversity in Sweden will have been halted.

This interim target will probably not be achieved by 2010, even if new policy instruments and measures are applied. However, the target has had a major impact. During Sweden's EU Presidency in autumn 2009, a great deal of international attention will be focused on the '2010 target'. The existing interim target should be followed up in the in-depth evaluation of 2012.

The interim target is an international commitment that has been incorporated into Sweden's system of environmental objectives. Similarly, a future new international target should be integrated into this system to replace the present interim target. In the present evaluation, then, no new national interim target is proposed; instead, the focus of a new international target is discussed.

PROPOSED SPECIFICATIONS OF THE ENVIRONMENTAL QUALITY OBJECTIVE

Current specifications (Government Bill 2004/05:150)	**Proposed changes** (changes in italics)
Actions by central and local government to conserve biological diversity will be undertaken from a landscape perspective on ecosystem management. The buffering capacity of ecosystems – their ability to cope with change and undergo further development so that they can continue to be productive and deliver goods and services – will be maintained.	No change.
The landscape, lakes and seas will be constituted so as to secure species habitats and dispersal pathways.	No change.
Habitats will exist in sufficient numbers to maintain long-term viable species populations (favourable conservation status).	No change.
Where important habitat types have been damaged, these will be restored, significantly improving conditions for biological diversity. Examples include habitat types that have shrunk substantially in area and/or distribution, whose quality as habitats has been generally degraded, or which support large numbers of species or genetically distinctive populations.	No change.
Nationwide distribution of animal and plant species within, for example, their natural ranges will ensure sufficient genetic variation within and between populations.	No change.
Alien species or genetically modified organisms posing a potential danger to human health or threatening to deplete biological diversity in Sweden will not be introduced.	No change.
Biological diversity will be maintained primarily through a combination of sustainable use of biological resources, conservation of species and their habitats, measures to minimize the pollutant load, and action to limit climate impact.	No change.
Species that are exploited, e.g. through hunting or fishing, will be managed in such a way that they can be harvested as a renewable resource in the long term without affecting ecosystem structures or functions.	No change.
People will have access to natural and cultural environments with a rich diversity of plant and animal life, which will help promote and maintain high standards of public health.	No change.
Sweden's biological cultural heritage will be managed in such a way that important natural and cultural assets are preserved.	No change.
Government and citizens alike will have broad knowledge and awareness of the importance of biological diversity. Traditional and local knowledge about biological diversity and its benefits will be safeguarded and used where appropriate.	No change.
Sweden will play an active part in international environmental cooperation aimed at conserving biological diversity.	No change.

▶ **THE COUNCIL PROPOSES** an unchanged interim target:

FEWER SPECIES UNDER THREAT

By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.

▶ **THE COUNCIL PROPOSES** a revised interim target:

SUSTAINABLE USE IN A LANDSCAPE PERSPECTIVE

By 2015, biological diversity and biological resources will be used in a sustainable manner, so that species and ecosystems are conserved and restored at the landscape level.

For the interim target to be judged to be met, the following specifications must be fulfilled:

- Ecosystems, processes, habitat types and structures will be present in the landscape on such a scale that all species occurring naturally in Sweden that are not under threat survive in viable populations within their natural ranges, and no previously viable species are threatened.
- A landscape approach will be applied in the implementation and application of measures and policy instruments in nature conservation.
- Effects on the wider landscape of measures undertaken will be taken into account in agriculture, forestry, fishing and other sectors.
- The resilience of nature (its capacity to withstand and recover from change) will be maintained or increase.
- Measures implemented in work on the other environmental objectives must not jeopardize biodiversity.
- The landscape will be used in a way that enhances the scope for biodiversity to adapt to climate change, and the danger of species and habitats being lost owing to climate change will therefore have decreased.
- The proportion of habitat types listed in the Habitats and Species Directive that enjoy a favourable conservation status will have increased.

The present interim target cannot be seen as a milestone objective that can be replaced by a more far-reaching one, since sustainable use is one of the three objectives (of equal value) set out in Article 1 of the United Nations Convention on Biological Diversity. The revised interim target, too, is aimed at bringing about sustainable use of biological resources and biodiversity in accordance with the Convention. In this context, 'sustainable use of biological resources' is defined in the same way as in Government Bill 2004/05:150, which in turn uses the definition provided in the Convention.

Interpretation of what 'naturally occurring species' and 'natural ranges' are may be problematical, especially in a climate change perspective. These phrases must not be interpreted as meaning that species that are dependent on management are excluded.

Monitoring and indicators

In principle, there are two ways of monitoring progress towards sustainable use:

- by defining and specifying requirements applying to use as such, for example in the form of consideration to be shown, measures permitted or prohibited etc.
- by monitoring whether the impact of a given use qualifies it as sustainable, i.e. biodiversity is not decreasing in the long term.

It is too early to propose in detail how methods of use should be monitored, since this should be based on the outcomes of various Government-commissioned studies to develop and define the term 'sustainable use' that have recently been completed.

Besides what is described under the specific habitat objectives, use is monitored through reporting on the trend in biodiversity (which is done within the framework of another interim target). The outcomes of the Government commissions on management of alien species (including environmental monitoring) and conservation of genetic variation, too, must be taken into account in the monitoring of sustainable use.

For the part of the interim target concerning implementation of the Habitats and Species Directive, monitoring can be coordinated to a high degree with the surveillance and reporting that Sweden is obliged to carry out under the Directive (Article 17).

▶ **THE COUNCIL PROPOSES** the introduction of a new interim target:

NATURE IN AND NEAR URBAN AREAS
By 2015, the population will have access to green space with valuable recreational, cultural and natural assets in and near urban areas.

For the interim target to be judged to be met, the following specification must be fulfilled:

- **The recreational, cultural and natural assets of green space in urban and urban-fringe areas will be conserved, cared for, enhanced and made accessible. At least 150,000 hectares of urban and urban-fringe forest will be managed with a view to recreation.**

This interim target specifies a given state of the environment and emphasizes the importance of conserving and enhancing biodiversity in and close to urban areas, combined with recreational and cultural heritage values. This supplements an interim target under *A Good Built Environment* that deals with green spaces and water bodies in urban and suburban areas.

Green space in urban and urban-fringe areas contains valuable recreational, cultural and natural assets. It promotes improved public health, social cohesion, attractive towns and villages, livelihoods based on visitors and tourism, and climate adaptation. Nature in and near urban areas is a subject of high political priority.

Figures from Statistics Sweden show that the assets of green space in these areas, which are difficult to describe in economic terms, are still often subordinated to other interests affording a more direct income. The built environment is becoming denser in urban areas, and expanding outwards. As a result, areas of urban and urban-fringe green space are diminishing and becoming fragmented and isolated. The quality of these sites then deteriorates and the population's access to nature decreases. Municipalities' measures to conserve nature in urban areas and the urban fringe vary. This may be attributed largely to deficient resources in the form of time and money. There is a potential for developing the sectoral collaboration that exists for conservation of nature in and around urban areas. This collaboration needs strengthening, and the efforts of municipalities, foundations and other organizations working on the ground need supporting.

Monitoring and indicators

One of the measures proposed under this interim target is for a system of national monitoring of the assets and accessibility of green space in urban and urban-fringe areas to be developed. Examples of what this kind of monitoring system might include are given below:

- the area in hectares of urban and urban-fringe green spaces protected as reserves,
- surveys of the recreational, cultural and natural assets of urban and urban-fringe green space in a number of sampling areas,
- the area in hectares of urban and urban-fringe forest under recreation-oriented management,
- the number of barriers to human and wildlife mobility in urban and urban-fringe green space that have been removed,
- the area in hectares of urban and urban-fringe green space that is accessible by public transport,
- the number of information and nature interpretation initiatives that are intended to improve accessibility for recreational purposes,

- the number of visitors of various demographic categories in a number of representative areas,
- questionnaire surveys and interviews with landowners and non-profit organizations in a selection of Swedish municipalities concerning their perceived participation in the management of urban and urban-fringe green space,
- a questionnaire survey of various demographic groups' knowledge of the right of public access to the countryside and of the assets of urban and urban-fringe green space.

5.16.5 How far are we from achieving the environmental quality objective?

Even if the interim targets on halting the loss of biodiversity, reducing the proportion of species under threat and using biological resources in a sustainable manner are achieved, further improvements in the status of biodiversity will be needed before the environmental quality objective is met. Stopping the loss of biodiversity probably means that, on a time scale of one generation, the level specified in the objective will be attained for species and habitats that are not currently threatened and whose conservation status may be described as favourable. Rarer species, genotypes and habitats may, however, need to grow in number or expand their range before the target can be deemed to be met. For many habitat types, an improvement in quality is also necessary.

The key factors affecting the prospects of achieving *A Rich Diversity of Plant and Animal Life* are:

- Habitat change and invasive alien species, and the direct and indirect effects of overexploitation of biodiversity (unsustainable use) and pollution.
- Demand for biofuels owing to climate change, which may result in increased pressure on land resources and exacerbated ill effects of habitat change.
- Direct effects of a higher mean temperature and altered weather conditions caused by climate change.
- Society's measures to protect itself against the impacts of climate change, such as flooding.

Scope for achieving this objective also depends to a high degree on action taken to meet other environmental quality objectives, especially those relating to particular habitats.

5.17 Regional environmental objectives and assessments

All of Sweden's 21 county administrative boards have adopted regional environmental goals based on the national environmental quality objectives. The specific procedures by which they arrived at them varied, but a common denominator was that these regional objectives were elaborated and approved on the basis of an extensive consultative process involving a wide range of stakeholders in the counties concerned: local authorities, businesses, non-governmental organizations and, in some cases, members of the public. The objective *A Rich Diversity of Plant and Animal Life*, introduced more than six years after the first 15 environmental quality objectives, has on the whole also been regionalized with fairly wide consultation, although that process has not yet been completed in every county. In addition, following the Riksdag's decision in November 2005 to revise the national objectives, most county administrative boards have undertaken a revision of their regional goals. Here, a shorter process has been involved, with less outside consultation, as only minor adjustments were needed to reflect the changes made at the national level.

Action programmes to achieve the environmental objectives have likewise evolved in differing ways around the country. In some counties, they were developed and decided on in parallel with the regional objectives. In others, they were elaborated subsequently, and sometimes in stages, with programmes being adopted for a number of objectives at a time.

The regional goals follow the structure of the national environmental quality objectives. The county of Västernorrland, however, has added an environmental quality objective of its own: *Geological Diversity*. The national interim targets are generally also to be found at the regional level, with the same level of ambition. Divergences can be noted, however, in the form of both more ambitious and less ambitious regional targets. This may be a result of regional variations in basic conditions and the problems faced, for example soils of varying acidity or differing areas of agricultural land. Sometimes, counties have chosen to omit particular national interim targets altogether. In some cases, moreover, regional goals have different target years from their national counterparts.

It is not possible at present to ascertain clearly whether, taken together, the regional objectives correspond to the national ones. Most of the responsible national agencies, however, have compared national and regional goals, usually in very general terms. To make an overall picture in this regard more readily available, better guidance from the national authorities for regional implementation of the objectives is needed.

Several county administrative boards have adopted regional targets on issues not covered by the national objectives, such as organic farming and food consumption. In their in-depth evaluations, a number of boards have proposed various wordings for new goals, for consideration by the central agencies responsible for the objectives. Against that backdrop, the Environmental Objectives Council now proposes the introduction of a new interim target for organic production, under the national environmental quality objective *A Varied Agricultural Landscape*.

One example of a goal where levels of ambition clearly vary, and could cause problems, is the interim target for phosphorus emissions under *Zero*

Table 5.17.1 Number of counties whose interim targets have the same, a higher or a lower level of ambition, compared with the national ones.

	Same level of ambition	Higher level of ambition	Lower level of ambition	No interim target
Phosphorus emissions[1]	4	2	6	1
Nitrogen emissions[2]	11	1	2	0
Ammonia emissions	12	3	2	4

1. Excluding six counties that have not updated their interim targets and two with targets that are not comparable (county-specific targets).

2. Excluding seven counties which, because of their geographical location, do not consider that they need an interim target for nitrogen emissions.

Eutrophication. Of Sweden's 21 counties, only four have a target for phosphorus with a level of ambition corresponding to that of the national one (see Table 5.17.1). Six county administrative boards have adopted interim targets that are less ambitious. They include the Stockholm and Södermanland boards, which is remarkable, given the very urgent need to reduce inputs of phosphorus to the Baltic Sea proper. Dalarna and Västra Götaland, meanwhile, have set more ambitious targets than the one adopted nationally, which is surprising in the case of Västra Götaland, since on the west coast priority should if anything be given to curbing inputs of nitrogen. In over three-quarters of counties, regional interim targets for nitrogen emissions correspond to the national target.

It is very important that, when monitoring progress towards the environmental quality objectives, the national agencies responsible for them should take greater account of the varying trends in the state of the environment in different parts of Sweden. Assessments will vary from one county to another, depending on the geographical location and economic development of the region in question. This is reflected in the following comments from the Stockholm and Värmland county administrative boards regarding the prospects of achieving the objectives:

> *'In an expanding region, certain conflicts often arise between achievement of environmental objectives, on the one hand, and development, growing inward migration, transport and emissions, on the other. Such conflicts can to some extent be addressed by developing more efficient transport and energy systems and new technologies. The key conflict is that between the climate objective and transport.'* – Stockholm County Administrative Board.

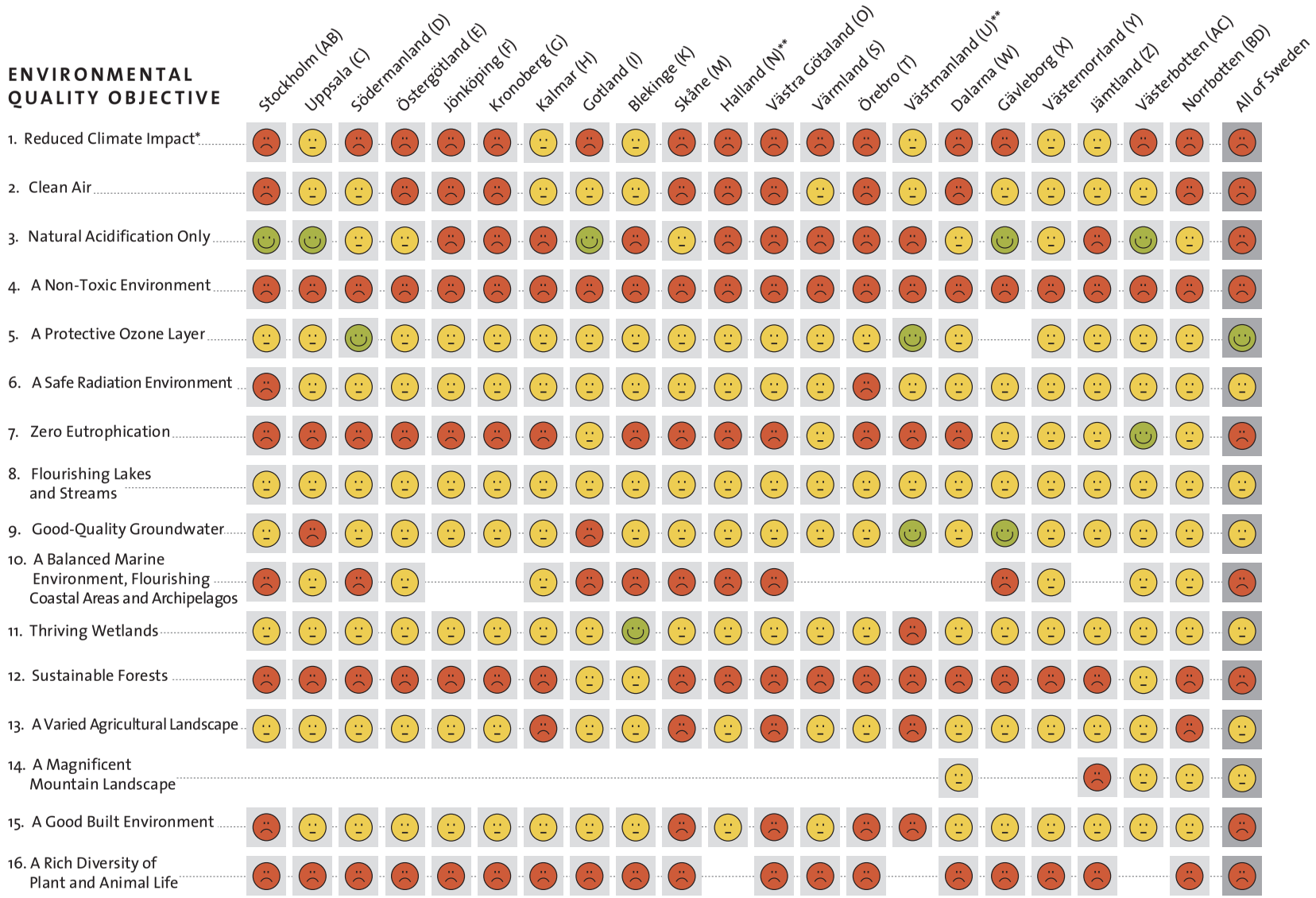
> *'Värmland is engaged in a constant battle against encroachment of scrub and woodland. Keeping valuable land and features open is most difficult in areas in the immediate vicinity of forests, where it may even be the case that woodland has already taken over and farming has been abandoned. Important factors in achieving the environmental quality objective are viable agriculture, maintenance of a rural population, and grazing livestock.'* – Värmland County Administrative Board.

The Environmental Objectives Council takes the view that, with the revisions under way and still to come, the shortcomings mentioned are gradually being reduced. It also believes, however, that several of the national agencies with lead responsibility for the objectives need to be more active in supporting and engaging in dialogue with the county administrative boards. For further discussion of the links between the regional and national environmental objectives, see 3.1.4.

5.17.1 Will the regional objectives be achieved?

All the county administrative boards and, in the case of *Sustainable Forests*, the Swedish Forest Agency have assessed progress towards the regional

Will the regional environmental objectives be achieved?



*Target year 2050, as a first step

**Assessment is from 2006, as regional objectives are currently being revised

SOURCE OF ASSESSMENTS OF REGIONAL OBJECTIVES: COUNTY ADMINISTRATIVE BOARDS' REPORTS TO ENVIRONMENTAL OBJECTIVES COUNCIL

FIGURE 5.17.1
Summary of county administrative boards' assessments

The table opposite shows the county administrative boards' 2007 appraisals of the prospects of achieving the environmental quality objectives in their respective counties, together with the Environmental Objectives Council's assessments for the national objectives. Only counties in the mountain region have assessed progress towards *A Magnificent Mountain Landscape*, and only those with a sea coast have made an appraisal for *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*. Some counties have yet to regionalize *A Rich Diversity of Plant and Animal Life*, which was adopted more than six years after the other environmental objectives, and have consequently not reviewed progress towards it. In one other case, too, no appraisal has been made at the county level.

A key to the symbols used can be found on page 93.

environmental objectives. The criteria applied were the same as those used by the Environmental Objectives Council in its national assessment.

By and large, the county boards' conclusions tally quite closely with those reached nationally, but they also reflect the differences in basic conditions between regions. Diverging assessments may also be due to differing interpretations of objectives, or a result of what data are available. The boards of sparsely populated counties are somewhat more optimistic than the others about the prospects of achieving the environmental objectives.

At the national level, the forecast for *A Protective Ozone Layer* is now more favourable than in *de Facto 2007*: the view is that it can be achieved. As yet, this change is only reflected in two of the counties' assessments. Apart from this, *Clean Air* and *Natural Acidification Only* are the objectives for which regional appraisals deviate most from the national ones. Ten county boards, chiefly those representing regions with major towns and cities where transport has a significant impact, conclude – in line with the national assessment – that it will be very difficult or not possible to achieve *Clean Air* within the defined time frame. The others consider that this objective can be met if additional action is taken.

The differing impacts of acidification are made clear by the appraisals of progress towards *Natural Acidification Only*. Gotland with its calcareous bedrock, counties in eastern Sweden and several counties in the north are relatively optimistic about the chances of reaching this objective. Other counties, more exposed to atmospheric transport of pollutants and with soil characteristics that entail slower recovery, are more pessimistic in this regard.

Stockholm, Västra Götaland and Skåne, with their expanding metropolitan regions, along with Örebro and Västmanland, judge the environmental quality objective *A Good Built Environment* to be very difficult or not possible to attain.

The counties on the south and west coasts of Sweden, together with Stockholm, Södermanland, Gotland and Gävleborg, conclude that it will be very difficult or impossible to achieve *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*. The boards of the other coastal counties believe that this objective can be met if further measures are introduced. Regarding *Zero Eutrophication*, the counties of northern Sweden make the most favourable assessments of the prospects of success.

Some county boards take the view that, with additional action, the climate objective can be achieved. That assessment is based on an interpretation whereby the objective is judged to be met if the county's own per capita emissions of greenhouse gases can be reduced to the level considered necessary to bring emissions down to the global average.

More information about the county administrative boards' assessments can be found (in Swedish) on the Environmental Objectives Portal (www.miljomal.nu) and the Regional Monitoring System website (www.rus.lst.se). New assessments are made each year and are posted on the Environmental Objectives Portal.

CHAPTER 6.

Strategies to achieve the environmental quality objectives

The Environmental Objectives Council notes in this report that much remains to be done to attain Sweden's environmental quality objectives. In several cases, its assessment is that it will be very difficult, and sometimes not in fact possible, to fully achieve by 2020 the quality of the environment which the objectives describe. Continued and intensified efforts are essential. An important aim in the various background reports prepared for this evaluation has been to put forward relevant proposals for policy instruments and practical measures.

Almost a thousand proposals have been presented, most of them in the background reports from the lead agencies for the environmental quality objectives. Proposals have also been submitted by agencies with special sectoral responsibility for the objectives and by county administrative boards and the Council's experts. To varying degrees, the economic impacts of these proposals have been analysed by the agencies concerned. In the framework of the three action strategies described in the following pages, the proposals put forward have been structured, grouped and prioritized. All the measures recommended and the impact assessments carried out are presented in Appendices 1 and 2, respectively, which are published separately. In addition, the results of the impact assessments are summarized in Chapter 7 of the present report.

The Environmental Objectives Council supports the strategies developed and the measures and policy instruments proposed in them. To a large extent, these measures and instruments cut across individual sectors and objectives, and are therefore difficult to handle in the framework of a single objective. The Council judges that the strategy-based analyses undertaken will have a greater overall effect than proposals for individual environmental objectives. With substantial resources currently being invested in addressing the climate change issue, for example, it is important to combine measures in that area with action in other environmental sectors.

Among the areas addressed by proposals set out in this report, a number have been identified as crucial to achieving several of the objectives and, moreover, as cutting across the three strategies. Some of these issues are considered in section 6.4.

THREE ACTION STRATEGIES

To coordinate and guide long-term efforts to achieve the environmental quality objectives, in such a way that those objectives can serve as tools in a transition to a sustainable society, the Government, in its bill 'The Swedish Environmental Objectives – Interim Targets and Action Strategies' (Government Bill 2000/01:130), drew up guidelines for three action strategies. These strategies cover the main areas giving rise to today's environmental problems, and describe the particular challenges that need to be addressed in order to reach the objectives. The three action strategies are:

1. A Strategy for More Efficient Energy Use and Transport (the EET Strategy) – chiefly to reduce emissions from the energy and transport sectors and increase the share of renewable energy.
2. A Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles (the GRK Strategy) – to reduce use of natural resources, curb emissions of toxic pollutants, and promote energy- and material-efficient environmental life cycles.
3. A Strategy for the Management of Land, Water and the Built Environment (the HUM Strategy) – to conserve biodiversity and valuable cultural environments, protect human health, and achieve environmentally sound land use planning and a sustainable built environment.

In its bill 'Environmental Quality Objectives – A Shared Responsibility' (Government Bill 2004/05:150), the Government emphasized the importance of the three strategies. Their basic concern is described as being to identify cost-effective measures, both short- and long-term, that can help to achieve several environmental quality objectives or interim targets at once, as well as contributing to the attainment of goals in other policy areas. To meet the objectives set, it is important that the action taken is coordinated and effective. Priority should be given to measures that will generate synergies and help secure

progress towards several of the environmental quality objectives. In addition, the strategies should identify conflicts both between environmental quality objectives and in relation to other policy goals.

In its guidelines for the background reports to the in-depth evaluation, the Environmental Objectives Council also provided guidance concerning the three action strategies:

- The strategies should identify policy instruments and measures that are judged necessary to achieve, in the short and long term, the environmental quality objectives and interim targets relevant to each strategy. The starting point should be the impact-assessed instruments and measures presented in the evaluations of individual objectives and in the sectoral reports.
- The strategies should result in action packages including various types of policy instruments (economic, administrative, legal and information instruments) for each strategy. As far as possible, these should have been made the subject of an overall economic impact assessment.
- The strategies should shed light on any conflicts and synergies between the proposals for attaining environmental quality objectives and objectives in specific sectors and other policy areas. The starting point should be 'conflicts and/or synergies in relation to the potential to achieve the environmental quality objectives'.
- The strategies should address the cross-cutting issues related to the environmental objectives (*Human Health*, *The Cultural Environment* and *Land Use Planning and Wise Management of Land, Water and Buildings*) and ensure that measures linked to these issues are included in overall action in pursuit of the objectives.
- The strategies should ensure that the 18 agencies with special sectoral responsibility for the environmental objectives are given scope to participate in the process. Measures identified in the sectoral agencies' reports should be used in the development of the strategies.

In the framework of each strategy, the policy instruments and measures proposed in the background reports have been reviewed and action packages developed on the basis of them. The aim of these action packages is to present and prioritize proposals in a more integrated and comprehensive manner than in the background reports on the individual environmental quality objectives.

OBJECTIVES AND TARGETS COVERED BY THE STRATEGIES

In preparation for this report, the environmental quality objectives and interim targets were divided up among the three action strategies, to ensure a degree of coordination. Table 6.1 gives a simplified overview of the resultant breakdown. Hard and fast dividing lines are not possible in this context, as policy instruments and measures to achieve one environmental quality objective are often of significance for other objectives as well.

The five environmental quality objectives *Reduced Climate Impact*, *Clean Air*, *Natural Acidification Only*, *Zero Eutrophication* and *A Good Built Environment* have been identified as the main concerns of the EET Strategy. Naturally, that strategy also has to take into account the other objectives, including *Sustainable Forests* and *A Rich Diversity of Plant and Animal Life*.

The GRK Strategy should primarily be designed to help meet the interim targets under the environmental quality objectives *A Non-Toxic Environment*, *A Protective Ozone Layer*, *A Safe Radiation Environment*, *Zero Eutrophication* and *A Good Built Environment*. More objectives and targets are assigned to this strategy in the present report than in earlier descriptions of it, including several important aspects of *Reduced Climate Impact* and *Good-Quality Groundwater*.

The HUM Strategy chiefly has a role to play in attaining the environmental quality objectives *Flourishing Lakes and Streams*, *Good-Quality Groundwater*, *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*, *Thriving Wetlands*, *Sustainable Forests*, *A Varied Agricultural Landscape*, *A Magnificent Mountain Landscape*, *A Good Built Environment* and *A Rich*

Table 6.1 Breakdown of the environmental quality objectives and interim targets between the three action strategies.

Environmental quality objective	EET Strategy	GRK Strategy	HUM Strategy
1. Reduced Climate Impact	Energy systems Transport systems Energy use in industry Energy use in connection with use of homes/premises and vehicles	Energy-efficient production Process emissions Energy-efficient use of products (excl. vehicles and homes) Energy-efficient waste disposal (incl. landfill gas) Fluorinated greenhouse gases	Renewable energy production Climate impacts of agriculture and forestry
2. Clean Air	Most aspects of the objective	Air pollutants from production (e.g. VOCs) Air pollutants from use of products other than vehicles (e.g. paint)	
3. Natural Acidification Only	Air pollutants from energy production and transport	Air pollutants from production	Acidifying effects of forestry
4. A Non-Toxic Environment		The whole objective	
5. A Protective Ozone Layer		The whole objective	
6. A Safe Radiation Environment		Most aspects of the objective	Electromagnetic fields
7. Zero Eutrophication	Nitrogen oxides from energy and transport	Phosphorus and nitrogen emissions from industry and sewage treatment	Nitrogen and phosphorus from forest and agricultural land
8. Flourishing Lakes and Streams		Good surface water status with respect to chemical factors	Most aspects of the objective
9. Good-Quality Groundwater		Good-quality drinking water	Protection of water-bearing geological formations and groundwater levels
10. A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos		Oil and chemicals from ships Good surface water status with respect to chemical factors	Most aspects of the objective
11. Thriving Wetlands			Most aspects of the objective
12. Sustainable Forests	Energy production from biomass		Most aspects of the objective
13. A Varied Agricultural Landscape	Energy production from biomass		Most aspects of the objective
14. A Magnificent Mountain Landscape			The whole objective
15. A Good Built Environment	Land use planning – transport and energy use Noise Energy use in buildings	Waste Indoor environment Soil and water free from toxic substances Natural gravel as a resource	Land use planning – use of land and water, cultural heritage and aesthetic assets Built environments of cultural heritage value Conservation of natural gravel deposits
16. A Rich Diversity of Plant and Animal Life			The whole objective

Diversity of Plant and Animal Life. In addition, it is intended to help achieve elements of the objectives *Reduced Climate Impact*, *Natural Acidification Only*, *A Safe Radiation Environment* and *Zero Eutrophication*.

HOW THE STRATEGIES WERE DEVELOPED

Background material for the Environmental Objectives Council's in-depth evaluation was prepared in the framework of each of the action strategies. Most of the government agencies involved had been entrusted with this task in their appropriation directions or instructions from the Government.

The process was guided by the specific characteristics of each strategy. In the case of the EET and GRK Strategies, development work had been undertaken before, while for the HUM Strategy this was the first time. The three strategies deal with environmental objectives of widely differing character, and diverge in terms of the underlying driving forces and the sectors and stakeholders concerned. These differences are reflected in the way proposals were handled and analysed and action packages assembled within each strategy, and in the policy instruments identified as relevant. Different approaches were taken, and the strategies have evolved to varying degrees in terms of methods and results.

Further development of the EET Strategy has been jointly entrusted to the Swedish Rail Administration, the Swedish Energy Agency, the Swedish Civil Aviation Authority, the Swedish Environmental Protection Agency, the Swedish Maritime Administration and the Swedish Road Administration, through the Government's appropriation directions to these bodies. The Environmental Protection Agency is responsible for administrative coordination of the strategy, and the results are to be reported to the Environmental Objectives Council. The strategy now presented was jointly prepared by the six agencies commissioned to develop it, with additional contributions from the Swedish Institute for Transport and Communications Analysis (SIKA) and the National Board of Housing, Building and Planning. The work done on the EET Strategy was presented to a wider audience at the Transport Forum in Linköping and the National Energy Convention in Stockholm in spring 2007. A full-day hearing with invited speakers from the Confederation of Swedish Enterprise, the Swedish Association of Local Authorities and Regions and the Swedish Society for Nature Conservation was arranged in September 2007 to gather views on the strategy.

In the case of the GRK Strategy, the Environmental Protection Agency, in line with its instructions from the Government, coordinated a commissioning group made up of representatives of three lead agencies for the objectives: the National Board of Housing, Building and Planning, the Swedish Chemicals Agency and the Swedish Radiation Protection Authority. An open reference group of interested stakeholders was given the opportunity to follow the process by means of newsletters, workshops, seminars and a hearing. In this way, representatives of some 40 organizations were able to monitor the work in progress. Some of the government agencies concerned have a particular interest in the challenge of achieving non-toxic, resource-saving environmental life cycles and also played an active part in developing the strategy. In addition to the Environmental Protection Agency, the Chemicals Agency, the Board of Housing, Building and Planning, and the Radiation Protection Authority, therefore, the Geological Survey of Sweden and the National Board of Health and Welfare were represented on the working group for the strategy. A large number of employees of these agencies contributed to the process and the report.

Responsibility for developing the HUM Strategy is shared by the Swedish Environmental Protection Agency, the National Board of Housing, Building and Planning, the Swedish Board of Fisheries, the Swedish Forest Agency, the Swedish Board of Agriculture, the National Heritage Board and the National Board of Health and Welfare. The Environmental Protection Agency is responsible for administrative coordination of the strategy. A working group made up of representatives of the agencies responsible, together with the Swedish Energy Agency and the Swedish Road Administration, prepared the background material relating to this strategy. Preliminary

action packages were assembled and analysed in relation to different future scenarios drawn up by the Environmental Strategies Research Group (fms) at Stockholm's Royal Institute of Technology. Enveco Miljöekonomi AB and WSP compiled the impact assessments of the packages relating to stewardship, protection and restoration, and to planning, respectively. A steering group comprising representatives of the Environmental Protection Agency, the Board of Housing, Building and Planning, the Board of Fisheries, the Forest Agency, the Board of Agriculture, the National Heritage Board, the Road Administration and the Energy Agency oversaw the work and approved the final report to the Environmental Objectives Council. The National Board of Health and Welfare declined the invitation to join the steering group and was represented only on the working group.

6.1 Strategy for More Efficient Energy Use and Transport

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL SUPPORTS** the Strategy for More Efficient Energy Use and Transport (the EET Strategy), including the proposed policy instruments.

▶ **THE COUNCIL CONSIDERS** that powerful policy instruments are needed to change current trends in these sectors. To achieve long-term environmental goals, including *Reduced Climate Impact*, more efficient technologies, renewable energy and pollution abatement equipment are not enough. It is also necessary to change people's behaviour. The Council emphasizes in particular that, even if the policy instruments now proposed look as if they will be sufficient to meet the interim targets for 2015 and 2020 covered by the strategy, further instruments will be required to strengthen sustainable development.

▶ **THE COUNCIL GIVES PRIORITY** to a general increase in energy efficiency. This should be achieved both through specific measures and at a system level.

▶ **THE COUNCIL WISHES** to see greater use being made of renewable and non-depleting energy sources, such as solar and wind. These are the highest priority, followed by biomass, which has considerable potential. Renewable energy is given priority over other carbon dioxide-efficient energy sources that are not sustainable.

▶ **THE COUNCIL BELIEVES** that, in the shorter term, end-of-pipe abatement technology must be used to reduce nitrogen and sulphur emissions, with a view to meeting the acidification and eutrophication objectives. This is particularly true in the shipping sector.

▶ **THE COUNCIL EMPHASIZES** that such measures could likewise help achieve *Clean Air*, but that for that objective additional action will also be required. As far as air quality is concerned, it is of particular importance *where* emission reductions are brought about. Targeted measures to tackle noise from transport are also needed to meet the objectives.

▶ **THE COUNCIL PROPOSES** some 50 new or modified policy instruments in the framework of this strategy, with a view to achieving the measures given priority above. These proposals identify what issues Sweden should be pursuing internationally, what central government can do and, to some extent, what can be done by local authorities. The aim is to create a good basis for the private and public sectors to act in accordance with the environmental objectives, thereby paving the way for system change. Economic instruments are seen as the main priority, but they need to be supplemented with administrative, information and other instruments. The policy instruments proposed include:

- Instruments to improve energy efficiency in industry, housing and services; in road transport of passengers and goods; through transport-efficient urban development and infrastructure; and in the aviation, shipping, rail and mobile machinery sectors.
- Instruments to reduce climate impact, by increasing the share of renewable energy in the supply of electricity, heat and transport fuels.
- Instruments to improve abatement of nitrogen oxide emissions from stationary sources, road transport and mobile machinery, and to reduce nitrogen and sulphur oxide emissions from shipping.
- Additional instruments for measures to reduce concentrations of air pollutants by cutting emissions from small-scale burning of wood and from transport.
- Instruments for measures to reduce transport noise.

6.1.1 Environmental and other objectives

FIVE ENVIRONMENTAL QUALITY OBJECTIVES

Five environmental quality objectives – *Reduced Climate Impact*, *Natural Acidification Only*, *Zero Eutrophication*, *Clean Air* and *A Good Built Environment* – are identified as the main concerns of the EET Strategy. All five and several of their interim targets require, for their fulfilment, further measures besides those decided upon (Environmental Objectives Council, 2007). Developments in the energy and transport sectors are crucial for these objectives. Naturally, the other environmental objectives, such as *Sustainable Forests* and *A Rich Diversity of Plant and Animal Life*, must also be taken into consideration in this strategy.

ENERGY POLICY OBJECTIVES

The guidelines for energy policy (Government Bill 2001/02:143, 'Collaboration for a Secure, Efficient and Environmentally Friendly Energy Supply') involve safeguarding the energy supply on terms that are competitive in relation to other countries. Energy must be used as efficiently as possible, with a low impact on the environment, climate and health, and in ways that facilitate the transition to a sustainable society. Nuclear power must be superseded by more efficient electricity use, renewable fuels and environmentally acceptable production techniques.

TRANSPORT POLICY OBJECTIVE

The overarching objective of transport policy is to safeguard an economically efficient and sustainable long-term supply of transport services for citizens and businesses throughout Sweden (Government Bill 2005/06:160, 'Modern Transport'). More specific targets are an accessible transport system, high transport quality, safe traffic, a good environment, regional development and a gender-equal transport system. The Swedish Institute for Transport and Communications Analysis (SIKA) currently has a government remit to propose revised objectives and targets.

OTHER POLICY OBJECTIVES

A number of other policy aims must also be taken into account in this broad strategy. The transport and energy sectors have a crucial bearing on aims relating, for example, to growth and employment. Conversely, such objectives as free trade or regional expansion generate higher demand for transport services as well.

6.1.2 The EET Strategy in an international perspective

In several respects, the EET Strategy is contingent on the rest of the world, both for attainment of the national environmental objectives referred to and, quite simply, in view of the workings of modern transport and energy systems.

The climate issue is a global concern; but the status of other environmental problems in Sweden also, in many cases, depends on international emission trends. This is true with regard to both *Natural Acidification Only* and *Clean Air*. Sweden must therefore act internationally – in the EU, directly through the specialized UN agencies, and in other contexts – to create a better environment, both globally and in Sweden. There are several good examples of how Sweden has contributed to international agreements to reduce acidification or use of chemicals, for example. The environmental objectives must therefore be seen in the light of international developments, and are partially defined in the light of international agreements.

A change in EU climate work is currently under discussion. There are indications that the Union will strengthen its own role: it may, for example, take over decisions on allocations of emissions rights in the scheme for trading in emissions of carbon dioxide (CO_2), the 'EU ETS'. EU directives in the energy sector also have a major bearing on national efforts to combat climate change. More centralized decision-making about climate policy instruments at EU level will reduce the scope for a separate Swedish climate policy in the future. Sweden must therefore pursue these issues internationally. The EU Presidency in 2009 will be a key opportunity, and the Swedish En-

vironmental Protection Agency's government assignment to propose priorities for continuous EU efforts is another forum in which to pursue these issues further.

Focusing too narrowly on national aims may preclude the emergence of cost-effective solutions. Two important examples are international aviation and shipping, which are outside the present structure of national environmental objectives and the international structure of objectives in the Kyoto Protocol. Efforts to reduce CO_2 emissions on the part of two UN agencies, the International Civil Aviation Organization (ICAO) for aviation and the International Maritime Organization (IMO) for shipping, show only slow progress.

The transport sector, especially aviation and shipping, is a genuinely international phenomenon and therefore dependent on international collaboration. Transport services, vehicles and fuels are international commodities that are greatly affected by international requirements. Competition legislation may, for example, prevent individual countries from imposing their own requirements. In many cases, rail transport is governed by EU directives as well. Energy markets are global and the electricity network has long been extended across national borders.

It is therefore necessary for the EET Strategy to be consistently international in outlook.

6.1.3 EET forecasts, drivers and challenges

Five environmental quality objectives have been identified as relevant to the EET Strategy. Achieving them means focusing especially on the following factors: energy supply, conversion and use; greenhouse gas emissions, especially CO_2; emissions of nitrogen oxides and, for shipping, also sulphur; concentrations of various substances, especially NO_x and particles; and transport noise.

FORECASTS

The Swedish Energy Agency's long-term forecasts are based on current energy and environmental policy. The basis for the Agency's assumptions includes assessments of future economic growth in various industrial sectors and for society as a whole. Other key assumptions are assessments of natural gas, oil and coal prices. Other issues assessed include measures to make energy use more efficient, based mainly on historical correlations.

Energy use

Energy use is expected to increase during the forecasting period in all sectors, except 'housing, services etc.', where it is expected to remain roughly on a par with its present level.

Energy supply

According to the forecast, the supply of virtually all types of energy is expected to increase. A particularly rapid rise in biofuels is expected.

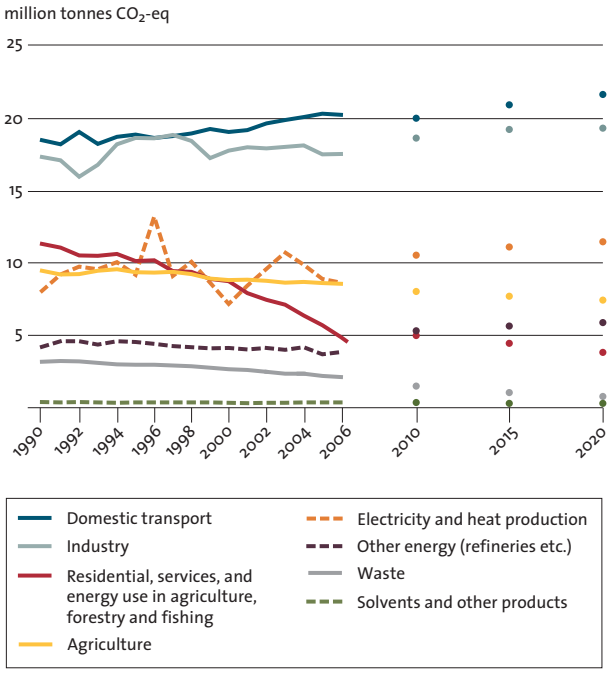
Emissions of greenhouse gases

Emissions from electricity and district heating production, industry and transport operations are increasing relatively fast. On the other hand, emissions from heating of homes and service outlets, landfill sites and agriculture are decreasing, slowing the aggregate rise expected up to 2020. The forecast indicates that Sweden's national target for emissions of greenhouse gases for 2008–12 may be met.

Emissions from domestic transport are expected to stabilize between now and 2010 compared with present-day emission levels, and thereafter to start increasing again up to 2020. Road transport will dominate emissions and the overall increase in emissions will be due mainly to increased industrial production in transport-intensive sectors where heavy transport operations are expanding.

A massive rise in emissions from international shipping from 1990 to 2020 is expected. No major changes in passenger transport are anticipated during the forecasting period. Goods transport, on the other hand, is expected to increase – mainly due to rising exports. Compared with 1990, emissions of CO_2 from international aviation are also expected to increase.

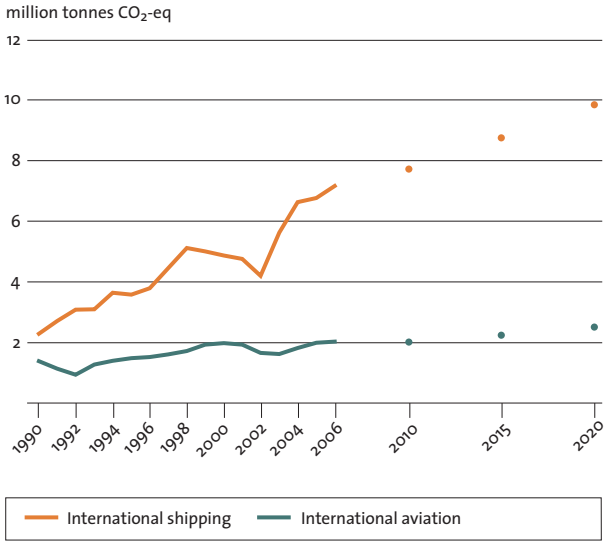
FIGURE 6.1.1 Emissions of greenhouse gases by sector, 1990–2006 and projected up to 2020



SOURCES: SWEDISH ENERGY AGENCY AND SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Trends for Sweden's emissions of greenhouse gases diverge from one sector to another. Between now and 2010, emissions are expected to increase from industry, electricity production and district heating, and also from refineries ('other energy'). On the other hand, emissions from individual heating installations in homes and premises, and also from agriculture and waste, have fallen in the past 15 years and this decrease is expected to continue.

FIGURE 6.1.2 Emissions of greenhouse gases from international aviation and shipping bunkering in Sweden, 1990–2006 and projected up to 2020



SOURCES: SWEDISH ENERGY AGENCY AND SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Emissions of greenhouse gases from international aviation and shipping bunkering (refuelling) in Sweden are large and have increased sharply. The forecast indicates a continued rise. These emissions are, at present, covered neither by the Kyoto Protocol nor by the Swedish environmental quality objective. The work being done in the two UN bodies, ICAO and IMO, to counteract CO_2 emissions is proceeding slowly.

Table 6.1.1 Emissions of sulphur oxides and nitrogen oxides from domestic and international shipping bunkering in Sweden, 2005–2020. Source: Swedish Environmental Protection Agency.

Kilotonnes per year	2005	2010	2015	2020
Sulphur dioxide (SO_2)				
Domestic shipping	4.4	3.2	3.3	3.4
International shipping bunkering in Sweden	94	69	78	88
Nitrogen oxides (NO_x)				
Domestic shipping	11	12	12	13
International shipping bunkering in Sweden	153	173	192	216

Table 6.1.2 Number of people exposed to noise in Sweden, by noise source. Source: Swedish Road Administration.

Mode of transport	No. of people exposed to >55 dBA equivalent sound level in homes
Road transport	1,200,000–1,800,000
Rail transport	400,000–600,000
Aviation, civil	15,000–25,000
Aviation, military	25,000–35,000
Total	1,600,000–2,400,000

Emissions of nitrogen and sulphur oxides

Emissions of nitrogen oxides have decreased sharply. According to the forecast, the trend looks encouraging after 2010 as well. This is mainly attributable to new exhaust controls already adopted for heavy goods vehicles and for mobile machinery, while replacement of passenger cars without catalytic converters is continuing. According to the forecast, which takes current policy instruments and trends into account, emissions of nitrogen oxides in Sweden will be 138 kilotonnes (kt) in 2015 and 119 kt in 2020.

Marine emissions of both sulphur and nitrogen exceed the land-based emissions. Moreover, while the latter are decreasing, emissions from international shipping are increasing. The major emissions from international shipping have made it the largest single source of deposition in Sweden of nitrogen oxides (NO_x) and the second-largest source of deposition of sulphur dioxide (SO_2).

Concentrations of nitrogen oxides, particles etc.

Air quality has improved considerably in the last 20–30 years, but over the past ten this improvement has levelled off for some pollutants. Based on forecasts for the period up to 2020, the environmental objective is judged to be very difficult to achieve. Long-range atmospheric transport of air pollution is, and has long been, a key cause of elevated concentrations of ground-level ozone and particles, for example, especially in southern Sweden. Urban background levels of pollution measured in parks and similar areas, at some distance from such known sources as road transport, provide a general picture of air quality in urban areas and shed light on human exposure to pollutants. At street sites, pollutant concentrations are often twice as high.

Transport noise

Noise is the environmental disturbance that affects the largest number of people directly today. Levels of noise in society are unchanged or even increasing. Compared with other environmental sectors, it is remarkable that the prevalence of noise has not been reduced, given the large number of people subjected to it and the extensive problems entailed by this exposure. Alongside the climate objective, noise is the area furthest from long-term target fulfilment.

GAP BETWEEN INTERIM TARGETS AND FORECASTS

The EET Strategy is based on the target of reducing Sweden's greenhouse gas emissions by 25–30%. This means a reduction of at least 17 megatonnes (Mt) of CO_2 equivalent by 2020, given that there are sources not included in the strategy. The proposal is that nitrogen oxide (NO_x) emissions should be below 130 kt by 2015. Compared with the forecast, NO_x emissions will consequently have to decrease by just under 10 kt. The proposed target for shipping entails a halving of SO_2 emissions from that source by 2015 and a reduction in NO_x emissions compared with 2005. Air pollutant concentrations must also fall to the proposed levels by 2015, and transport noise must decrease so as to meet the interim target by 2020.

The EET Strategy therefore has the following targets:

- A reduction of at least 17 Mt in CO_2 equivalent emissions by 2020.
- A reduction of just under 10 kt in NO_x emissions by 2015.
- A halving of SO_2 emissions from shipping and a reduction in NO_x emissions by 2015.
- A reduction in emissions of air pollutants to enable the *Clean Air* targets to be met by 2015.
- A reduction in transport noise by means of additional measures by 2020.

DRIVERS FOR DEVELOPMENTS

Trends for emissions, air pollutant concentrations and noise caused by the transport and energy sectors depend on several different factors, and there are many underlying drivers.

Demographic factors, such as population trends and employment, are fundamental drivers. Both the population and the labour force are expected to increase by 2020. The tendencies towards regional expansion, both spontaneous and fostered, involve increased travel.

Perhaps the most important driver in the development of energy and transport activities, however, is *economic development*: incomes, GDP, sectoral composition, foreign trade and the globalization of production systems. An increase in manufacturing generates a rise in goods transport. High GDP growth boosts demand for electricity, but the higher growth rate also results in more rapid replacement of equipment. Similarly, higher growth results in increased demand for larger homes and premises, but also a rise in the number of households, and consequently a larger area to be heated.

For the industrial sector, trends are largely governed by the international market since much of its production is exported. Economic trends in other countries therefore have a major bearing on Swedish industry.

Price trends are another important driver. A harmonized European electricity market will probably not result in a marked change in prices for the production and distribution of electricity in Sweden, since these are currently close to the average in Europe. The larger market will lead to more stable prices, and the effect of variations in hydroelectric power production due to particularly dry and wet years will decrease.

Raised energy prices, especially for fossil fuels, are contributing both to the replacement of heating oil with heat pumps, biofuels and district heating, and to an increase in energy efficiency. In several industrial subsectors, there is a strong incentive to reduce energy use since energy costs account for a substantial share of total expenditure. Key economic drivers of transport trends include overall Swedish economic growth and price trends for fuels, vehicles etc. In this context, the price of crude oil is particularly relevant, although high taxes on fuels reduce the relative importance of the rising price of this commodity.

Future energy use and emissions will also be affected by *technological development* regarding vehicles and production of electricity and heat.

The specific fuel consumption of new vehicles is falling, but slowly. Engines are becoming more efficient but, at the same time, demand for bigger, stronger vehicles has been high. Use of renewable fuels is rising rapidly owing to various incentives but still accounts for a very small proportion of total fuel consumption. The proportion of passenger cars with diesel engines is increasing; this is bringing about a reduction in the average specific fuel consumption of vehicles on the road, but an increase in NO_x emissions. Other trends include a fall in specific vehicle emissions of nitrogen oxides, particles, hydrocarbons etc. as tighter emission controls increasingly affect the Swedish vehicle fleet. Vehicles' specific CO_2 emissions, on the other hand, are decreasing only very slowly. The same applies to their noise emissions.

Besides prices, the range of products available, income trends etc., developments also depend on prevailing *attitudes and preferences*. In forecasting contexts these are usually assumed to be unchanged, but in reality changes can take place at an unforeseen

speed and affect people's travel patterns and choices of products, forms of heating, vehicles and fuels, means of transport etc.

CENTRAL CHALLENGES FOR THE EET STRATEGY

Trends in the energy and transport sectors will determine whether the environmental objectives assigned to this strategy are met. The following challenges have been identified as the most crucial.

Attaining the environmental objectives through more efficient energy use means that every sector must continue to work to this end. Perhaps the greatest challenge here is the relatively high and rapidly rising transport demand for goods and passengers alike. Vehicles, ships and aircraft can become more energy-efficient and a switch to more energy-efficient types of transport, where possible, is also necessary. It is vital for society to be planned in a way that permits energy-saving behaviour and reduced transport use. International aviation and shipping have high rates of energy use but, at present, lack policy instruments to influence them.

Reducing impact on the climate calls for a decrease in the use of fossil fuels. However, the supply of electricity and fuels from such alternatives as biomass, wind power, solar electricity and solar heating is limited in the short and medium term. Increasing energy efficiency is, accordingly, especially important. Storage of CO_2 is an interesting method but one as yet untried on a large scale. Nuclear power is a CO_2-efficient technology but associated with other problems. The transport sector is, basically, entirely dependent on oil. Aviation, in particular, has a major greenhouse effect besides its CO_2 emissions.

Reducing nitrogen emissions through greater energy efficiency is another challenge. Further pollution abatement measures are, however, required for stationary installations, mobile machinery and road traffic. Since shipping accounts for large nitrogen and sulphur emissions, additional exhaust gas treatment and a fuel of lower sulphur content are needed in this sector.

Reducing total emissions of air pollutants can also mitigate local problems, especially if the reductions take place where people live, work and play. Further challenges are the small-scale burning of wood, particles from the use of metal-studded tyres and some impact from ships in harbours and from such mobile machinery as snowmobiles.

Abating disturbance from transport noise is another challenge. This noise comes mainly from road and rail transport but also exists around airports.

The EET Strategy tackles these crucial challenges by emphasizing a number of strategic choices of measures required and providing proposals for policy instruments that can bring about the requisite changes.

6.1.4 Strategic choices affecting the future

Meeting the environmental objectives requires change. Outlining visions of the future with a longer time perspective is one way of discussing various solutions and making clear that we can influence the kind of future we face. Futures studies are therefore needed, with special analyses of particular environmental objectives and challenges. (One study of this kind is 'The 2°C target in sight? Scenarios for the Swedish energy and transport system up to 2050', Environmental Protection Agency, 2007, in Swedish.) Many of the measures in the energy and transport system that are being discussed today, such as investments in roads and railways or production facilities for new fuels, have a long life span and will affect scope for achieving the long-term environmental objectives.

Based on the present-day situation, it is also possible to choose various ways of attaining an energy and transport system that is compatible with the environmental objectives. The choices made today affect chances of meeting these objectives in the future, and solutions that prove unfruitful and involve suboptimization should be avoided. Decision-makers at various levels therefore need to make strategic choices and take decisions to start and attain the requisite change. These choices may be strategic because, for example, the decisions have a

major impact on the environment, are interdependent or involve embarking on development paths that are hard to change. This section discusses three general choices: what is necessary, whether technical solutions will suffice and how change can be brought about.

WHAT CHANGES AND ACTIONS ARE REQUIRED?

The EET Strategy gives priority to improving energy efficiency. This will exert major positive effects in terms of the environmental objectives mentioned above, except possibly that relating to noise. In addition, however, further measures are required to reduce climate impact through an increased share of renewable energy. Emissions of nitrogen and sulphur must be reduced by means of treatment measures. The *Clean Air* objective will benefit from these measures, but requires further action. Transport noise also calls for targeted measures. To fulfil objectives and targets as far as possible and maximize cost-effectiveness, the following measures are given priority:

- A general increase in energy efficiency.
- Investments in renewable energy to reduce greenhouse gas emissions.
- Treatment to reduce emissions of nitrogen and sulphur oxides.
- Targeted measures to reduce concentrations of air pollutants.
- Targeted measures to reduce transport noise.

Among these measures, there are several synergic effects. A good urban environment with low noise and clean air may, for example, be said to be a requirement for a dense urban structure that, in turn, is a key issue for the climate objective and increased energy efficiency. It is therefore important to consider the strategy as a whole.

General increase in energy efficiency the highest priority

Using energy more efficiently is often cost-effective, and has a beneficial impact on all the objectives. If the use of fossil fuels decreases, CO_2 emissions and other environmental impacts also diminish. Renewable energy sources, where used, last longer if used efficiently. Greater efficiency can be achieved through both technical solutions and behavioural changes. Very few conflicts with other objectives result from general increases in efficiency.

The whole energy system can be made more efficient. This means 'using the right energy in the right way'. The choice of fuel or energy source on the supply side, as well as the distribution, transmission and use of energy, should be analysed with a view to minimizing their environmental impact in a life-cycle perspective. A system view, showing how energy should be treated as a resource, can thereby be achieved.

There are several examples of existing and forthcoming technologies that result in greater efficiency: heat pumps and plug-in hybrid electric vehicles are two examples. But making energy use more efficient does not necessarily involve only new and advanced technology. Today, the solutions are to a large extent already available.

The *physical structure of the community* – planning and building of infrastructure and siting of housing and workplaces – is crucial in the creation of a transport-efficient and sustainable society. Combining, in the long term, the environmental objectives with the aim of high accessibility is feasible with a physical structure that favours short journeys and energy-efficient modes of travel. IT communication can also serve to replace physical mobility.

Development of *infrastructure* has a major bearing on scope for making energy use in transport more efficient. Infrastructure has a structuring effect: roads, railways, harbours and airports govern the location of new business establishments and housing, and thereby the travel and transport patterns that arise. It takes time for changes in infrastructure to attain their full effect, and changes must therefore be initiated now. However, other increases in energy efficiency will provide the largest contributions to reducing CO_2 emissions in the short term.

In Sweden, rail and sea operations account for a relatively high proportion of goods transport. This is favourable from the climate point of view. Expansion of capacity is making it feasible for more goods

to be transported by rail. Development of strategic harbours, with their associated infrastructure, has the effect of stimulating shipping. This may help to reduce overall use of energy by the transport sector. The railways also play a key part in the public transport system, and commuting in and between regions should take place, as far as possible, by train to permit sustainable regional development.

All opportunities for boosting energy efficiency must be taken in each transport mode. It is also important to make use of the potential for greater energy efficiency in private transport that efficient collaboration among different transport categories can afford. Multimodal operations involving elements of road, sea, rail and air transport combined will be increasingly important as distances increase. More integrated transport planning also needs to be encouraged.

Renewable energy a higher priority than other CO_2-efficient energy sources

To reduce the greenhouse effect from the energy supply, our use of fossil fuels must decrease. Renewable and non-depleting energy sources, such as solar, wind and hydroelectric power, are the top priorities, followed by bioenergy. Renewable energy is given priority over other CO_2-efficient energy sources that are not sustainable in the long term.

Hydroelectric power is a key energy source in Sweden, but involves a heavy, irreversible impact on animals and plants. Neither is *wind power*, albeit a non-depleting energy source, problem-free in terms of influencing its surroundings. *Solar heating* is also entirely emission-free, putting very little pressure on the environment. The environmental impact of *solar electricity* is small, but several types of solar cells contain relatively uncommon and toxic metals. *Wave energy* is, at present, a major unexploited source for renewable energy production, but limited experience of this technology means that a full picture of its environmental effects is lacking. Solar and wave power will probably become interesting technologies in the longer term.

The potential for harvesting *biofuels* has been the subject of numerous studies. Results vary, depending on the assumptions made. They may be summarized in the statement that the biofuel harvest can be substantially increased, but it will not be able to cover all needs. Conflicts may arise concerning the use of raw materials in various sectors, especially the forest industry and the energy and transport sectors, and about land for food production and recreation. A very high biofuel harvesting rate may jeopardize, for example, the environmental quality objectives *Sustainable Forests* and *A Rich Diversity of Plant and Animal Life*, and also have adverse social repercussions. Biofuel production and use must therefore be energy-efficient and ecologically sustainable.

To use the bioenergy as efficiently as possible, it is necessary to devise energy systems that extract the maximum amount of energy from fuels and avoid losses. The most efficient use of biofuels at present is combined heat and power (CHP) or energy combinations of CHP with the production of steam, pellets, transport fuels, chemicals, animal feed or biogas.

Refining biomass to make *transport biofuels* invariably entails energy losses. At present, energy performance and impact on the climate and environment vary widely from one such fuel to another. Vehicle biofuels may, for example, be produced with a high input of fossil raw materials; but ethanol from sugar cane is among those showing a relatively good performance, and biogas can, for example, be produced from organic waste. Given the limited supply of biomass, it is important to devise more resource-efficient methods of producing fuels of this type that must also have acceptable effects on other environmental objectives. To increase the incentive to produce transport biofuels in an environmentally acceptable way, international certification of these fuels may come to play a part.

Capture and storage of CO_2 is a future option for bringing about reductions in CO_2 emissions. Existing knowledge indicates that there are ample storage spaces in many parts of the world where CO_2 could be kept for long periods, but more research is needed. The technology makes it possible to dispose of CO_2 emissions from both fossil-based and biobased energy production. With a biofuel-fired power station, the outcome would be negative emissions. The method

is interesting for the future but too little time now remains for there to be any great effect by 2020.

Reducing energy use enough for renewable fuels to meet the demand for energy entirely is a great challenge. Besides renewable energy, therefore, non-renewable fuels with relatively low CO_2 emissions could be considered, even in the longer term. However, the EET Strategy does not propose any changes to decisions or policy instruments in these areas.

Nuclear power is a non-renewable form of energy with relatively low CO_2 emissions. If a delayed phase-out of nuclear power were considered for climate reasons, great attention would have to be paid to safety aspects, including accident risk and military aspects, and also to environmental effects other than climate change. There would above all need to be stringent environmental requirements concerning uranium mining operations and enrichment and high safety standards for reactors and final disposal.

Natural gas is a fossil fuel that entails lower emissions of greenhouse gases per unit of energy than oil and coal. The sulphur content is, moreover, low and this reduces emissions of acidifying substances and also of volatile organic compounds (VOCs) and particles. Emissions of nitrogen oxides, too, are low in comparison with combustion of other fuels.

No single energy source can be expected to provide a solution for the energy system in the foreseeable future. Nor, perhaps, should this be aimed at since diversity in the energy system may yield more robust solutions. A distributed electricity system with many small power sources, such as CHP in residential buildings, affords less vulnerability. A system of this kind is favoured by simple technology and scope for local supply of fuels. This small-scale, distributed energy system may need to be supplemented by large-scale solutions. A high proportion of wind power in the energy system, for example, may need to be supplemented by large-scale hydroelectric power to afford regulation potential. Where large-scale solutions are concerned, the state has a key role to play in terms of responsibility and supervision.

Air pollutant emissions reduced by climate measures, but further action needed

For the EET Strategy, the International Institute for Applied Systems Analysis (IIASA) has carried out rough calculations using the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model to estimate synergic effects of improved energy effi-

Table 6.1.3 Effects on emissions of air pollutants of measures to reduce CO_2 emissions in Sweden, compared with forecast for 2020. Source: IIASA 2007.

% reduction compared with forecast for 2020, for all gases	Decrease in CO_2 emissions compared with 1990					
	5 %	10 %	15 %	20 %	25 %	30 %
CO_2 (%)	–6.5	–11	–16	–21	–26	–31
SO_2 (%)	–9.0	–17	–18	–18	–19	–20
NO_X (%)	–0.7	–2.8	–4.2	–5.4	–6.3	–6.7
Particulate matter (%)	–1.2	–1.8	–1.8	–1.8	–2.0	–1.9
VOCs (%)	–1.4	–1.5	–1.6	–1.6	–1.7	–1.8
Cost of reducing CO_2 emissions (€ million a year)	–0.4	115	263	445	690	985
Gain from not needing to install treatment equipment to meet the forecast level for other atmospheric emissions (€ million a year)	–103	–115	–116	–116	–119	–125

ciency and fuel switching on emissions of air pollutants in Sweden ('Sweden in 2020', Environmental Protection Agency, 2007). The model proposes practicable measures to reduce CO_2 and other atmospheric emissions, and estimates the costs of these measures. The results indicate major synergies. If CO_2 emissions in Sweden were, for example, to be cut by 25% between 1990 and 2020, emissions of SO_2 and NO_x would also fall as a result of the same measures, by 19% and 6% respectively compared with the forecast for 2020. Emissions of particles and VOCs, too, would decrease by some 2% each. However, it is uncertain whether concentrations of air pollutants would show a corresponding degree of improvement.

It may also be concluded from the study that a 10% decrease in Sweden's CO_2 emissions would be offset by reduced costs of treatment equipment to bring down emissions of other air pollutants. However, these gains are an underestimate, since the model analyses only technical measures such as steps to improve energy efficiency and achieve fuel switching, but takes no behavioural measures into consideration.

Estimates also show that effects on emissions of greenhouse gases resulting from technical measures introduced to reduce air pollution are small. But here, too, a broader arsenal of measures could yield greater synergies.

The analysis demonstrates the importance of dealing with emissions of CO_2 and other air pollutants in a single context in order to find a cost-effective mixture of measures with a lower total cost than if the action strategies were analysed separately.

Although the synergic effects are extensive with respect to greater efficiency and there would be certain synergies from investment in renewable fuels, further measures are required to achieve both the emission and the concentration targets in the short term. Examples of key areas for further work are treatment of ship exhaust gases and cleaner fuels for shipping; small-scale burning of wood; and use of studded tyres. Thus, it is insufficient to invest in the climate objective: rather, work must continue to ensure that the more traditional environmental problems, too, are solved.

Specific measures required to tackle transport noise

Synergic effects associated with increased energy efficiency have less impact on noise. Lower speeds on the roads generate less noise, for example, while increased rail transport may exacerbate noise problems instead. To be successful, noise abatement efforts therefore need to be more systematic and long-term. Work should also become more focused on controlling noise at source. Examples of such measures are new vehicle and tyre designs that cause less noise. Quieter road surfaces are another possibility. In the past ten years, extensive action has been taken and, as a result, the noise experienced by many people in and around their homes has decreased; but this action has consisted mainly of mitigation measures.

GREATER ENERGY EFFICIENCY AND RENEWABLE ENERGY – ENOUGH IN THE LONG TERM?

To achieve the interim targets concerned by 2020, increased energy efficiency and a higher proportion of renewable energy resources appear to go a long way. The cost-effectiveness of different measures should govern which ones are introduced. However, such behavioural changes as modified travel and consumption patterns are a key complement when it comes to creating a resource-efficient mix of measures in the short term, and look set to become even more important in the long term. It is therefore vital to devise policy instruments that also include behavioural issues, and essential for present-day trends not to impede future scope for resource-efficient behaviour.

In terms of the period up to 2050 and looking further to 2100, current knowledge indicates that global emissions of greenhouse gases must decrease very sharply and in due course approach zero. The global supply of CO_2-neutral energy is therefore a key issue for the transport and energy sectors in Sweden as well. We do not know which technologies will be available then, but the restructuring period for vehicle fleets and energy systems is long. Nor do we know for certain today that new, energy-efficient technology and the supply of renewable energy will suffice for attaining a low enough impact on the

climate and environment. The rapid increases in air travel and road transport are examples of daunting challenges. We therefore need to discuss and analyse how behavioural changes should be made to generate resource-efficient energy and transport systems that achieve future climate and environmental objectives.

Consumers and the business sector are important stakeholders since, through their choices, they have the capacity to influence much of the energy system. Society must pave the way, creating scope and structures to permit, facilitate and foster behavioural changes that promote the environmental objectives. Financial incentives combined with information, dialogue and voluntary agreements can help to bring about change. Nevertheless, resource-efficient options are sometimes not selected despite high fuel prices, for example, if other parameters weigh more heavily in decisions. One key strategic choice for the future is therefore how to effect gradual behavioural changes to facilitate the transition to a sustainable society.

FORMULATING EFFECTIVE POLICY INSTRUMENTS

Here, 'policy instruments' means the tools that are available to bring about various actions in society. They may be roughly classified in the following categories:

- Economic instruments, such as taxes, charges and emissions trading.
- Regulatory instruments, such as laws and regulations.
- Information, dialogue and voluntary agreements, such as environmental labelling and environmental management systems.
- Research, development and demonstration.
- Physical instruments, such as investments in infrastructure.

Owners of policy instruments may be international organizations, the EU, the state or municipalities.

Meeting environmental objectives at minimum cost to society

The premise in the analysis of instruments undertaken in the EET Strategy is that the environmental objectives must be attained at the lowest possible cost to society. This means that measures already beneficial in private financial terms should be stimulated by the provision of information; economically cost-effective measures should be given priority in the short term; and incentives should be provided for long-term improvements and technological development.

General economic instruments, such as trading schemes and taxes, basically exert all the above effects. Areas where policy instruments are lacking at present need special attention and should be subject to such instruments in the future, for example to restrict CO_2 emissions from international aviation and shipping. Cost-effective measures are likely to exist in these sectors. The same applies to areas where current controls are relatively weak.

Advantages and disadvantages of packages of instruments

A well-balanced package of policy instruments can boost the impact of various measures and reduce administrative costs or uncertainty in estimates of the costs of measures (OECD, 2007). Different instruments can also complement one another. To supplement economic instruments in various forms, information has a key part to play. A mix of instruments may sometimes be required, to tackle a range of different market failures.

There are examples of measures to boost energy efficiency that are not implemented despite their direct profitability and short payback periods. This may be because operators lack knowledge of what can be done. It may also be difficult, using general instruments alone, to manage the location and timing of emissions, which may be highly significant.

But packages of instruments are not ends in themselves. In the best of worlds, all stakeholders would encounter equivalent incentives and possess perfect information about the measures available. As far as one policy instrument can attain the desired effect, this single instrument should be used. In practice, an analysis of policy instruments must relate to a world of market failures and existing instruments of various types. It is then important to avoid overlaps among

instruments intended to solve the same problems, since these increase administrative costs. To restrict the number of proposals in the EET Strategy, instruments with a relatively large impact on at least one environmental objective are given priority.

Supplementary instruments

Besides the more specific proposals concerning policy instruments in the next section, continued efforts are also required in other areas to create a resource-efficient transport and energy system. Supplementary instruments that must continue, as hitherto, to support favourable trends in the energy and transport sectors include research, development and demonstration (RDD), promotion of environmental technology and a supply of venture capital for it, regulatory simplification measures, tighter environmental requirements in procurement, and information and training. One example would be to afford greater encouragement to environmental technology and its supply of venture capital by initiating and assisting in the creation of partnerships, networks or arenas linking environmental technology companies and major users. This could be done through financial, technical and practical support for investors to facilitate the development of new, eco-friendly products and environmental technology.

Energy and transport affected by other policy areas

The EET Strategy touches mainly on decisions taken in the fields of energy and transport policy, although energy use and demand for transport often stem from decisions in all other policy areas and enterprise sectors. The environmental repercussions of decisions in these sectors must therefore be emphasized clearly, and policy instruments must be sufficiently vigorous to ensure progress towards the environmental objectives.

6.1.5 Proposed policy instruments for the EET Strategy

The EET Strategy is based mainly on the policy instruments proposed in the Checkpoint 2008 report and the reports by objective and sector that have been drawn up in the in-depth evaluation. New proposals have been put forward during work on the strategy, and some have been excluded. Note that the EET Strategy contains only proposals for changes, not an evaluation and repetition of existing instruments in the areas concerned. The time frame is up to 2020. To a varying degree, impact assessments of the proposals are contained in the respective background reports, and a summary of these assessments, with quantifications, may be found in a separate report. All the reports are available at the Environmental Protection Agency's website.

The collected proposals for policy instruments are aimed at:

- Reducing energy use in general to make achieving the environmental objectives easier.
- Reducing CO_2 equivalent emissions by at least 17 Mt in comparison with the forecast for 2020.
- Reducing NO_x emissions by just under 10 kt by 2015 in comparison with the forecast.
- Halving SO_2 emissions from shipping and reducing NO_x emissions by 2015.
- Reducing emissions of air pollutants to attain the targets for *Clean Air* by 2015.
- Reducing transport noise by means of additional measures by 2020.

INSTRUMENTS TO IMPROVE ENERGY EFFICIENCY, WITH A VIEW TO ACHIEVING THE CLIMATE AND OTHER ENVIRONMENTAL OBJECTIVES

Improving energy efficiency is a relatively cheap type of action with positive effects on all the environmental objectives cited. The EET Strategy therefore chooses to make it a priority. Here, a few general policy instruments can also provide incentives for fuel switching, for example, but this is commonly more expensive than raising efficiency.

Improving energy efficiency in industry

The challenge is to change existing policy levers so that marginal costs in various sectors converge. Nowadays, for reasons of competition, industry pays

considerably lower taxes on CO_2 and energy than households. However, this means that there are probably cost-effective measures to be found in both the trading and the non-trading industrial sectors.

Today, installations covered by the EU Emissions Trading Scheme (EU ETS) are subject to a reduced national carbon tax. A national tax in an EU-wide trading scheme mainly imposes costs on Swedish industrial facilities, without affecting emissions.

For industrial companies not covered by the EU ETS, the option of reducing tax through participation in voluntary energy efficiency and fuel use programmes is a way for the state to stimulate and control development. Dialogue processes, too, can supplement general policy instruments. In such processes, strategies can be adapted to the operator's circumstances. Advice, training and other support may be included.

▶ TO INCREASE ENERGY EFFICIENCY IN INDUSTRY, THE FOLLOWING PROPOSAL IS MADE:

EU Emissions Trading Scheme (ETS)
The proposal is both to cut down on the total allowances allocated to trading sectors and to auction allowances to electricity and district heating producers.

▶ FOR INDUSTRY OUTSIDE THE ETS, THE FOLLOWING IS PROPOSED:
Further investigation of scope for *limited tax rises* combined with, in particular, an expanded *Programme for Improved Energy Efficiency (PFE)* or some other form of voluntary agreement focused on fuel use and also, as a secondary option, further development of the application of the *Swedish Environmental Code* or *direct investment support* within the framework of a new system of climate investment support.

In the Checkpoint 2008 report, the consequences of cutting the allocation by 6–10 Mt of CO_2 a year in relation to the forecast for 2020 are analysed. Reductions for industry outside the ETS depend on the form taken by the proposal.

Improving energy efficiency in housing and services

Housing and services are characterized by sharply decreasing emissions of greenhouse gases due to conversions from heating based on fossil fuels. The combination of rising oil prices and a rise in carbon tax that has already been decided upon is expected to yield sufficient incentives to phase out the remaining heating based on fossil fuels, i.e. a potential of some 0.6 Mt of CO_2 equivalent by 2020. On the other hand, energy use in homes and premises can be made far more efficient and contribute to reduced greenhouse gases in other sectors.

Financial incentives are usually to be found in existing energy taxation, but general awareness of opportunities for reducing energy use is fairly low. One difficulty is that buildings are built, managed and used by different stakeholders: as a result, each one does not always have incentives to act. The focus of the proposal is on raising consumer awareness.

▶ TO INCREASE ENERGY EFFICIENCY IN HOUSING AND SERVICES, THE FOLLOWING PROPOSAL IS MADE:

Environmental labelling for buildings – energy performance certificates
Environmental labelling with a threefold classification (A, B, C) should be linked to the recently introduced energy performance certificates, with building regulations as the minimum level (C). This can be done for both new and existing buildings. For the latter, more levels may be required (D, E). Building regulations need monitoring; adjustments should be required in cases where the regulations are not met.

The increase in energy efficiency will depend on the detailed form taken by the proposal.

Improving energy efficiency through transport-efficient urban development and infrastructure

For a long-term reduction in the environmental impact of transport, the physical structure of communities and investments in infrastructure are key factors. Technological improvements and alternative fuels can only partially mitigate transport's impacts

on the environment. Other needs are to curb transport growth and, in the long run, reduce it through purposeful spatial planning to shape travel needs, transport distances and choices of transport mode.

With the odd exception, Sweden lacks regional planning. There are therefore difficulties in integrating, for example, county transport plans with other aspects of regional development. To a large extent, this must be done in dialogue with local authorities. The Energy Agency developed a sustainability programme with five pilot municipalities in 2003–7, for example, and the programme is to be extended to some 20 municipalities in 2008–12. This programme has helped local authorities obtain a clearer grasp of energy and transport issues in their spatial planning as a whole.

Infrastructure, too, may need supplementing to meet needs and stimulate the use of energy-efficient means of transport. The effect of spatial planning on transport trends may be seen as a multiplier that reinforces or reduces the impact of other transport-related policy instruments.

Swedish spatial planning is done almost entirely locally, and it is also in the municipalities that the foundations of a transport-efficient society are laid. There are resource shortages and a need for expertise for land use and other planning in municipalities and for regional coordination. It is also important to create incentive structures to bring about these solutions. There is a large gap to be bridged between global environmental problems and municipal siting decisions. It is also essential for new infrastructure investments not to exert effects that, in the long term, make meeting the environmental objectives more difficult.

▶ TO INCREASE ENERGY EFFICIENCY THROUGH TRANSPORT-EFFICIENT URBAN DEVELOPMENT AND INFRASTRUCTURE, THE FOLLOWING PROPOSALS ARE MADE:

Regional coordination of national environmental objectives with municipal planning
With the creation of better coordination in the planning process and a clear responsibility to pursue the environmental objectives, coordinated planning in line with the objectives can be promoted.

A changed division of functions in the planning process may call for adjustments in the Planning and Building Act, and also an expansion of the role played by comprehensive plans.

Extended legal scope for municipal policy instruments
Today, municipalities wishing to promote transport-efficient development through local policy instruments and ordinances of their own encounter legal obstacles or obscure points in some cases. By clarifying in the legislation (especially the Planning and Building Act) what is allowed or even desirable, the municipalities will be given more scope for using local instruments. Legislative amendments should be drawn up in dialogue with the municipalities concerned.

Support for developing integrated transport plans for towns and cities
Developing transport plans that integrate all modes of transport and spatial planning to create a sustainable, functional transport system constitute a successful approach for urban areas, and one that is recommended by the EU Green Paper on Urban Transport. Through support and skills transfer, the municipalities' work on transport plans can be speeded up and improved.

Capacity building for transport-efficient spatial planning
Only a few Swedish municipalities have engaged in active transport-efficient spatial planning. To systematically enhance understanding of the potential of, and increase knowledge about, such planning, capacity building and skills transfer to the municipalities are required. To make the process more efficient, this function should be concentrated in an organization with a clear assignment and resources for its implementation.

Standardized assessment method for estimating impact of transport-intensive activities
Today, no uniform method is used for reporting on the CO_2 emissions and accessibility effects to which the establishment of transport-intensive activities gives rise. Use of such a method would improve the data on which decisions are based, thereby helping to steer more business relocations to optimal sites. A standardized method of reporting environmental and accessibility effects can be implemented in the form of regulations. As a secondary effect, the assessment tool could result in a manual on impact assessment of transport-intensive activities. This measure permits clarification of requirements concerning the data used for decisions.

Infrastructure investments to meet environmental objectives
When directing the transport agencies to implement policy and action planning, the Government can clearly state in their planning directives that the climate objective must be given higher priority than today in shaping infrastructure.

Investments to strengthen rail capacity
Through a higher maintenance level, improved integration of transport services and expansion of alternative lines that afford greater flexibility and speed, railways can effectively support both Sweden's competitiveness and the emergence of a sustainable transport system. The Swedish Rail Administration's assessment is that railways can take up 50% more freight between now and 2020, mainly in the form of expanded multimodal transport, thereby helping to reduce aggregate CO_2 emissions from the transport sector.

Government grants for installation and maintenance of local rail networks
Local rail networks are crucial to the competitive strength of rail transport in relation to road transport, in particular. Rail should be subject to conditions as similar as possible to those applying to road transport, but local rail networks are currently burdened with costs to which there is no counterpart in the road network. To achieve competitive neutrality among different modes of transport, the state should be able – as it does for private roads – to provide grants, subject to review, for installation and maintenance of rail infrastructure that meets a communication need for the business sector.

State investment in public transport
Public transport needs to be developed both in major towns and cities and along inter-city routes. The required investments include attractive and safe travel centres, stations and stops; improved punctuality and reliability of regional trains; road lanes for public transport and signal priority systems; good connecting footpaths and cycle lanes; well-functioning, modern information systems; and ample parking facilities for bicycles or cars.

Grants for more efficient lighting on municipal road networks
Halving the use of electricity for lighting is feasible, but stronger incentives are needed to achieve this.

It is not possible to give separate quantifications of environmental impact for every individual proposal, but the overall effect should represent several megatonnes of CO_2 a year in the long term.

Improving energy efficiency in road passenger transport

Road transport is an energy-intensive activity, but its potential for enhanced efficiency is large at both vehicle and system level. Policy instruments can focus on sales of new vehicles, which change the vehicle fleet over time, or use of both old and new vehicles. There are several instruments, both regulations and taxes, influencing developments at present.

Including the transport sector in the EU ETS is under discussion, but repercussions both on the sectors engaged in trading at present and on the trans-

port sector itself are still unclear. The EET Strategy therefore does not propose that road transport should be included in the ETS. The road transport sector is perceived as having a high willingness to pay for CO_2 emissions, and there is a risk of it boosting the price of allowances for other sectors. On the other hand, the costs of certain measures are low and many examples of measures with negative costs may be found in the sector.

Tax allowances for travel in their current form give cars a clear competitive advantage for work commuting. Half of the sum deducted for travel to and from work in 2003 went to the metropolitan counties of Stockholm, Skåne and Västra Götaland, where public transport provision is good. Thus, instead of raising fuel taxes further to compensate for this distortion, the proposal is to make travel allowances neutral with respect to modes of transport.

▶ TO INCREASE ENERGY EFFICIENCY IN ROAD PASSENGER TRANSPORT, THE FOLLOWING PROPOSALS ARE MADE:

Raise tax on petrol and diesel by SEK 0.75 per litre and index it according to GDP
Introduce an annual upward adjustment of the tax in line with Consumer Price Index and GDP trends, to maintain its environmental effect.

CO_2-based vehicle taxation
Increase CO_2 differentiation of vehicle tax to influence choices of new cars and steer demand towards passenger cars of higher energy efficiency. The CO_2 component should be raised to SEK 25 per gram of CO_2 and charged on emissions exceeding 120 grams of CO_2 per kilometre driven. This proposal also includes an overview of vehicle tax for diesel vehicles.

CO_2-based taxable benefit
The taxable benefit of a free car should be based on a combination of CO_2 emissions and a percentage of the price of a new car. With rising CO_2 emissions, the taxable benefit will increase. The Swedish Road Administration's definition of a 'green vehicle' will form the basis for an extra reduction for such vehicles. This means that not only fuel-flexible cars that meet fuel requirements, but also fuel-efficient petrol and diesel vehicles, will be encouraged. The requirements are to be progressively tightened. In addition, the taxable benefit of free fuel should be raised.

Binding CO_2 standards for new cars
According to the European Commission's proposal for binding emission standards to be met by car manufacturers, the maximum allowed will be an average of 130 grams of CO_2/km for new passenger cars in 2012. Standards will then be tightened and should be broadened to include other vehicle categories as well.

Campaign to promote compliance with speed limits
This will be conducted mainly by means of cameras.

Changed travel allowances
Tax allowances for travel can be made independent of transport mode, as in Norway and Denmark. There may be exemptions or compensation for households in sparsely populated areas with limited public transport.

Further development of consumer information for purchasers of new vehicles
This will supplement changes in fuel taxes, vehicle tax and regulations on company cars, and will show vehicles' fuel consumption.

The largest single effect on CO_2 emissions will come from the proposals for raised fuel taxes. The aggregate effect of these policy instruments is substantial, i.e. of the order of several megatonnes of CO_2 a year.

Improving energy efficiency in road freight

The external costs of heavy goods transport are not internalized in the prices of transport services. Goods are transported over increasing distances, which may be explained by the fact that the costs of transport are lower than the financial advantages of specialized production.

Road freight may be seen as part of manufacturing industry and could more simply be included in the EU ETS than passenger transport by road, but this is

a more long-term proposal that requires coordination in the EU.

▶ TO INCREASE ENERGY EFFICIENCY IN ROAD FREIGHT, THE FOLLOWING PROPOSALS ARE MADE:

Kilometre tax
This is based on the marginal cost principle. Its impact has been analysed by the Swedish Institute for Transport and Communications Analysis (SIKA).

Measuring method for heavy goods vehicles to standardize measurement of fuel consumption
Sweden should press for the development of an EU-standardized method. Today, there is no standardized method on which to base comparisons of fuel consumption for heavy vehicles and for mobile machinery.

The kilometre tax could reduce CO_2 emissions by 0.5 Mt and NO_x by 3 kt a year between now and 2020.

Improving energy efficiency in aviation and shipping

International shipping and aviation account for copious and rapidly increasing emissions. Their climate impact is excluded from the Kyoto Protocol at present, and their acidifying emissions are outside the air pollution conventions. This means that cost-effective measures to reduce these emissions are not being introduced.

It is proposed that these sectors should be included in the EU ETS, and there is already a concrete proposal at EU level to include aviation. However, a readiness to apply alternative instruments – such as using the Energy Tax Directive if establishing a trading scheme takes too long or fails to materialize – is required.

▶ TO INCREASE ENERGY EFFICIENCY IN AVIATION AND SHIPPING, THE FOLLOWING PROPOSALS ARE MADE:

Include aviation in the EU Emissions Trading Scheme for CO_2
There is a concrete proposal in the EU for aviation to join from 2011.

Include shipping in the EU Emissions Trading Scheme for CO_2
Discussions have started in the EU.

Improving the energy efficiency of mobile machinery and of rail transport

Mobile machinery can be run more efficiently, thereby reducing emissions. However, to realize this potential, operators of these machines need better knowledge of the relevant methods and the motivation to change their behaviour. It should be pointed out that electricity use in rail transport is already included in the EU ETS, but that there is great potential for making energy use in this sector more efficient.

▶ TO INCREASE THE ENERGY EFFICIENCY OF MOBILE MACHINERY AND RAIL TRANSPORT, THE FOLLOWING PROPOSALS ARE MADE:

Government directives to public agencies on economical operation of mobile machinery and equipment

Grants for introduction of systems to foster energy-efficient driving in rail transport
Although rail transport is, in general, highly energy-efficient, there is scope for saving energy. One key precondition for achieving this is to measure the use of electric power in trains. Technology for this is available, but its introduction in individual rolling stock needs to be encouraged. Other systems for reducing energy consumption exist.

All in all, the proposed policy instruments listed above as means of making energy use more efficient could bring about a reduction of at least 5 Mt of CO_2 a year in addition to the yield of 6–10 Mt from the tightening-up of the EU ETS. According to the IIASA calculations, raising energy efficiency by these means would also yield a reduction of the order of 6 kt of NO_x over and above the benefit of the kilometre tax, 3 kt of NO_x a year.

INSTRUMENTS TO REDUCE CLIMATE IMPACT THROUGH AN INCREASED SHARE OF RENEWABLE ENERGY

Policy instruments that make energy use more efficient also reduce impact on the climate. In addition, further instruments are proposed that more directly boost the proportion of renewable energy sources.

More renewable energy in the supply of electricity and heat

The share of renewable energy sources amounted to 29% in 2006, which is relatively high by international standards. The sources concerned were mainly biofuels and hydroelectric power. However, the proportion needs to increase further.

The complicated licensing process has been identified as an obstacle to further expansion of wind power. Solar heating is, at present, a costly technology that can become cheaper in the long run. Solar cells and wave power are judged to be insufficiently developed as yet to prompt proposals for rigorous policy instruments. Further RDD is also important.

To boost the proportion of renewable energy in the energy system, taxes on non-renewable sources can be raised. However, energy markets are often international, which means that national instruments could provoke relocation of production facilities outside Sweden, which may entail inferior environmental performance.

A general form of investment support could bring about a more efficient energy system by improving the use of, for example, waste heat. It could also serve to support new technology for using renewable energy sources.

▶ TO INCREASE THE USE OF RENEWABLE ENERGY IN THE SUPPLY OF ELECTRICITY AND HEAT, THE FOLLOWING PROPOSALS ARE MADE:

Simplify licensing of wind power
Expansion of wind power should be facilitated. The issue should be investigated further, for example in terms of how to simplify the licensing process, how to manage areas of national interest for wind power and how to generate applicable knowledge in the form of, for example, research findings about environmental impacts and various guidance documents.

Extend support to solar heating
A standard grant of SEK 10,000 for homeowners switching from electrical to solar water heaters and a grant of SEK 2.50 per estimated annual kWh of heat supplied from all solar panels should be introduced. Other measures are information initiatives, extension of the support period to eight years, and amended building regulations (as preparation for solar heating) for all new buildings.

Explore the option of sector-specialized support for climate investments
The Climate Investment Programme (Klimp) should be reshaped to focus on measures with long-term effects, such as use of waste heat, distribution networks for district heating on both a large and a small scale and for district cooling, storage of heat and cooling, conversion measures in industry outside the ETS, market launch of new technology for conversion from direct electric heating to district heating, new technology for production and upgrading of biogas, and more efficient goods transport operations.

The potential for wind power is large: at least 20–30 TWh of electricity a year. Solar heating can replace perhaps 1 TWh of other heating.

More renewable fuels for the transport sector

The policy instruments proposed in the EET Strategy regarding renewable energy in the transport sector are aimed mainly at attaining the objective

proposed in the EU of 10% biofuels in this sector by 2020. The instrument proposals are mutually complementary, to achieve the objective cost-effectively. RDD initiatives with respect to 'second-generation' transport biofuels are a priority for the future.

▶ TO INCREASE THE USE OF RENEWABLE FUELS IN THE TRANSPORT SECTOR, THE FOLLOWING PROPOSALS ARE MADE:

Abolish the EU's import duty on ethanol
The EU applies customs duties to transport biofuels, in order to build up the European biofuel industry and enhance security of supply. However, Sweden should work for abolition of these duties, one reason being that Brazilian ethanol from sugar cane enables CO_2 reductions to be made more cost-effectively.

Support EU work on certification of transport biofuels
In production of biofuels, the importance of sustainable production needs to be emphasized. The EU is working to achieve this in terms of climate benefits, land use and biodiversity.

Biofuel obligation system to fulfil the EU Directive
A forecast shows that the target of 10% transport biofuels by 2020 will not be met with the current tax reduction, given the IEA expectation of an oil price of $50 dollars a barrel in 2020. The consequence of a binding target at EU level may also be that tax reductions will no longer be allowed to be used as an instrument. The advantages of an obligation system are that the cost is separated from the government budget and that target fulfilment is more certain.

Demonstration plants for cost-effective second-generation biofuels
Investing in demonstration plants for biofuels from synthesis gas should be part of a national strategy for transport biofuels.

All in all, the proposed policy instruments listed above under the heading of renewable energy should reduce CO_2 emissions by at least another 1 Mt a year.

INSTRUMENTS TO IMPROVE ABATEMENT OF NITROGEN OXIDE EMISSIONS AND OF SULPHUR OXIDE EMISSIONS FROM SHIPPING

Policy instruments that bring about greater energy efficiency usually also result in reduced emissions of nitrogen oxides (NO_x). But this is insufficient for the emission reduction targets to be met, especially in the short term. Instruments directly addressing NO_x emissions and, for shipping, also sulphur dioxide (SO_2) emissions are therefore necessary.

Reduced NO_x emissions from stationary sources

Attaining the targets for NO_x emissions defined in the National Emission Ceilings Directive by 2010 requires prompt reductions. A system of charges affords a cost-effective distribution of measures; thus, an effective policy instrument can be used even more by increasing the number of charge payers. External costs exceed the charge level, even including the increase already implemented.

▶ TO REDUCE NO_x EMISSIONS FROM STATIONARY SOURCES, THE FOLLOWING PROPOSAL IS MADE:

Extension and differentiation of charge-payer base and a rise in the NO_x charge
The charge should be raised to SEK 60 per kg for stationary sources, over and above the proposal in the 2007 budget, which is expected to yield a reduction of 5.4 kt.

Reduced NO_x emissions from diesel vehicles and mobile machinery

Reductions in emissions of nitrogen oxides and particles from diesel vehicles are needed. For petrol-driven vehicles, a continued decrease in emissions is also required. In the long term, moreover, regulation of particle emissions will be necessary. Where heavy vehicles and mobile machinery are concerned, emission standards have not been extended in quite the same way as for cars. Controls on emissions must be developed in such a way as to cover actual transport emissions more effectively than at present. Procurement criteria favour vehicles with the cleanest emis-

sions, and procurement requirements for mobile machinery need to be developed.

▶ TO REDUCE NO_x EMISSIONS FROM DIESEL VEHICLES AND MOBILE MACHINERY, THE FOLLOWING PROPOSALS ARE MADE:

Encourage clean mobile machinery through procurement criteria
The current procurement rules, with environmental criteria, used by the major municipalities, the Swedish Road Administration and the Swedish Rail Administration should be disseminated so that they are used by small municipalities and the business sector as well.

Investigate an incentive for early adjustment to future emission standards
Diesel vehicles are expected to increase, partly to take advantage of their relatively low CO_2 emissions. To reduce the impact on NO_x emissions, introduction of the best exhaust treatment technology can be speeded up. Diesel vehicles that meet the Euro 6 standards could be given a special tax status. These emission standards will not be compulsory until 2015, but in this way the benefit of relatively lower NO_x emissions could be obtained earlier. The cost of Euro 6 exhaust treatment has been estimated at just over SEK 1,000.

Reduced nitrogen and sulphur oxide emissions from shipping

Slack controls on emissions in shipping mean that there is scope for implementing cost-effective measures. Emission standards for a new ship plying Baltic routes, for example, permit emissions of sulphur oxides and nitrogen oxides that are roughly 1,000 times and four times higher, respectively, than those for a new heavy goods vehicle, per kWh generated. In shipping, various emission-reducing measures and instruments have relatively recently begun to be introduced, and they have not yet had much effect on international shipping. The potential for reducing emissions in shipping is therefore much greater than that for land-based sources. Reductions in emissions from international shipping are, moreover, the most cost-effective measures that can be taken.

International agreements on shipping need to be achieved globally, in the EU or just for the Baltic Sea. Despite intensive efforts on the part of Sweden and other countries, however, progress is slow. Supplementary policy instruments for transport to Swedish harbours may need to be developed to hasten the trend towards cleaner fuels and lower emissions. These instruments would cover mainly sulphur and nitrogen oxides, and they would also reduce particle emissions to some extent, although special remedies may be needed for the latter.

▶ TO REDUCE NITROGEN AND SULPHUR OXIDE EMISSIONS FROM SHIPPING, THE FOLLOWING PROPOSALS ARE MADE:

Tighten IMO standards for fuel sulphur content and regulations on NO_x emissions from ships
Standards for sulphur oxides and/or nitrogen oxides can be made stricter generally or solely within special control areas. More stringent standards may be introduced for all ships or special groups, such as passenger ferries on scheduled routes. For nitrogen oxides, they may call for greater changes on board and it would therefore, for example, be possible to confine them to a smaller proportion or to new vessels only.

Tighten EU standards for fuel sulphur content and regulations on NO_x emissions from ships
The same kinds of requirement as in the IMO could be introduced, but EU has the option of proceeding more rapidly by, for example, imposing standards on ships that dock at EU harbours.

Create agreements on joint emission standards in the Baltic region
The same kinds of requirement as in the IMO and EU could be introduced, but it is easier for a limited number of countries to conclude agreements. Standards might, for example, cover passenger vessels that dock at harbours in countries around the Baltic Sea.

Further increase the environmental differentiation of port and fairway charges
Using the fairway charges of the Swedish Maritime Administration and port charges, it should be possible to provide incentives for reductions in ship emissions.

Explore the prospects of an emissions trading scheme for SO_2 and NO_x to include shipping
A trading scheme covering both shipping and land-based installations could create scope for cost-effective emission reductions. However, this calls for action including large-scale regulatory amendments and fair allocation principles. A trading scheme for shipping alone would concentrate the reductions in a sector that has a large untapped potential compared with land-based installations, which have been subject to strict controls for many years.

Explore the consequences of a charge system for NO_x as a substitute for a trading scheme
The repercussions of a charge system for nitrogen oxides, similar to that in Norway for domestic transport or the Swedish system of NO_x charges for large combustion plants on land, should be investigated.

Explore the scope for environmental differentiation of state support for and taxes on shipping
Interesting options that should be explored further include, for example, state support for shipping companies that undertake exhaust treatment measures and scope for environmental differentiation of the proposed tonnage tax.

These targeted instruments have a massive potential, which may be measured in hundreds of kilotonnes of NO_x and SO_2, but their effect by 2015 is hard to estimate since it depends on how strict the requirements introduced are and when they can be implemented.

INSTRUMENTS FOR MEASURES TO REDUCE CONCENTRATIONS OF AIR POLLUTANTS

Many of the policy instruments proposed above would also result in cleaner air. However, further instruments with local effects are needed as well.

For air quality in urban areas, implementation of proposed measures, rather than finding new instruments, is a key factor. Within the framework of the action programmes to meet environmental quality standards, measures and policy instruments have been devised. Of these, not all have been adopted and far from all have been implemented. Examples are instruments for bringing about a renewal of the vehicle fleet and further development of congestion charges in more cities.

Cleaner air through reduced emissions from small-scale wood burning

Evaluations of the *Clean Air* objective have identified emissions from small-scale burning of wood as a problem area. But the scale of the problem is somewhat unclear. Suitable emission-reducing measures have been proposed, but implementation costs have often been an obstacle, as has a lack of standards with sufficiently strong environmental effects.

▶ TO MAKE AIR CLEANER BY REDUCING EMISSIONS FROM SMALL-SCALE WOOD BURNING, THE FOLLOWING PROPOSALS ARE MADE:

Improved small-scale wood burning
The extent of emissions from small-scale wood burning should be studied further. If problems concerning emissions from this source prove to be restricted to a few sites, the first option below can be applied. If the problems are more widespread than this, the second proposal should be applied:

1. If analysis shows that environmental quality standards, interim targets and target values are being exceeded, measures should be applied in the problem areas under the amendment to the Ordinance concerning Environmentally Hazardous Activities and the Protection of Public Health proposed by the Swedish Energy Agency in 2003. Replacing boilers or supplementing them with accumulator tanks, which will then be called for, will be supported with grants of some SEK 10,000.

2. If emissions from wood burning need to be reduced generally in Sweden, a system of environmental classification should be introduced for wood-burning equipment, with differentiated environmental charges. Households with inferior boilers would pay a charge, while those with good boilers (corresponding to environmental category 1 in the Building Regulations of the Swedish National Board of Housing, Building and Planning) would pay no charge or could receive a grant. Possible designs for this system should be investigated in parallel with further measurements.

Cleaner air through reduced emissions from the transport sector

Emissions of inhalable particles (PM10) from road transport in Sweden are largely derived from wear of the road surface and resuspension of particles. During the winter and spring, these sources may account for more than 80% of the particles found in areas close to roads.

▶ TO MAKE AIR CLEANER BY REDUCING EMISSIONS FROM THE TRANSPORT SECTOR, THE FOLLOWING PROPOSALS ARE MADE:

Tax on studded tyres, tread depth requirements
A substantial portion of the particle concentrations in urban areas where the environmental quality standards for particles are exceeded and the *Clean Air* objective is difficult to meet is derived from a high rate of studded tyre use. A tax on new studded tyres at the level of SEK 50 per tyre, combined with an increased minimum tread depth of 4 mm on winter tyres, is one policy instrument that combines environmental, health and road safety effects. This instrument, combined with information measures, is judged to be a powerful signal to people who can easily refrain from using studded tyres, while it would not stop people who need such tyres from using them.

NO_x-differentiated take-off charges at regional airports
Today, take-off charges at national airports are differentiated with respect to the NO_x emissions of aircraft. Under this proposal, the same type of emission charge would be introduced at regional airports where local air quality is a problem. The ICAO has drawn up guidelines on how this can be done.

Environmental classification of snowmobiles and other mobile machinery
Sweden should work for the EU to tighten its controls. The USA has, for example, decided to subject snowmobiles to emission standards, which are to be progressively tightened up. By 2020, CO and hydrocarbon emissions are expected to have fallen by 56% and 72% respectively. These emission standards can be met by modifications of two-stroke engines, engines with injection technology and four-stroke engines. Emissions of non-methane volatile organic compounds (NMVOCs) also come from evaporation from fuel tanks and leads. The USA is therefore also introducing permeability standards for fuel tanks and leads, and the EU could introduce the same requirements in the form of an environmental classification system for snowmobiles.

The environmental effects of these policy instruments are hard to judge. Reduced use of studded tyres would mean reduced particle and noise emissions in densely populated areas. Halving the use of studded tyres in Stockholm would, for example, reduce the quantity of inhalable particles by 20–25%.

INSTRUMENTS FOR MEASURES TO REDUCE TRANSPORT NOISE

To achieve the interim target for transport noise, additional targeted instruments are required. Only limited synergies with other measures and instruments exist. For such measures as lower speeds and transport restructuring in towns and cities, however, there may be substantial synergic effects. To reduce noise problems, more focus should be placed on measures to

curb noise at source, although government support for noise mitigation in the municipal road network should continue. Noise also needs to be taken into account to a greater extent in spatial and land use planning, and more knowledge of noise problems is required.

▶ TO REDUCE TRANSPORT NOISE, THE FOLLOWING PROPOSALS ARE MADE:

Work for tightened EU regulations to steer the vehicle and tyre industries towards less noisy vehicles and tyres
The noise of road traffic has increased over time, owing to increased traffic. Measures to reduce transport noise in the long term should focus on noise at source, i.e. from vehicles, tyres and other sources. The limit values for both vehicles and tyres should be tightened up, and Sweden can influence the EU regulations that govern limit values, test methods and requirements for noise performance labelling. This includes influencing the EU's functional standards requiring tyres to withstand extremely high speeds, which entails inferior environmental characteristics.

Run information campaigns to boost use of low-noise vehicles and tyres
Noise characteristics of the vehicles and engines available on the market at present vary widely. The tyres on the market today are highly variable in terms of price as well as road safety, particle and noise aspects. To boost the use of quiet vehicles and tyres, information activities should be stepped up to give consumers access to information about the noise and other environmental and road-safety characteristics of vehicles and tyres.

Stricter noise standards for approval of rolling stock
Standards setting maximum permitted noise levels for new rolling stock have been adopted by decisions at EU level. Rolling stock for rail transport must be approved by the Swedish Rail Agency before being commissioned in Sweden. This applies to new, imported and substantially converted stock. Further tightening of the legal requirements should continue at EU level, as at present.

Develop and introduce a noise component in track charges
Marginal costs of noise are a component that should, in principle, be included in track charges. The state of knowledge about both marginal effects and valuation of noise disturbance from rail transport is such that the Swedish Rail Administration has not been able to decide on a charge. There is a need for a noise classification system to be developed for rolling stock. With this as a basis, economic instruments and clearer indicators for noise emissions can, for example, be developed.

Develop grant systems for modifications of existing rolling stock
Noise standards for new rolling stock alone will not, within a reasonable period, reduce noise from the railway sector. Rolling stock in this sector has a very long service life. Reducing noise from the existing fleet of goods wagons, above all, calls for the introduction of new economic instruments. For the railway sector, initiating a replacement programme for brake systems in the existing fleet of goods wagons has been deemed essential at European level. Needs and opportunities for funding and state support need to be studied and elucidated.

Develop economic valuations for noise
The economic valuations for noise from infrastructure in use today need to be developed. Present-day valuations are based mainly on property prices and not on, for example, health effects of noise.

Amend regulations and improve information about government grants to local authorities for noise measures

Government grants to municipalities for measures to combat noise (such as soundproofing buildings and laying quieter road surfaces) should continue and be used more effectively. Ordinances should be revised so that grants can also be obtained for inventory and development of implementation plans. The background to the proposal is that the majority of people exposed to noise from the road transport system are located along the municipal road network. In the Swedish Road Administration's experience, the factor determining the scale of municipal noise remediation seems not infrequently to be a lack of information and knowledge, noise surveys and resources.

Introduce government grants for low-noise road surfaces and a quieter standard surface

A quieter road surface can be chosen in noise-sensitive environments, thereby reducing the noise that arises between tyres and the road surface. Recommendations on choice of surface with reference to the environment, identifying the surface that affords the greatest benefit to society in terms of noise, particles, CO_2, wear and economic considerations, should be developed and distributed to bodies responsible for road maintenance. This should be combined with targeted information to municipalities about the availability of government grants to cover 50% of the additional cost of low-noise road surfacing.

It is difficult to make an overall assessment of the environmental effects of these instruments.

OVERALL IMPACT ASSESSMENT OF PROPOSED POLICY INSTRUMENTS

Gains for society

Restricting emissions of greenhouse gases will be costly. However, Stern (2006) points out that the most successful economies are those that are flexible and dynamic enough to adapt rapidly to the new ground rules. Globally, it will probably cost even more not to reduce emissions since climate change may well then cause an average global GDP loss of the order of 5–10%. The costs would rise further if it were possible for the analysis to take all the effects fully into account (Stern, 2006).

Positive health effects in Sweden of reducing emissions of atmospheric pollutants have been estimated as being in the range of SEK 2.3–7.7 billion a year up to 2010. The gain in the form of reduced forest damage is estimated at some SEK 75 million a year (CAFE, 2007).

Impacts on the business sector

The policy instruments that will affect industrial competitiveness most are the EU ETS, the rise in diesel tax and the introduction of a kilometre tax on heavy vehicles.

Different sectors have varying scope for bearing the costs associated with changes in policy instruments.

In the short term, trading sectors will adapt by becoming more efficient and substituting fuels in individual facilities. In the longer term, a shift will take place from heavy to less fossil-dependent industry. The long-term effects of the EU ETS on manufacturing industry will, according to model estimates, be minor changes in total production volume and profits. The ETS will have most influence on production and employment in the quarrying industry, followed by mining, iron and steel, and pulp and paper. Metal goods, rubber, plastics and the 'other industry' category will be least affected. Overall, demand for labour will rise (Swedish Institute for Growth Policy Studies, 2007).

The proposed rise in diesel tax will affect both the haulage industry and manufacturing. This tax rise will reinforce the effect of a kilometre tax but should not affect the general conclusions from studies of the effects of such a tax. In brief, these may be summarized as being that the levels analysed generally yield minor effects on production and employment. In absolute terms, the loss of production will be greatest in the pulp and paper industry. However, production will decrease by less than 1% in all

manufacturing sectors. Transport costs are expected to rise most in the food industry, but the costs of transport in this sector are nonetheless relatively low in relation to total production costs. Employment will rise, since labour-intensive sectors will expand at the expense of transport-intensive industries and transport services will be replaced by labour in the sectors concerned ('Climate, transport and regions', Environmental Protection Agency, 2007, in Swedish). Fuel has previously been found to constitute a small share of the value of the product transported. Diesel tax in Sweden is slightly higher than in the closest neighbouring countries, but lower than in countries like Germany and France.

Impacts on households

Households will be affected most by the proposals for changed policy instruments in the transport sector.

The costs to society of a rise in petrol tax will consist of a loss of prosperity for travel not undertaken, for example, and for travel habits that have changed in other ways. The redistribution of resources in the economy will amount to SEK 2 billion, representing an average cost increase of just over SEK 600 per car owner. This effect is not the same for all households in the country; instead, it varies according to household size, vehicle type and dependence on car travel.

The proposed rise in energy tax on diesel is expected to result in welfare losses of some SEK 55 million, of which roughly SEK 15 million is assumed to relate to private motoring. The redistribution of resources in the economy is estimated at SEK 1.2 billion for households, which gives an average cost of some SEK 1,500 per year and vehicle owner. This calculation assumes that all diesel cars are owned privately, which overestimates the distribution effect since some of them are used in commercial transport and driven above-average distances. One regional distribution effect of fuel taxes is that households in rural areas, which normally have larger and more 'fuel-guzzling' cars than average, may incur an increase in spending on fuel, due to a rise in fuel tax, up to 15% higher than the average household.

The proposed change in vehicle tax will primarily affect private motoring. The loss of prosperity and the redistribution effects may be estimated as being a slightly positive net effect for households. One reason for this is that more energy-efficient cars reduce fuel costs per kilometre.

The proposed changes in taxable car benefit will have considerably greater effects in terms of promoting the choice of more energy-efficient cars than the vehicle tax proposal. Unless the taxable benefit for environmental vehicles is reduced, the net effect of our proposal will, with the company cars currently in existence, be a rise of SEK 6,000 a year in average costs to motorists enjoying this benefit. If these motorists adapt to the change by choosing energy-efficient cars, the cost increase can give way to a cost gain.

Households may also face higher electricity prices as a result of changes in the ETS. However, there are various ways in which households can respond to the stronger financial incentives by choosing energy-efficient household appliances and conserving electricity for heating and other purposes.

Impacts on central government finances

Here, the changes in government revenue and expenditure entailed by our proposals for changes in policy instruments are summarized. Thus, existing revenue from energy tax, for example, is not included.

The largest effects on central government finances will be exerted by the proposed changes in instruments affecting the transport sector. Owing to a raised tax on fuel, government revenue may come to increase by SEK 2,500 million a year for petrol and SEK 5,000 million a year for diesel up to 2020. There will also be the revenue from indexation of these taxes, which is expected to rise successively to some SEK 6,000 million a year by about 2020. Kilometre tax on heavy vehicles is expected to yield a surplus of some SEK 2,000 million a year. The proposals for greater CO_2 differentiation of vehicle tax and benefit taxation are both neutral in terms of public finances. A change in tax allowances for travel could also be made neutral for public finances and more easily verified.

The state will also incur higher expenditure in a number of areas, including support for solar heating, noise abatement measures, investments and a range of investigations and administration, for example relating to training in fuel-saving driving.

All in all, the proposed policy instruments will involve a rise in government revenue of up to SEK 15 billion a year by 2020, while spending will not increase by as much.

6.1.6 Conclusions from the EET Strategy

Measures in the transport and energy sectors are crucial to achieving five environmental quality objectives: *Reduced Climate Impact*, *Clean Air*, *Natural Acidification Only*, *Zero Eutrophication* and *A Good Built Environment*. Since these sectors are characterized by very strong drivers, powerful measures are required to change trends as well.

The strategy gives priority to increased energy efficiency, which will have positive effects on the five environmental objectives identified, with the possible exception of noise. An increased share of renewable energy is also necessary. Bioenergy should mainly be used in the energy sector for heat and electricity production, since its supply is limited. This is more cost-effective and energy-efficient than converting biomass into transport fuels. Future technologies may, however, make transport biofuels more efficient, and this calls for continued investment.

The policy instruments proposed appear sufficient for meeting the interim targets for 2015 and 2020, but additional instruments will be needed to strengthen development that is sustainable in the long term. The impacts of the proposed policy instruments on the business sector and consumers are relatively minor, and the outcome with respect to public finances is favourable for the state.

Both the objectives and the sectors relevant to the EET Strategy are, in several respects, dependent on the rest of the world. It is therefore essential for the strategy to have a consistently international perspective. In the future, for example, international aviation and shipping must be better covered by instruments that reduce their greenhouse effect.

One overall conclusion from the EET Strategy is that technical improvements in efficiency, renewable energy and pollution abatement equipment alone are insufficient for the environmental objectives to be met. Behavioural changes must also be included in a resource-efficient mix of measures, and deciding how to bring these about is a key strategic choice for the future.

6.2 Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL SUPPORTS** the proposals for policy instruments developed within the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles (the GRK Strategy). It considers the life-cycle principle to be crucial, both to the strategy and to achieving a sustainable society. In the Council's view, many of the instruments and measures proposed in the framework of the in-depth evaluation can be implemented without further delay.

Several key measures put forward have to do with establishing effective rules and securing good compliance with environmental legislation. Proposals of particular importance relate to waste management, single-household sewage systems and chemicals.

A number of proposals in the strategy are concerned with introducing new regulations and standards and with working for the introduction of standards that will also reduce the use of dangerous substances in products. The Council's assessment is that, for the objectives covered by the strategy that are particularly difficult to achieve, it is essential to change patterns of production and consumption, not only in Sweden, but in large parts of the world. It is proposed that Statistics Sweden should be commissioned to develop indicators to measure the environmental impacts of Swedish consumption.

▶ **THE COUNCIL BELIEVES** that the environmental impacts of the food supply chain and the construction sector remain very significant, and that there consequently needs to be a greater focus than before on reducing them. Here, the Council proposes that the central government agencies responsible for the construction, property and civil engineering sector and for the food sector should have a clearer overall responsibility for improving environmental performance. The Council also calls for an increased commitment to promoting resource efficiency, through measures to reduce waste in the food chain. In addition, it wants to see more extensive guidance to supervisory authorities on how the Environmental Code's provisions on conserving raw materials and energy and on reuse and recycling can be applied, in particular in the construction, property and civil engineering sector. Among other things, the relevant provisions should also apply to rebuilding work, as this involves the handling of large quantities of waste and there are shortcomings in the separation of hazardous waste. The Landfill Tax Act (1999:673) should be amended to exempt additional categories of waste from the tax.

▶ **THE COUNCIL PROPOSES** a range of measures which the public sector should implement in order to set an example in the environmental field. The Council also considers that major gains in efficiency can be achieved through closer coordination between the authorities affected by the strategy. It calls for the desired inter-agency cooperation in the framework of the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles to be made clear by means of a joint brief to a number of central government agencies to develop effective environmental measures, based on the same approach as under the other two strategies. As work on this strategy has progressed, three areas of cooperation have emerged with particular clarity: the regulatory frameworks for products, chemicals and waste; collaboration within the food supply chain; and cooperation in the construction, property and civil engineering sector.

▶ **THE COUNCIL BELIEVES** that, in order to attain the objectives, there is a need for more new knowledge than is being generated at the current pace of work within Sweden's borders.

▶ **THE COUNCIL PROPOSES** that state funding for capacity building and research should have a clearer focus on helping to build a sustainable society in which the environmental quality objectives are achieved. It also calls on the Government to commission a feasibility study on establishing a knowledge centre whose aim would be to speed progress towards sustainable production and use of chemicals.

6.2.1 Why are environmental life cycles not already non-toxic and resource-saving?

For the purposes of this strategy, and also for a sustainable society, the life-cycle principle remains crucial:

> *What we extract from nature should be used, reused, recycled or finally disposed of in a sustainable manner, with the least possible consumption of resources and without harm to the natural environment* (Government Bill 1992/93:180).

In many areas, good progress has been made towards such a society, while in others there is a long way to go. 'Non-toxic' is an important basic ingredient of the life-cycle principle. Progress towards a non-toxic society has accelerated in recent years, but a good deal more needs to be done. The transition from linear use of resources towards cyclical flows and closed loops is also making good headway. Many environmental problems are directly or indirectly linked to the flow and use of natural resources in society and are the result of our production and consumption of goods and services. As far as achieving sustainable resource use is concerned, change is too slow or even moving in the wrong direction for certain natural resources and our overall consumption of them.

This section discusses the reasons why non-toxic, resource-saving environmental life cycles have not yet been attained.

Not yet non-toxic

In the context of the environmental objectives, 'non-toxic' is a measure of quality rather than quantity. There have always been toxic substances in the environment. The aim is to get back to concentrations close to background levels or, in the case of substances that are not naturally occurring, close to zero.

Progress towards a non-toxic state of affairs has gathered momentum in recent years, not least with the formulation of the vision of a 'non-toxic environment'. Since then, a series of measures leading in the direction of that goal have been decided on – including the European chemicals legislation REACH. The results achieved in the area of chemicals control since the last in-depth evaluation, chiefly through new legislation, are impressive. At the same time, it is important to maintain efforts to ensure rigorous implementation and good compliance, and also to achieve a much-needed tightening up of certain aspects of the regulation of chemicals.

Moves towards a non-toxic environment, in the sense of phasing out substances that deplete the ozone layer, have also been successful, although they have been under way for longer in the international arena. Here, a succession of measures have been adopted and implemented internationally over the last two decades. Legislation and international agreements have been supplemented with economic instruments to encourage substitution. In general, ozone-depleting substances are also very significant as greenhouse gases. Efforts to implement the Montreal Protocol have therefore also made a valuable contribution to reducing the greenhouse effect. Just how valuable that contribution will be will depend on which chemicals take the place of the ozone depleters. In this regard, Sweden has an important part to play in shaping international cooperation under the Montreal Protocol so that it also produces benefits in climate terms.

With a record of positive progress towards *A Protective Ozone Layer* over an extended period of time,

the Environmental Protection Agency judges that this objective will be met by 2020, although full recovery of the ozone layer is not expected to occur until some point beyond 2050.

The environmental quality objective *A Non-Toxic Environment* will be difficult to attain within one generation. There are three principal reasons for this:

- Diffuse releases of substances harmful to health and the environment, partly as a result of growing trade in products.
- Unintentional production of harmful substances, such as dioxins and perfluorinated compounds.
- Harmful substances already released into the environment, such as PCBs, DDT and dioxins, which will remain there for a long time.

The great majority of the resources being used by Swedish society to secure a non-toxic environment are devoted to remediation and monitoring of toxic substances already present in the environment. A smaller share of the total is being used for preventive control of chemicals, with a view to avoiding future damage, clean-up costs and resource-intensive waste collection systems. As long as dangerous substances are used in products, however, the need for remediation and environmental monitoring will remain. Increased resources for preventive efforts and a clearer focus on reducing the use of hazardous substances in products are therefore crucial to achieving *A Non-Toxic Environment*.

Progress towards the interim target for radioactive substances under *A Safe Radiation Environment* is judged to be positive. The overall picture regarding the effects on humans of radiation from various activities has improved. International cooperation is under way to enhance assessments of radiation's effects on plant and animal life. Continued efforts are needed on a national basis to contribute to this international undertaking and to translate the results into national action.

A guiding principle in international radiation protection is the considerable weight attached to the interdependence of different elements of activities. It is proposed that *A Safe Radiation Environment* should be broadened to give it a comprehensive approach, taking in not only the external environment, but the indoor and work environments as well. If radiation protection measures are focused exclusively on the external environment, a large proportion of the radiation to which people may be exposed will be overlooked.

For long-lived, high-level nuclear fuel wastes, mercury-containing wastes and other particularly difficult wastes that need to be taken out of circulation, the question remains as to how final disposal should be arranged. The current intense research and development effort in this area must be maintained.

Resource-saving – an underused way of achieving the objectives

Many environmental problems are directly or indirectly linked to the flow and use of natural resources and materials in society, and are the result of our production and consumption of goods and services (EEA, 2003, *Europe's environment: the third assessment*). Although material streams and effects are partly unknown, certain conclusions can be drawn. The use of materials is unevenly distributed and unsustainably high in certain parts of the world. The environmental impacts of using natural resources and materials are nearly always of greater concern than their possible scarcity (Commission Communication COM (2003) 572 final).

This is true, for example, of coal, oil and phosphorus, whose pollution effects are already a major environmental problem, long before recoverable reserves have been exhausted. It is also true of ecosystem services and renewable resources, overuse of which can result at an early stage in ecological imbalances and adverse impacts on soil and water. The Baltic Sea provides clear examples of changes in the food web resulting from intensive fishing and eutrophication.

Resource efficiency per unit produced is now higher than it used to be. Despite this, the use of raw materials in absolute terms shows an upward trend. Specific material consumption in industrial and commercial production has been halved since the mid-1950s, but at the same time the volume of production

has more than trebled. The growth in output has thus more than offset the improvement in material productivity (SOU 2001:2, 'Efficient use of natural resources', in Swedish). The same can be said of the business sector's use of energy.

The futures studies carried out (FMS 2007:8, 'Action strategies under different societal and global trends', in Swedish) show that the proposals in the reports on individual objectives and sectors demonstrate relatively little preparedness for the possible effects of continued globalization and rising consumption. In recent years (1994–2005), for example, the quantity of household waste in Sweden has grown by 24%, despite national environmental objectives which say that it should not increase, and effective action to tackle the problem has yet to be introduced.

The European Commission has proposed an action plan on sustainable consumption and production, setting a target of a 3% annual improvement in resource efficiency to offset a similar yearly rate of economic growth. Swedish measures or proposals to meet this target are not yet in place.

Resource efficiency is important for businesses and consumers alike, as it provides an opportunity for everyone to contribute to a better environment, and as the measures involved often combine environmental and economic benefits. In its background report to the in-depth evaluation, the Confederation of Swedish Enterprise shows that the national environmental objectives are not what drives companies' environmental efforts. They are more a kind of compass that is used to check the direction of travel.

Energy, too, is a key factor for attaining many of the environmental objectives. In its sectoral report, the Swedish Energy Agency expresses the view that energy resources are not addressed in a consistent and comprehensive way within the environmental objectives structure.

The European Commission is pursuing an integrated approach to the problems of resource use through its strategy on natural resources, but so far it has not managed to provide clear guidelines on what measures are appropriate.

Environmental life cycles – we're getting there

Expressions such as 'ecological cycles' and 'closing the loop' were much used in the 1990s. Sweden's Ecocycle Commission, which sat from 1993 to 1997, presented a picture of a future society in which people's needs would be met without threatening natural cycles and biodiversity or destroying the resource base ('Sustainable of course – an ecocycle strategy', Ecocycle Commission Report 1997:13, in Swedish). Since then, a great deal has happened in the area of waste. Increased separation at source and changes in the ways waste is dealt with have led to a reduction of landfill disposal and growth in materials recovery, biological treatment and incineration with energy recovery.

The quantity of waste disposed of at non-industrial landfills fell from 6.1 million tonnes in 1994 to 2.5 million tonnes in 2004, i.e. by more than half. For household waste, the reduction over the same period was no less than 85%. Landfill disposal in industry has also declined. The quantity of landfilled pulp and paper industry waste, for instance, decreased from some 1.25 to 0.43 million tonnes between 1994 and 2004. The construction, property and civil engineering sector, too, appreciably reduced its reliance on this disposal route over the period.

In the case of household waste, utilization of both energy and materials (through materials recovery and biological treatment) increased from 80% in 2002 to 95% in 2005, when only 5% of this class of waste was disposed of to landfill. In 2005, 45% of household waste was recycled by means of materials recovery, including biological treatment.

Waste is being recycled to a much higher degree now than in the mid-1990s. If energy recovery is also included, even greater use is being made of its resource potential. The decrease in landfill disposal is reducing emissions of methane from disposal sites, and increased recovery is saving resources by providing alternative fuels and materials. The assessment in Sweden's national waste plan, *A Strategy for Sustainable Waste Management*, is that, provided the regulations decided on are implemented and the policy instruments introduced are actually used, the environmental impact of waste management will be

relatively limited compared with that of other sectors. There is a need for monitoring, however, to ensure that groundwater is not contaminated around landfills or when recycled materials are used in infrastructure and other projects.

Potential exists to increase recovery of materials and thus further reduce the impact on the environment. Under *A Good Built Environment*, targets for recovery of plastics, metals, paper and glass are proposed. The Council calls for improvements in the application of the Environmental Code's rules of consideration, and for an inquiry into the feasibility of a tax on all incineration of waste.

While better use is now being made of the resource which waste represents, there has been no reduction in the quantity of it arising. On the contrary, consumption trends have been moving in the opposite direction, and continue to do so, resulting in growing volumes of waste. For example, over the period 1994–2005, the quantity of household waste dealt with rose from 3.5 to 4.3 million tonnes, an increase of 24%. Per capita, the increase was from 395 kg to 480 kg per year. Waste from manufacturing (excluding mining waste) grew from 15 million tonnes in 1994 to 18 million tonnes in 2002, a rise of 21%. To some extent, such variations are a reflection of business cycle fluctuations and demographic and other factors, such as companies moving production to other countries.

To a relatively large degree, then, linear resource use has given way to cyclical flows or closed loops, which has saved resources. At the same time, consumption has grown, laying claim to even more resources. The quantity and hazardousness of waste can be influenced to only a limited extent by measures at the waste stage. How much waste arises and how hazardous it is are determined when a product is designed and used. Measures should therefore be introduced primarily in the areas of products and chemicals. Saving resources in the first place is a more important means of reducing the quantity of waste than recycling efforts. The question of waste minimization is thus more closely linked to resource efficiency than to closed loops and recycling.

6.2.2 Strategy for achieving the objectives

The action being taken to implement the environmental quality objectives is extremely wide-ranging, with new environmental measures decided on or put into effect on a daily basis. Nevertheless, several of the objectives relevant in this context will be very difficult to meet by 2020. In the following, a strategy is proposed for introducing the measures needed to achieve the environmental quality objectives. The strategy takes as its starting point the reasons why the objectives are judged to be difficult to attain.

Strategy should focus on meeting the objectives *Reduced Climate Impact, A Non-Toxic Environment* and *Zero Eutrophication*

The results of the in-depth evaluation make it clear that, in future, there needs to be a mobilization of efforts around a number of the environmental objectives that are particularly hard to achieve. In the context of the present strategy, these are, above all, *Reduced Climate Impact* and *A Non-Toxic Environment*, but also *Zero Eutrophication*. These goals are especially difficult to reach because they are dependent on changes in production and consumption patterns, which take a long time. Measures in pursuit of the interim targets for waste can also be included in the focus of this strategy, since they often have a part to play in securing progress towards *Reduced Climate Impact* or *A Non-Toxic Environment*. At the same time, the proposed focus will contribute positively to meeting several of the other objectives, for example those relating to water.

The reasons for the difficulties in achieving the objectives provide the six starting points for this strategy:

- Implement and develop policy instruments already decided on.
- International solutions are required.
- Changed production and consumption patterns are required.
- Reduce the environmental impacts of the food supply chain and the construction sector.

- Improve coordination of environmental action.
- More knowledge is needed.

Implement and develop policy instruments already decided on

There is much that the authorities can do straightaway, without awaiting further directives. The environmental quality objectives, interim targets and environmental policy in general provide sufficient guidance, and agencies should therefore continue to implement such proposals as are within their powers, without delay and without awaiting detailed instructions. The system of environmental quality objectives, annual follow-up, indicators and regular in-depth evaluations provides tools for defining the direction of environmental action that were not available a number of years ago. The results of the evaluation also show that there are additional gains to be made through further decisions along the path entered upon. The reports on individual objectives and sectors contain hundreds of ideas and proposals which could usefully be developed and implemented, and which are within the powers of government agencies. Used in the right way, this possibility could make for more effective progress towards the objectives. If, on the other hand, the authorities wait, action – and attainment of the objectives – will be delayed.

International solutions are required

International interdependence is growing apace, and this is no less true in the environmental sector. In autumn 2009, Sweden will hold the EU Presidency and will have a greater influence over EU environment policy than would otherwise be the case. When the national environmental objectives were developed in the mid-1990s, the Swedish Parliament had far greater control over policy in this area than it does today, when environmental regulations are largely laid down in Brussels. This is of particular importance when it comes to the objectives that are difficult to meet through action in Sweden alone and that call for international solutions. Consequently, both objectives and measures need to be adapted to work well in an international context.

Solve environmental problems rather than export them

The national environmental quality objectives are based on Swedish emissions and Swedish impacts on the environment. Up to now, this has been taken to mean impacts on and arising from the domestic territory of the country. Today, manufacturing is becoming increasingly specialized and trade more and more global. Products manufactured in Sweden are increasingly often exported, while a growing share of those consumed in Sweden are imported. All the signs are that this trend will continue. As a result, a growing number of environmentally harmful activities and their environmental impacts will move abroad.

To ensure that Sweden is not simply exporting its environmental problems, this issue needs to be pursued further, and interim targets and specifications may sometimes have to be reworded so as also to encourage sustainable consumption.

Changed production and consumption patterns are required

Economic prosperity and consumption continue to grow in Sweden. The Long-Term Survey of the Swedish Economy assumed an annual increase in GDP of 1.9%, while Checkpoint 2008 was based on a continued annual rise of 2.3%. Future economic growth of 2–3% a year will, for many parameters, entail an equally large increase in environmental impact, unless something is done to sever the causal link between the two. In certain areas, consumption needs to shift towards more sustainable resource use and reduced impacts on the environment, whether it be a matter of quantities of waste, the area of living space heated, consumption of meat and other foods, or numbers of electrical appliances. In all these areas, consumption is rising.

The state can give a lead in addressing this issue, but is not yet doing so. More knowledge is needed to identify the key areas in which the public sector can set an example and initiate changes in consumption patterns. But in many fields, we already know more

than enough to instigate consumption changes that will make a difference. The climate impact of the public sector is one of them.

In the reports on specific objectives and sectors, the measures proposed for attaining the particularly challenging objectives are often a matter of filling knowledge gaps and securing international agreements. These things can be achieved, for example, by focusing more clearly on research and negotiations, which will take a great deal of time, resources and hard work. Such a focus will be of strategic importance in the years ahead.

Production and consumption changes take a long time

Achieving the environmental objectives will require a very substantial and broad-based commitment of effort. Public agencies, businesses and consumers all have an important part to play in shaping a society in which the objectives are met. This is not least the case when environmental problems necessitate changes in patterns of production and consumption. Such problems are more difficult to solve, calling for a shift away from ingrained habits on the part of broad sections of the population in many countries – and probably also requiring a very different type of action strategy. Changes of this kind, moreover, are likely to take a very long time to have their full effect.

In this area, day-to-day environmental efforts need to be strengthened. The contributions of companies and consumers are poorly reflected in the in-depth evaluations carried out by government agencies. The business sector points out that, at present, the environmental objectives are not what drives companies' environmental activities. More ambitious efforts in this regard, rather, are often spurred by a combination of legislation, companies' own awareness, brand building, commercial considerations, and pressure from customers and the wider society. A survey of a number of firms conducted by the Confederation of Swedish Enterprise shows that, for the businesses in question, there is no link between successful environmental management and the company's attitude to the Swedish environmental objectives. Business representatives also point out that voluntary environmental initiatives in the business sector receive scant reward, since the Environmental Objectives Council's annual progress reports increasingly often show that the objectives will be very difficult to achieve on time, despite all the good work undertaken.

If the business sector is to feel a greater sense of involvement, more business-related aspects need to be taken into account in implementation of the objectives. Companies also call for more positive incentives of the type provided by the Programme for Improved Energy Efficiency in Energy-Intensive Industry.

A futures study ('Non-toxic, resource-saving environmental life cycles: Action strategies under different societal and global trends', Anna Björklund et al., Royal Institute of Technology, Stockholm, 2007, in Swedish) also shows that, in general, the reports on individual objectives and sectors contain few proposals for measures and policy instruments that will encourage changes in consumption. The instruments that are proposed and that could influence consumption patterns tend to be relatively weak, involving information to consumers to enable them to make good environmental choices. Often, though, such choices can be both difficult to make and costly for the individual.

Reduce the environmental impacts of the food supply chain and the construction sector

The significant environmental impacts of housing, food and transport were highlighted by the Environmental Protection Agency as early as the mid-1990s, and subsequently in the report of a government inquiry in 2006, *Biffen, Bilen och Bostaden* ('Eating, travelling and living sustainably'). Also in 2006, the European Commission published a consultancy study (EIPRO) that arrived at broadly the same conclusions: activities to meet our food, transport and housing needs are responsible for the bulk of society's impact on the environment. They lay claim to large resources, in terms of land, materials and energy, which cost so little to use that there is a danger of a certain amount of waste. Swedish efforts in pursuit of environmental objectives are organized differently

today. There is therefore a clear risk of environmental action failing to reflect an integrated approach to food, transport and housing. The present strategy sets out measures to encourage such an approach to the food supply chain and to the construction, property and civil engineering sector, while the problems of transport are addressed under the Strategy for More Efficient Energy Use and Transport.

Improve coordination of environmental action

Efforts to safeguard the environment are undertaken in different arenas and from different points of view. Consequently, major gains in efficiency can often be achieved through better coordination of closely related activities. More 'peeking over the fence' needs to be encouraged. In the last in-depth evaluation, attention was for example drawn to opportunities to improve coordination between

- the national waste plan and evaluation of the environmental objectives,
- the timetables for the climate strategy 'checkpoint' and the environmental objectives evaluation,
- the aims of the EU's Batteries and Waste Electrical and Electronic Equipment Directives.

In these respects, coordination has now improved, but even more could be done, saving both effort and the environment.

In this evaluation, closer coordination is proposed between

- objectives in the areas of recycling and chemicals,
- policies on products, chemicals and waste,
- implementation of the environmental objectives and national action in pursuit of sustainable consumption and production,
- environmental agencies involved in the food supply chain,
- the relevant agencies in the construction, property and civil engineering sector,
- health-related environmental action and implementation of the environmental objectives.

Efforts to identify and take advantage of opportunities for coordination must continue.

More knowledge is needed

To achieve non-toxic, resource-saving environmental life cycles, central government needs to ensure that sufficient new knowledge is generated, and that it is used and turned into practical action.

6.2.3 Key measures for the future

Sweden has made good progress towards a better environment, but much still remains to be done. The individual objective and sector reports relevant to the GRK Strategy contain hundreds of ideas and proposals for crucial measures and policy instruments. The emphasis in this strategy is on implementing and developing instruments already decided on. Here, considerable potential exists, not least in the use by public agencies of the powers entrusted to them. There needs to be a mobilization of future efforts around the environmental quality objectives *Reduced Climate Impact*, *A Non-Toxic Environment* and *Zero Eutrophication*, which will be particularly difficult to achieve.

These objectives call for international solutions, but also Swedish initiatives to change patterns of production and consumption. It is particularly important that such measures are introduced without delay, as changes of this kind often take time to have their full effect. Studies continue to show that activities concerned with meeting food, transport and housing needs account for the major share of society's impact on the environment. There therefore needs to be a greater focus than before on measures to reduce the overall environmental impacts of the food supply chain and the construction, property and civil engineering sector. Coordination of closely related initiatives and resources is a tool that can be used even more effectively in implementing the environmental objectives. The basis for doing that will be improved, moreover, by a strengthening of capacity building and research.

It is important to take into account, among other things, the significant repercussions which the current rapid growth in prosperity in Asia will have for Sweden. Developments in China and India in recent years have been a powerful contributory factor behind a more than threefold rise in the price of oil and increases in the prices of metals and other construction materials. According to some assessments, every second new building in the world over the next 15–20 years will be constructed in China. If this scenario of rapid growth in Asian prosperity continues, major consequences may also be expected in Sweden.

Appendix 3 to the GRK Report (Swedish Environmental Protection Agency Report 5798, in Swedish) includes outline impact assessments of the proposals put forward.

Implement and develop rules to achieve non-toxic, resource-saving environmental life cycles

Legislation in the field of environmental policy has been under development for several decades, both nationally and at EU level. This is particularly true with regard to chemicals, products and waste. Concerning waste, there is little call for further regulations, but improvements are needed in the way the existing ones are applied. As regards remediation of contaminated sites, initiatives to clarify and simplify the interpretation of provisions of the Swedish Environmental Code would speed and make more effective action to achieve the objectives. To a greater extent than before, measures in pursuit of the environmental objectives must be implemented without adding to the regulatory burden. Actions that generate synergies for several objectives may be one part of the solution. Clearer rules and clearer guidance to supervisory authorities, more effective supervision and better compliance with regulations may be another. The Environmental Protection Agency's three-year plan for supervisory guidance is one step in this direction. The plan is designed to enhance the effectiveness of regulatory supervision in the environmental field through better guidance to the agencies with operational responsibility for it. In 2008, the Agency also intends to initiate a research programme on more effective environmental supervision. Very little research has been done in support of the practical delivery of supervision in this area.

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES** an increased commitment to measures to develop preventive control of chemicals, in the areas of research, regulations, information on substances in products, and international cooperation.

To achieve a non-toxic environment and non-toxic environmental life cycles, vigorous action is required. This should include measures of a preventive character, such as:

- Ensuring that the new chemicals legislation, REACH, provides a good regulatory basis for securing significant steps towards Sweden's environmental quality objectives. Between now and 2020, REACH and other EU legislation, relating for example to biocides, will be the subject of a number of reviews. These will provide good opportunities to further influence the wording of annexes and guidance documents linked to the key EU rules on chemicals, to make them as consistent as possible with the thinking behind the Swedish objectives.
- Efforts by Sweden, in conjunction with the review of REACH, to ensure that its requirements regarding information to users about substances of very high concern in products are extended to a wider range of dangerous substances.
- Stringent supervision of companies' compliance with REACH, along with measures that will help to achieve uniform supervision across the EU.

▶ **THE COUNCIL PROPOSES** increased efforts in the areas of dissemination of knowledge, guidance to supervisory authorities, local authority plans for single-household sewage systems and targeted grants, in order to achieve the environmental quality objective *Zero Eutrophication*. Supervision and implementation of legislation on single-household sewage systems are still inadequate in many municipalities.

The Environmental Protection Agency calls for the establishment of a national competence centre on single-household sewage systems, with a view to improving the quality of solutions and technologies in this area. The centre's intended target groups are local authorities, contractors and property owners.

In connection with the publication of new guidelines and a new manual on single-household systems, the Agency plans to arrange a series of information sessions offering opportunities for dialogue.

The Agency also proposes a grant scheme whereby funding to tackle the problems associated with single-household sewage disposal systems will go primarily to local authorities. In order to qualify for grants, authorities will have to draw up and adopt a plan for their work on such systems. Local authorities will thus assume overall planning responsibility for solutions relating to single-household sewage systems in their areas.

Certain hazardous substances, such as mercury, spent nuclear fuel and other radioactive materials, need to be taken out of circulation and finally disposed of in a safe manner. For non-nuclear radioactive waste, questions of responsibility and legal and financial aspects of disposal need to be studied. In the case of mercury-containing waste, plans for a permanent repository should be further developed and implemented.

High-level nuclear fuel wastes, low- and intermediate-level wastes from the refurbishment or demolition of nuclear power stations, and non-nuclear wastes all need to be disposed of in a satisfactory manner. To ensure a comprehensive approach, in terms of strategies, objectives and management, a special national waste plan for all types of radioactive waste should be drawn up.

For the problem of contaminated sites to be largely solved by 2050, a major programme of remediation is called for, along with further capacity building in this area. Stable central government funding for the remediation of orphan sites will be essential in meeting the targets set. Continued support at the current level of some SEK 600 million a year is judged to be necessary over the entire period up to 2050. The estimated cost is based on the present approach, whereby remediation efforts are focused mainly on sites contaminated by land-based point sources.

Adapt goals and measures where international solutions are required

Many environmental problems are global, and Sweden consequently needs to act at an international level. Pollutant substances travel long distances through the atmosphere and the oceans, and are transported across borders with goods. Action in other parts of the world affects Sweden's prospects of achieving its environmental objectives. Swedish efforts therefore need to be focused to a large degree on influencing the shape of international environmental agreements and hence the measures introduced in other countries.

▶ **THE COUNCIL CONSIDERS** that the environmental objectives structure should also, with regard to objectives that are dependent on international action, guide the direction of Swedish efforts in an international context. This is particularly relevant to *Reduced Climate Impact, A Non-Toxic Environment, A Protective Ozone Layer* and *Zero Eutrophication*. Questions of goals and means will thus automatically be shifted from officials to the policymaking level.

Swedish action to achieve *A Non-Toxic Environment* is a good example of how the country has managed to take advantage of and influence the international dimension of environmental protection. Less than eight years after Sweden had formulated its vision of a non-toxic environment, EU legislation on chemicals (REACH) and a global chemicals strategy (Strategic Approach to International Chemicals Management, SAICM) had been adopted, both of which very much reflect the Swedish vision. Another good example is the country's endeavour to persuade first the EU and subsequently the rest of the world to ban mercury, take it out of circulation and ensure its safe final disposal. Here, Sweden's efforts have been clearly focused and, to date, successful. In both cases, the

steps taken were based on a careful analysis and a conscious strategy.

The environmental quality objective *A Non-Toxic Environment* includes interim targets relating to information, products and phase-out, stating what is to be accomplished. The approaches they express have been successfully exported. The wordings of the targets incorporate an international dimension, and the measures to be taken by Sweden to secure a non-toxic environment are thus also clearly sanctioned by the Riksdag. The background report of the Swedish Energy Agency and the Environmental Protection Agency for Checkpoint 2008 provides another example, with a proposed new goal structure that includes information on the appropriate direction of Swedish efforts at the international level.

There are other environmental quality objectives, too, which are fundamentally concerned with environmental quality in an international context. *Zero Eutrophication* and *A Protective Ozone Layer* are two examples where the international dimension is essential if further environmental gains are to be achieved. Appendix 3 to the GRK Report includes an outline of how the wordings of objectives and targets could be further developed.

The Environmental Protection Agency intends, within its sphere of responsibility, to elaborate a strategy for sharing Swedish experience in a more systematic and coordinated fashion than hitherto with other countries that are of significance for the environmental quality objectives referred to.

Sweden has made considerable advances across a wide range of environmental issues. In the case of *Reduced Climate Impact*, *A Non-Toxic Environment*, *A Protective Ozone Layer* and *Zero Eutrophication*, and interim targets relating to waste, the country is dependent on action being taken by other nations as well. The experience of Swedish government agencies is in demand, in the fields of environmental legislation and its implementation, permitting and supervision, as well as organization and planning. This demand exists in countries in the EU's 'near abroad', in growth economies and in developing countries. Concerning broader administrative issues, too, there is an interest in Sweden's experience, for example regarding how effective stakeholder collaboration can be developed. The Environmental Protection Agency plans to analyse what measures and combinations of measures are appropriate to achieving the environmental quality objectives, to provide better guidance for initiatives in this direction. Given that several important countries and regions will soon no longer be traditional development cooperation partners, moreover, new forms will have to be found for bilateral environmental cooperation. Particular care must be taken to adapt support to the needs and capacities of partner countries.

Strengthen measures to change patterns of production and consumption

Continuing globalization and growth in consumption will make some of the environmental objectives increasingly difficult to achieve. Measures to change consumption patterns in an environmentally beneficial direction are therefore urgently called for. Shifts in patterns of consumption also drive changes in what companies produce.

This strategy primarily presents examples of what the public sector should be doing to 'green' its consumption. But it is important that the business sector and consumers take similar steps.

State, county councils and local authorities must set an example in the environmental field

▶ **THE COUNCIL CONSIDERS** that the state and the public sector in general need to show the way in terms of practical action in pursuit of sustainable development. Earlier inquiries have made this clear, but more consistent implementation of this leadership is called for.

To this end, central government has to make sure that it really does give a lead, both through its own actions and by taking various steps to promote drivers of environmentally sound consumption. These could include incentives for eco-friendly technology, greater attention to the environment in product development, smarter methods of production, and more

widespread and effective use of environmental management systems. The state also has to demonstrate that it is taking a lead, and that it expects others to follow.

The state is Sweden's biggest corporate owner. A study ('Do state-owned enterprises set an environmental example?', Environmental Protection Agency Report 5699, 2007, in Swedish) has shown that the state's directives to the companies in which it holds a stake often fail to spell out what approach they are to take on different environmental issues. There is considerable variation in the account which such enterprises take of the environment. Wholly or partially state-owned companies operating on competitive markets seem to be as proactive on environmental matters as their privately owned competitors, while those not exposed to competition perform less well in this respect. The Environmental Objectives Council therefore welcomes the Government's new rules requiring state-owned enterprises, with effect from 2008, to present sustainability reports drawn up in accordance with the Global Reporting Initiative guidelines, as a basis for evaluation and follow-up.

▶ **THE COUNCIL PROPOSES** that the Government should call on all public sector organizations to

- set targets for their impact on climate,
- draw up action programmes setting out how they plan to reduce that impact, and
- report annually on their websites on their climate impact, the targets they have set and the steps they are taking to reduce their climate impact.

For agencies and other public organizations that have already introduced environmental management systems, such a call is easy to comply with. For others, with less well-developed environmental policies, responding to it may be more difficult. This indicates that compliance should be voluntary. As a basic principle, all public sector organizations should endeavour to reduce their climate impact, to the extent that their individual capabilities and the measures available to them allow.

For the roughly 180 central government agencies that are required to have an environmental management system, the Environmental Protection Agency will be presenting a new proposal on reporting in the summer of 2008. The aim will be to improve monitoring of the effects of state environmental management systems, by requiring a higher degree of measurability. This will provide the agencies concerned and the Government with a better tool for monitoring environmental action.

Measures to green public procurement

▶ **THE COUNCIL CONSIDERS** it particularly important to develop national targets for public consumption at the product level, to ensure that public sector organizations apply clear environmental criteria in their purchasing of goods and services in areas where public procurement can make a real difference.

Targets are important in ensuring that environmentally sound public procurement has a significant impact, and in measuring the success of this instrument. According to several studies, local authorities and county councils have done more than central government organizations when it comes to greening their procurement. This is mainly because the actions of county and municipal councils are guided more by the wishes of members of the public, while state organizations are steered by instructions and appropriation directions, which as yet do not send equally strong signals about environmental purchasing.

The Environmental Protection Agency has previously called for the adoption of national targets for public consumption ('Greener public procurement – proposals for an action plan', Report 5520, in Swedish). These targets were to be at the product level, covering a limited number of product categories with substantial impacts on the environment. The aim of the proposals was to focus on and flesh out the question of green public procurement, so as to activate all public sector organizations in this area. In a communication

on the subject (Government Communication 2006/07:54), however, the Government chose not to adopt the Agency's recommendations, taking the view that the issue of possible consumption targets at the product level needed to be looked at more closely.

▶ **THE COUNCIL PROPOSES** that the Swedish Environmental Technology Council (SWENTEC) should be commissioned to analyse, in collaboration with the relevant agencies, the feasibility of and basic conditions for increasing the proportion of technology procurements involving clear environmental criteria.

Technology procurement is a tendering procedure that is designed to stimulate and speed the development and market launch of new technologies which meet buyers' requirements better than products already on the market. The requirements involved are considerably more far-reaching than those normally laid down in public procurement. Groups of buyers acting together offer larger purchasing volumes, are able to exert a greater influence, and develop their own purchasing capabilities. At the same time, manufacturers gain access to a new market and a guaranteed volume of sales. In Sweden, this approach has above all been used to promote the development of more energy-efficient products and systems. Since the early 1990s, the Swedish Energy Agency has initiated and participated in almost 60 different technology procurements, many of them with very good results.

Technology procurement involving clear environmental criteria should be used more widely and more extensively than at present as a means of achieving progress towards the environmental objectives. Public purchasers should be urged and encouraged to join forces in planning and carrying out procurements of this kind. As a first step, an analysis should be made of the feasibility of and basic conditions for making greater use of this instrument within a number of government agencies. Inter-agency coordination in the area of environmental technology is part of the normal role of SWENTEC.

Another form of technology procurement is one known as the Gothenburg model, which involves environmental agencies and producers and users of chemicals forming partnerships to increase the availability and use of environmentally sound chemicals. This model is described in detail in Appendix 4 to the GRK Report (in Swedish).

Production and consumption changes to aid progress towards waste targets

▶ **THE COUNCIL CONSIDERS** that efforts to prevent waste arising in Sweden should be stepped up. A feasibility study of ways of preventing the generation of waste is to be undertaken by the Environmental Protection Agency. At the same time, a major waste research programme with similar aims is under way.

Sweden's structure of national environmental objectives includes very few goals concerning increased resource efficiency. In the negotiations on a revised Waste Framework Directive, the European Parliament now wishes to introduce a target of stabilizing waste production at 2008 levels by 2012. It also proposes binding minimum recycling rates of 70% for construction and demolition waste and 50% for household waste.

In Sweden, action needs to be taken by local authorities to further facilitate the collection and separation of different types of waste from households and small businesses. Such measures will help to meet both the interim targets for waste and the new types of targets now being discussed at EU level.

The Environmental Objectives Council's assessment is that material flow statistics and indicators can play an important role in identifying opportunities to improve resource efficiency. Statistics Sweden's system of material flow statistics should be developed, in close dialogue with users. A special group could be set up to analyse which statistics of this kind should form a basis for the next in-depth evaluation of the environmental quality objectives. Such an analysis should include a study of the Japanese 3R strategy of 'Reduce, Reuse, Recycle' ('Memo on 3R policy in Japan', Izumi

Tanaka, ITPS), the proposals in the EU's action plans on sustainable consumption and production (SCP) and sustainable industrial policy (SIP) (background document: http://ec.europa.eu/enterprise/environment/sip.pdf), and other international initiatives to measure and increase resource efficiency.

Reduce use of dangerous substances in products

▶ **THE COUNCIL PROPOSES** a redoubling of preventive efforts and a greater focus on reducing the use of dangerous substances in products. Requirements regarding information to users about substances of very high concern in products should be extended to a wider range of dangerous substances, both in REACH and under other EU legislation.

Regulations and policy instruments relating to products must continue to be developed. The Strategic Approach to International Chemicals Management (SAICM) also needs to be developed and implemented. New substances with hazardous properties should be nominated for inclusion in international agreements such as the Stockholm Convention.

For chemical products there has long been a system of health and environmental information within the EU, but for other products information of this kind on the substances incorporated in them is required only in exceptional cases. REACH introduces a requirement to provide information on any substances of very high concern which products contain. This is an important step, creating a better basis for reaching the objective in the longer term. However, this information requirement needs to be extended to include all substances hazardous to health and the environment – not just those of very high concern. A requirement to provide users with health and environmental information on any dangerous substances present in products also needs to be introduced under other legislation (the Biocides Directive and other product directives), and greater supervision of compliance with product regulations is judged to be important.

National action to promote sustainable consumption and production

▶ **THE COUNCIL PROPOSES** that national efforts in pursuit of the environmental objectives, including the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles and the other action strategies, should clearly feed into the development of a national action plan for sustainable consumption and production.

At present, work on the environmental objectives and the action strategies is a separate process from efforts to promote sustainable consumption and production (SCP). The two processes are not clearly coordinated. When a national action plan for SCP is to be drawn up for Sweden, it would be appropriate to make use of the work being done in pursuit of the national environmental objectives and the three action strategies, since both the objectives and the approaches involved have much in common. Such coordination could enhance the effectiveness of the action taken. To make good use of international SCP efforts in implementing the Swedish environmental objectives, an analysis will need to be carried out of what measures are required internationally to attain those objectives.

Measure environmental impacts in other countries arising from Swedish consumption

The national environmental quality objectives are based on Swedish emissions and on impacts on and arising from the domestic territory of Sweden. Today, manufacturing is becoming increasingly specialized and trade more and more global. Products manufactured in Sweden are increasingly often exported, while a growing share of those consumed in Sweden are imported. All the signs are that this trend will continue. As a result, a growing number of environmentally harmful activities and their environmental impacts will move abroad. Estimates for Sweden show, for example, that emissions of carbon dioxide linked to imported goods are greater than those associated with exports. Total carbon dioxide emissions

arising from Swedish consumption thus exceed the figure for emissions occurring inside the country, which Sweden reports internationally.

Targets need to be framed in such a way as to achieve the environmental quality objectives, while ensuring that Swedish consumption is sustainable and does not cause new environmental problems in other countries. Only then can it be said that our environmental problems can be solved.

▶ **THE COUNCIL PROPOSES** that Statistics Sweden should be commissioned to develop indicators to measure the environmental impacts of Swedish consumption. Initially, these should be the climate impact, energy use and use of substances hazardous to health arising from annual Swedish consumption. Statistics Sweden should also be asked to consider whether the area of land needed to meet Swedish demand for renewable raw materials could be another suitable indicator.

Indicators to measure the environmental impacts of Swedish consumption should be developed in stages, in phase with international work in this area, to ensure availability of data, robustness, and comparability between countries. In addition, Sweden should encourage the development of EU-wide methods, to make it easier to identify and quantify the origins of impacts on the environment. The three indicators now proposed are essentially the same as those previously put forward in reports from Statistics Sweden and the Environmental Protection Agency. The indicators should also be designed to reflect changing national needs.

The model chosen to calculate the indicators should be seen as a first approximation, to be developed in stages in collaboration with other EU countries. An appropriate method could be what is known as environmental input–output analysis. When these indicators are developed, corresponding indicators to monitor carbon dioxide emissions, energy use and use of hazardous substances resulting from Swedish public (state, county council and local authority) consumption could be fairly easily elaborated, both at the aggregate level and for selected products (*IPP indicators for private and public consumption based on environmental accounts and LCA*, Royal Institute of Technology, Stockholm, 2007). Such indicators are of particular interest when it comes to developing targets for central government consumption of selected products, and should be coordinated with that work. This proposal is elaborated somewhat in Appendix 3 to the GRK Report.

▶ **THE COUNCIL CONSIDERS** that all evaluations by the lead agencies of the environmental quality objectives should in future include a qualitative, and if possible a quantitative, assessment of how far progress towards the objectives has been favourably affected by overall environmental impacts being reduced or moved abroad.

Reduce the environmental impacts of the food supply chain and the construction sector

The Environmental Objectives Council judges resource efficiency to be an important component of the environmental objectives system, not least with a view to securing broad support for objectives and measures. Improved resource efficiency in terms of energy use, materials consumption and waste would be beneficial with regard to several of the objectives. The Swedish Energy Agency has for example proposed in its sectoral report that *Energy* should be identified as a new cross-cutting issue in this context. That would mean that none of the 16 environmental quality objectives are to be achieved to the detriment of a resource- and energy-efficient energy system with an increased share of renewable energy sources.

Practical experience of taxation of minerals and water varies, but in certain cases such taxes have significantly affected resource use and encouraged substitution. The effectiveness of taxes on natural resources and chemicals must be assessed on a case-by-case basis, and compared with that of other policy instruments. But in the longer term it may be appropriate to introduce raw materials taxes on another one or more materials.

The material streams associated with the food, construction, property and civil engineering sectors are also very important from a resource point of view, and consequently the measures proposed here have a focus on these sectors.

The food supply chain

▶ **THE COUNCIL PROPOSES** that, in advance of the next in-depth evaluation, the Swedish Board of Fisheries, the Swedish Board of Agriculture, the National Food Administration and the Swedish Environmental Protection Agency should be jointly entrusted with studying, and proposing measures to reduce, the overall environmental impact of the food supply chain, with the National Food Administration as the coordinating body.

A more integrated approach to the food supply chain could make action to achieve the environmental objectives more effective, reducing for example nutrient leaching, methane emissions, generation of organic waste, the use and spread of pesticides or the need for highly productive farmland. Work in this area could appropriately involve, in the first instance, the government agencies mainly concerned with the food sector and the food stream, from primary production to waste management. It would thus be natural to include the National Food Administration, the Board of Agriculture and the Board of Fisheries in a coordinating group, along with the Environmental Protection Agency, with its responsibility for ten of the environmental quality objectives and for waste, and with its expertise on the environmental pressures arising from the food sector. The Food Administration should have a coordinating role, and the focus should be on issues that are important in reducing the overall environmental impact of the food chain, but which are not normally dealt with by these agencies or in the framework of the environmental objectives. With regard to a more integrated approach to the food supply chain, too, indicators need to be developed to track trends in environmental performance. Further discussion on this subject will be found in Appendix 3 to the GRK Report.

▶ **THE COUNCIL PROPOSES** greater efforts to study the extent of waste in the food sector and possible measures to reduce it, including information campaigns. This work should be seen as part of the joint exercise, also proposed by the Council, to develop measures to reduce the overall environmental impact of the food supply chain.

Waste occurs at every stage in the food supply chain, with the result that more food has to be produced than is consumed. Some of this waste is unavoidable, but ways of making greater use of resources in the food chain should be studied more closely. Reduced waste and more optimal production, distribution and consumption will increase the potential for environmental gains throughout the chain. Such gains could include reduced emissions of greenhouse gases, less leaching of nutrients and pesticides, and less waste to be disposed of.

First and foremost, stakeholders in the food chain need to become more aware of the significance of waste for the environment, and of the benefits, economic and environmental, of more efficient utilization. Among other things, different ways of using food more efficiently and curbing waste should be explored. In 2007 an initial study was made of the waste occurring in one part of the food chain, from the production of food (excluding primary production such as arable farming, livestock rearing, horticulture, hunting and fishing) to its consumption (Grontmij AB 2007, 'Measures to reduce waste in the food chain', in Swedish). That study suggested that educational and other initiatives should primarily be aimed at professional operators in the chain, such as food wholesalers and retailers, caterers and restaurants, where both the potential benefits and the economic incentives would appear to be greatest.

▶ **THE COUNCIL CONSIDERS** it important to support the National Food Administration's efforts to 'green' its dietary recommendations, which are aimed at changing consumer supply and demand for food in such a way as to promote both good health and a sound environment.

For several decades, the National Food Administration has been issuing nutritional and dietary recommendations, which have influenced trends for certain groups of foodstuffs. Now the Administration intends to 'green' its dietary advice, and this could significantly affect the range of food products supplied. Production and consumption of food have appreciable impacts on the environment. The European EIPRO (Environmental Impact of Products) study estimates that private consumption of food and drink is responsible for 20–30% of impacts relevant to several of the environmental objectives, and that its contribution to eutrophication is in excess of 50%. Meat and dairy products are judged to have a particularly pronounced impact. According to an FAO report, *Livestock's long shadow* (2006), 18% of the global human influence on climate is attributable to livestock production.

The construction, property and civil engineering sector

▶ **THE COUNCIL PROPOSES** that, as part of their existing sectoral responsibilities, the National Board of Housing, Building and Planning, the Swedish Rail Administration and the Swedish Road Administration should jointly, and in collaboration with the business sector and other agencies concerned, study the overall environmental impact of the construction, property and civil engineering sector and, for the next in-depth evaluation, propose measures to reduce that impact.

The National Board of Housing, Building and Planning already has both a sectoral responsibility for the environmental objectives and lead responsibility for the environmental quality objective *A Good Built Environment*. The Board intends to further develop its work on indicators, to provide a better basis for monitoring environmental performance in the construction and property sector. At the same time, there are significant pieces in the overall picture that are also the responsibility of other agencies, such as the Swedish Rail Administration, the Swedish Road Administration, the Swedish Chemicals Agency (dangerous substances), the Environmental Protection Agency (waste and other issues), the National Board of Health and Welfare (health issues) and the Swedish Energy Agency. A more integrated approach to environmental and health issues in the construction, property and civil engineering sector, and closer collaboration between the relevant agencies and stakeholders, could make efforts to achieve the environmental objectives more effective. It has been discussed whether an inter-agency group should be established to support the sectoral responsibilities of the Board of Housing, Building and Planning and the Rail and Road Administrations, and to ensure close cooperation. However, the Board of Housing, Building and Planning intends to develop its sectoral responsibility and hence also its coordination with other agencies and the business sector, and therefore sees no need to further formalize inter-agency collaboration. The Environmental Objectives Council accordingly takes the view that, with the proposal presented here, the basis for an integrated approach to greening the construction, property and civil engineering sector will largely be in place.

▶ **THE COUNCIL PROPOSES** more extensive guidance to supervisory authorities on how the Environmental Code's provisions on conserving raw materials and energy and on reuse and recycling can be applied, in particular in the construction, property and civil engineering sector.

The Environmental Code includes general rules of consideration that are designed to prevent adverse effects arising from activities and measures and to promote better environmental stewardship. To make these provisions more effective in practice, guidance is needed. During 2008 the Environmental

Protection Agency plans to prepare guidelines on how Chapter 2, Section 5 of the Code especially, on conserving raw materials and energy, can be applied to a greater extent, in particular in the construction, property and civil engineering sector.

The requirements of the Planning and Building Act concerning demolition permits and demolition plans should be tightened up. Among other things, the relevant provisions should also apply to rebuilding work, as this involves the handling of large quantities of waste and there are shortcomings in the separation of hazardous waste.

In addition, criteria need to be developed regarding when wastes can and should be recovered for use as construction aggregates. Here, work is already in progress, and it will also be important to ensure that the criteria adopted are widely known, accepted and applied.

The Landfill Tax Act (1999:673) should be amended to exempt additional categories of waste from the tax. As it is now, this tax creates too much of a financial incentive to try to recycle, and hence spread, several types of waste containing harmful substances. The law should therefore be amended as proposed by the Environmental Protection Agency in its consultation response to the inquiry on taxation of landfilled waste (SOU 2005:64), so as to exempt wastes such as bottom ash, fly ash and other flue-gas cleaning residues arising from waste incineration.

The Construction Products Directive is shortly to be reviewed. In that connection, the Swedish Chemicals Agency proposes that the standards which the directive provides for should be broadened to reflect a life-cycle approach, partly to facilitate final disposal, recycling and reuse of construction and demolition wastes. The Chemicals Agency has also called for a study of the possibility of requiring building logbooks to be kept, containing information on the products incorporated in buildings ('Better information on dangerous substances in construction materials – a report commissioned by the Government', Swedish Chemicals Agency Report 2/07, in Swedish). Such logbooks would provide a basis for minimizing the effects and the costs of remedying problems, should new, serious risks be identified.

Developing the roles of government agencies

▶ **THE COUNCIL PROPOSES** that the desired inter-agency cooperation in the framework of this strategy should be made clear by means of a joint brief to a number of central government agencies to develop effective environmental measures, based on the same approach as under the Strategy for More Efficient Energy Use and Transport. This proposal concerns, in particular, the National Board of Housing, Building and Planning, the Swedish Board of Fisheries, the Swedish Board of Agriculture, the Swedish Chemicals Agency, the National Food Administration and the Swedish Environmental Protection Agency.

In the context of the Strategy for More Efficient Energy Use and Transport, six central government agencies have been assigned a clear responsibility to work together to develop a joint strategy. Such collaboration creates a better basis for more effective introduction of environmental measures. Cooperation organized along similar lines can be achieved in the framework of the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles by giving a number of central government agencies a role in the coordination of the strategy. Clearly defined responsibilities are particularly important when collaboration is crucial to successful completion of the task. As work on the present strategy has progressed, three areas of cooperation have emerged with particular clarity: the regulatory frameworks for products, chemicals and waste; collaboration within the food supply chain; and cooperation in the construction, property and civil engineering sector.

Products, chemicals and waste

▶ **THE COUNCIL CONSIDERS** that greater coordination of efforts relating to products, chemicals and waste is important in securing more effective progress towards the environmental objectives without adding to the regulatory burden. In this area, the Swedish Chemicals Agency, the National Board of Housing, Building and Planning and the Swedish Environmental Protection Agency intend to further coordinate their work, with the Environmental Protection Agency as the convening authority.

Measures to ensure closer coordination in implementing policies on products, chemicals and waste, both internationally and nationally, will help to attain the environmental objectives. EU legislation on waste does not apply once the waste has been recycled and thus ceased to be waste. For such materials, however, the EU's chemicals legislation, REACH, may be applicable. For everyone affected by these issues, it is important for the two regulatory frameworks to work well together in practice, which cannot yet be entirely guaranteed. To date, a Swedish study has been conducted and a seminar held on the subject, with the aim of establishing what tangible steps can be taken in connection with the EU's work on REACH and the Waste Framework Directive to make the rules simple to apply and effective from an environmental point of view. In the context of the Strategic Approach to International Chemicals Management (SAICM), similar coordination should be promoted by including a focus on waste, to ensure a life-cycle approach to chemicals. The Energy-using Products (EuP) Directive requires energy consumption to be assessed in the design of such products. When this directive is revised, one option to consider is imposing other health and environmental requirements on the design of energy-using products, in addition to those relating to consumption of energy.

▶ **THE COUNCIL CONSIDERS** it important to continue to take forward the work of the 'Stockholm Group', with a view to achieving more effective coordination of international action relating to substances with both climate and ozone-depleting effects.

A good example of a coordinating activity is the 'Stockholm Group', set up on Sweden's initiative to secure more effective international implementation of the Montreal and Kyoto Protocols. Ozone-depleting substances, such as CFCs and HCFCs, as well as some of the alternatives to them, contribute very significantly to the greenhouse effect. The idea of the group is, first, to create awareness that phase-out of CFCs is also important in tackling climate change and, second, to ensure that measures adopted in one process are not counterproductive to the other. Strikingly often, the substitutes for ozone-depleting chemicals that can most easily be introduced to meet Montreal Protocol commitments have a very powerful greenhouse effect and therefore hamper implementation of the Kyoto Protocol. Since international negotiators and experts are rarely able, or required, to take both these global environmental problems into account, the responses arrived at can often represent suboptimizations, which simply shift the problems instead of solving them.

The need for coordination is also illustrated by the special precautions required on farmland and around roads, sewage works and waste facilities to achieve and maintain good-quality groundwater.

Contaminated sites

▶ **THE COUNCIL PROPOSES** a study of the organizational structure and division of responsibilities for remediation of contaminated sites, to establish whether resources can be used even more efficiently and whether there are any essential tasks that are not covered by the existing structure. The aim is to secure greater benefits for the environment and better use of resources, and to enhance the prospects of attaining the environmental quality objective *A Non-Toxic Environment.*

Official responsibility for contaminated site remediation is currently spread over a number of agencies. There are probably advantages to be gained from concentrating responsibility in a single central organization. Closely related areas of responsibility include grant-funded measures to deal with older contaminants, work arising from discontinued state operations, management of sites now covered by the Remediation Insurance Scheme, and the responsibilities referred to in the proposed Soil Framework Directive and the Environmental Liability Directive.

Strengthen capacity building and research

▶ **THE COUNCIL PROPOSES** that state funding for capacity building and research should have a clearer focus on helping to build a sustainable society in which the environmental quality objectives are achieved, and that the Environmental Protection Agency should be given a coordinating role in this context.

A strong civil research sector is crucial to remaining competitive in a globalized world. To achieve the environmental quality objectives, increased central government support for research, development and innovation know-how is desirable. The present in-depth evaluation shows that there are still gaps in the knowledge needed to meet a number of the objectives.

In addition, exports of Swedish environmental know-how can help other countries to improve their environments. Ultimately, this will also aid progress towards several of the Swedish environmental quality objectives. Efforts in this area should focus not only on capabilities in the business sector, but also on effective ways of exporting the environmental know-how of the public sector. Swedish expertise in this field is often of a high standard internationally and also much in demand, but the effectiveness of knowledge exports of this kind could be enhanced.

Sweden was one of the pioneers in developing academic expertise and infrastructure in the environmental field. Now and in the years to come, however, most new knowledge will be generated abroad. Given the often boundary-crossing nature of environmental issues, international cooperation in the area of knowledge and research is crucial. It is becoming increasingly important to make resources available to monitor trends in the wider world and to put international research results to practical use.

The Environmental Objectives Council considers it essential to

- develop new knowledge based on environmental research in areas where Sweden already has a competitive capability, and in areas where Sweden's environmental problems differ from those of other countries,
- invest more resources in putting research results to work by adapting them and translating them into effective measures geared to user needs,
- invest more resources in knowledge translation for the benefit of different types of user groups (international, national, regional, local; professionals, consumers, government agencies and businesses),
- invest more resources in monitoring of societal and global trends, futures studies, synthesis work and knowledge reviews, to make better use of the research results of others, and
- coordinate research more effectively with a view to attaining the environmental quality objectives.

Overall, this requires a strengthening of resources. The Council also considers that it could be appropriate to give the Environmental Protection Agency a coordinating responsibility for ensuring that state research resources are directed more towards meeting the environmental objectives.

▶ **THE COUNCIL PROPOSES** that the Government should commission a feasibility study on establishing a knowledge centre whose aim would be to speed progress towards sustainable production and use of chemicals.

The purpose of a knowledge centre would be to bring about national coordination with higher

education institutions, research funders and the business sector. Work in the field described is being undertaken in Sweden, but at present there is no major, coherent programme or stable platform to promote progress in the desired direction.

A knowledge centre would conduct research and development in the area of green chemistry and clean technology, and provide information and technical support to companies with the aim of reducing use of chemicals posing hazards to health and the environment. The centre should have a high level of expertise in the chemical and engineering fields and should develop collaboration with other institutions, in Sweden and abroad. It could appropriately be linked to a university or university college.

There is an urgent need, too, to encourage research on the health and environmental risks of chemical substances – whether produced intentionally or unintentionally – and of nanotechnology.

6.3 Strategy for the Management of Land, Water and the Built Environment

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL SUPPORTS** the Strategy for the Management of Land, Water and the Built Environment, including the measures and policy instruments proposed by the agencies involved: the Swedish Environmental Protection Agency, the National Board of Housing, Building and Planning, the Swedish Board of Fisheries, the Swedish Forest Agency, the Swedish Board of Agriculture, the National Heritage Board, the National Board of Health and Welfare, the Swedish Energy Agency and the Swedish Road Administration.

▶ **THE COUNCIL BELIEVES** that, in order to meet the environmental quality objectives, land, water and resources must be used with due consideration for the ecosystems concerned, and taking into account the natural and cultural values of the landscape. Additional measures and new policy instruments are required. The strategy's focus on planning, stewardship and protection creates a good basis for greater sectoral integration and collaboration between business, central government agencies and local authorities. To ensure that the environmental objectives more clearly shape our society, the strategy should be used as a platform for developing methods of valuing ecosystem services, biodiversity and cultural heritage, and for striking strategic balances on different scales in the landscape.

▶ **THE COUNCIL ALSO NOTES** that expected changes in climate represent major challenges for the sustainable management of natural resources, land, water and the built environment. To achieve the climate objective, there needs to be a shift to renewable energy. Economic activities and resource use need to be adapted to a changing climate.

▶ **THE COUNCIL HIGHLIGHTS** the importance of measures relating to planning, environmental stewardship, protection and restoration, and the dynamic links between them. The quality of planning and the degree of care shown in resource use affect what measures will be required to prevent uses with potential adverse impacts. With better environmental consideration and longer-term planning, future requirements in terms of both protecting and restoring natural and cultural environments can be reduced.

▶ **THE COUNCIL CONSIDERS** it imperative to develop and improve environmental stewardship in agriculture, forestry and fisheries, and in urban development and the infrastructure sector, to ensure that natural resources, land, water, and natural and cultural assets are used in a long-term sustainable manner.

▶ **THE COUNCIL SUPPORTS** the level of ambition for the protection of natural and cultural environments proposed in the reports on the individual objectives. At present, the need for protection is considerable, and often ongoing management is also required to conserve biodiversity and cultural heritage in the longer term. In addition, there is a need for restoration and re-creation schemes, to recover lost functions or values in the landscape.

▶ **THE COUNCIL CALLS** for a strengthening of expertise in environmental and health issues in the context of land use planning. Regional planning needs to be developed so that structural issues can be resolved optimally in terms of the environment and resources. Long-term, environmentally sound planning is needed to define the direction of travel towards sustainable development.

▶ **THE COUNCIL PROPOSES** additional central government funding for protection and restoration, and to develop good environmental practice in land use planning. To improve stewardship in agriculture, forestry and fisheries, economic as well as administrative and information instruments are proposed. Here, the Rural Development Programme is important, as is advice in support of voluntary undertakings by different stakeholders.

▶ **THE COUNCIL ALSO CONSIDERS** that more use needs to be made of policy instruments that prevent environmental problems by involving operators and consumers. Attention should be drawn to the importance of consumption for sustainable resource use, partly through targeted instruments to improve environmental awareness in private and public consumption.

6.3.1 Action strategy for sustainable management

The purpose of the Strategy for the Management of Land, Water and the Built Environment (the HUM Strategy) is to conserve biodiversity and valuable cultural environments, protect human health and, through environmentally sound land use planning, achieve sustainability in built development and infrastructure. The HUM Strategy has three basic components (Government Bill 2004/05:150):

- Sustainable use of land and water areas and good production conditions for long-term protection of natural and cultural assets in the environment.
- Conservation and sustainable use of sites and resources of particular value and creation of a rich cultural and natural environment where essential elements of cultural heritage, along with biodiversity, are safeguarded.
- Environmentally sound land use planning and urban development, combined with sustainable regional development, to create a built environment and infrastructure with new facilities of high quality and to ensure balanced extraction of natural resources and good management of land, water and the built environment.

In preparation for this in-depth evaluation, work on the HUM Strategy was focused on gaining an overview of the action proposals presented in the reports on individual objectives and sectors. In this work, the (sometimes preliminary) reports available in October 2007 were mainly used. Besides the reports on objectives and sectors referred to in the section on the action packages, reference is made to two other reports: the National Board of Health and Welfare's evaluation of environment-related health issues and the National Heritage Board's account of environmental efforts in the cultural heritage sector. By including in action packages both the measures proposed and the impact assessments done, the strategy provides an overall picture of the cost-effectiveness of various types of measures and their importance for the environment and to various stakeholders.

No new proposals for measures besides those included in the background reports are submitted in this strategy. The agencies concerned are, during spring 2008, continuing to work on developing the strategy in terms of both specific content and forms of cooperation and implementation. For a more comprehensive approach whereby natural resources are used in ways that preserve and develop environmental characteristics, further measures and additions to the action packages are needed. The results of the Government assignments to the Forest Agency, the Board of Agriculture and the Board of Fisheries to develop and define the notion of 'sustainable use' are one basis for this work. Effective policy instruments and methods of increasing commitment in society – in the business sector, in municipalities and among consumers – need to be developed further.

6.3.2 Sustainable and unsustainable

Ecosystem services

People benefit from a range of different functions and products provided by ecosystems, such as clean water, pollination and the natural cycling of substances. These services vary in nature and may be classified as:

A. Provisioning services, such as raw materials, energy and genetic resources.
B. Regulating services, such as nutrient removal, water conservation and climate regulation.
C. Supporting services, such as photosynthesis, decomposition and soil formation.
D. Cultural services, such as experiences and recreation.

(See Millennium Ecosystem Assessment, 2005a.)

People have always influenced and shaped their surroundings. Cultivation, forestry, hunting and fishing have taken place for a very long time. Changed production and consumption patterns, with industrialization and urbanization, have accelerated our negative impact on the environment. We are dependent on natural resources and ecosystem services, but also on resources created by us, such as infrastructure, the built environment and cultural landscapes.

To attain long-term sustainability in the development of society and in the use of renewable as well as finite resources, ecosystems must be used with great prudence and care. Sustainable use means that the long-term productive capacity of ecosystems is not impaired: this is because we limit the adverse impact of our use, but also make the most of its positive effects.

Under the HUM Strategy, long-term interests are intended to weigh more heavily than short-term ones, and existing assets to be used but also developed. One key starting point is the ecosystem approach, which has been defined in, for example, the Convention on Biological Diversity (CBD). Accordingly, every decision relating to resource use must be evaluated on the basis of how it affects the functioning and productivity of ecosystems. This is important, since we are dependent on goods and services delivered by ecosystems.

The ecosystem approach

The purpose of the ecosystem approach is integrated management of land, water and living resources, so that an equitable balance between conservation and sustainable use of biodiversity and natural resources is attained.

The ecosystem approach recognizes humans as an integral component of many ecosystems, and stresses the importance of the precautionary principle. It requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge of their functioning. Every segment of society, moreover, should join in formulating the aims of this management, which should be decentralized to the lowest appropriate level.

(See the Convention on Biological Diversity and Swedish Environmental Protection Agency Report 5782, 'The ecosystem approach', in Swedish.)

The exact definition of 'sustainable use' remains unclear. One fundamental principle is that long-term conservation aspects should be considered at an early stage of all planning processes. Good stewardship of natural and cultural resources in the activities that influence land and water use, such as agriculture, fishing and forestry, and also urban and infrastructure development, is crucial to attain balance in sustainable use.

However, sustainable use through prudent management means restricting the ways in which society can make use of land and water. Extraction of finite resources must be limited and take place efficiently from a sustainable management point of view. Use of renewable natural resources needs to be adapted to a level at which, in the long term, ecosystems can continue to provide services. The focus has been increasingly shifted from the risk of a finite resource being used up to the problems connected with renewable resources not being used sustainably. Nor is use of renewable resources free from environmental effects, and this calls for appropriately adjusted consumption and careful cultivation methods. Claims to land, water and natural resources also need to be directed geographically, so that assets can

develop favourably and negative impacts on ecosystems, natural and cultural heritage values and human health are as small as possible.

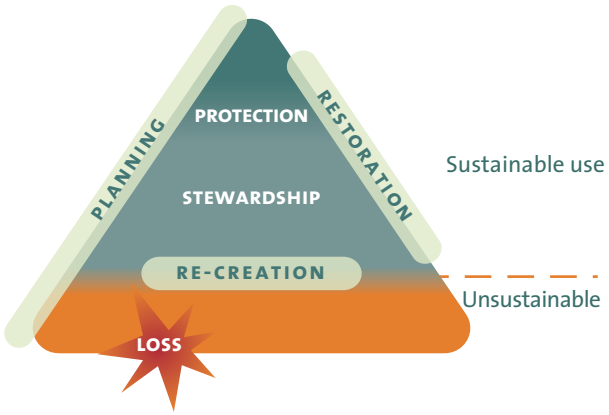
Problems for the environmental quality objectives to which the HUM Strategy relates can be divided into various categories, which also influence one another:

- Overuse of ecosystems as receptors. Ecosystem functions whereby various substances are converted are changed or destroyed when loads are excessive. Examples are climate change, marine eutrophication and acidification of lakes.
- Extraction of finite resources, with the risk of these resources being used up entirely. Examples are natural gravel and fossil fuels.
- Overuse of renewable resources from ecosystems. When consumption exceeds the long-term productive capacity, productivity is undermined or reduced. An example is dramatic decreases in several marine fish stocks.
- Environmental degradation and change due to use of land and water areas. Examples are drainage, expansion of hydroelectric power, and extension of settlements and infrastructure.
- Environmental deterioration due to reduced or discontinued management or changed methods of land use. Examples are scrub encroachment of meadow and pasture land and site preparation on forest land.

A SUSTAINABLE BALANCE

Planning, stewardship and protection are deemed to be the key areas of action with respect to the three components of the HUM Strategy: sustainable use of land and water areas, conservation of particularly valuable environments and resources, and environmentally sound land use planning and urban development. Today, in addition, there is a need for restoration of various environments that were previously used in a manner that failed to preserve their value. The 'sustainability triangle' (Figure 6.3.1) illustrates the interconnections and equilibrium among these measures.

FIGURE 6.3.1 The sustainability triangle



SOURCE: SWEDISH ENVIRONMENTAL PROTECTION AGENCY

The triangle illustrates relationships between the key tools of planning, stewardship, protection and restoration. It relates to the entire landscape, including all ecosystems, natural resources and the built, natural and cultural environments.

The boundaries among the various portions of the triangle are neither clear-cut nor static. In the best of worlds, all activities and all use of land and water would be characterized by long-term sustainability, i.e. the requisite stewardship. In reality, however, there is a sustainability gap. This principle applies even though we have not yet defined exactly where the boundary of long-term sustainable use is located.

There is limited scope for restoring particularly important resources or environments. For natural and cultural assets to be preserved in the long term, restoration must often be linked to further management action. However, large parts of the landscape are so affected that changes in the natural environment are irreversible on a human time scale and constitute a cumulative 'environmental debt'. Some ecosystem functions can be recreated to some extent, but this is often very costly.

Environmental stewardship practised in various activities is crucial for sustainable use and good management of natural resources. One central feature of this stewardship is that available resources are used in such a way that ecosystems retain their natural resilience – their capacity to recover after a

disturbance – in the face of future change. Land and water use must be adapted to the natural and cultural values of the landscape and take place in such a way that the targets for biodiversity are attained.

Land use planning makes it possible to balance wishes regarding development of the built environment, infrastructure or exploitation of resources against requirements for stewardship and protection within a framework of sustainable use and management. Protection and restoration needs ensue from such factors as inadequate stewardship, but also from structural transformation or other changes in use. When stewardship is inadequate, progressively more powerful protective instruments are applied, aimed at safeguarding ecosystem functions, preserving cultural heritage assets and core ecological values, or protecting human health.

In relation to the whole and the prospects of achieving the environmental objectives, the various parts of the triangle may be seen as communicating vessels. The degree of stewardship exercised in the use of land, water and built environments affects public measures in the form of protection and action to restore, conserve or recreate assets. If the landscape and natural resources are used in ways that are unsustainable in the long term, more inputs in the form of restrictions, restoration and re-creation will be required for the environmental quality objectives to be met. With enhanced stewardship of landscape assets, the human living environment and the functionality of ecosystems, special measures to offset the adverse effects of use will be required on a decreasing scale. Operators and businesses can, by themselves assuming responsibility, help the environmental quality objectives to be achieved while the need for further restrictions is simultaneously reduced.

6.3.3 Action packages

Efforts to develop the HUM Strategy in preparation for the in-depth evaluation have focused on summarizing, in overall packages, proposals for measures on which impact assessments have been carried out. No new proposals for measures have been made. On the other hand, a few different issues and areas for further development over and above the action packages have been identified, and these are discussed in the next section.

The action packages of the HUM Strategy are based exclusively on proposals for measures and policy instruments in the background reports on the environmental quality objectives and sectors concerned. Some 250 proposals have been judged to have a bearing on sustainable management of land, water and the built environment. Of these, finally, two-thirds have been grouped and analysed in four different action packages: planning, stewardship, protection and conservation, and restoration. The first three packages are linked to the three cornerstones of the strategy and, in addition, several environmental quality objectives emphasize restoration needs. The packages are intended to provide a comprehensive picture of all the measures and claims in the strategy.

The ‘planning package’ includes all measures connected with land use planning. In cases where the proposed planning measures are intended to promote achievement of specific objectives, such as restoration or site protection, they have been incorporated into the corresponding action package. The ‘stewardship package’ includes the kinds of measures that relate to some form of requirement or restriction and are intended to apply generally to resource use in the landscape, within the framework of the sector or activity concerned. The ‘conservation package’, besides protection in such forms as establishment of nature and cultural heritage reserves, also includes management measures for physically demarcated environments or features, for example. Measures assigned to the ‘restoration package’ are those aimed at restoring, re-establishing or creating environments that have been damaged or have disappeared owing to current or previous land and water use.

The action proposals in the objective and sectoral reports are highly varied in nature and their impacts have not always been fully assessed. Proposals mainly concerning research or government inquiries and the formulation of guidance by public agencies are not included. For many of these proposals, aims were not clearly formulated, nor was it possible to assess their

relevance to target fulfilment. However, a number of partially incomplete proposals are also to be found in the packages, for the purpose of including policy instruments of various types.

This section groups the proposed measures and provides an overview of their implications. The proposals in the various tables are described in more detail in the ensuing text, but for comprehensive accounts of measures and instruments, please see the objective and sectoral reports.

PLANNING

Land use planning, i.e. planning for the use of land and water areas, is carried out mainly within the framework of the Planning and Building Act (1987:10). The municipalities are primarily responsible for decisions on planning and building. For some sectoral legislation, especially that which relates to road building and railway construction, there are also regulated planning processes.

A well-developed and solidly supported comprehensive plan that includes the environmental objectives is a good strategic instrument. This plan must be based on conditions in the area concerned, assign priorities among different public interests and specify the basic features of future use of land and water areas. Legally binding detailed development plans (Chapter 5 of the Planning and Building Act), too, can be key tools for meeting environmental objectives, for example by ensuring protection, or regulating in more detail the design of or activities associated with the built environment.

Plans and programmes are accompanied by an environmental assessment aimed at predicting future environmental impact and adapting planning with reference to the environment and human health. Land use planning can thus take the environmental quality objectives into account. It can locate and shape businesses, housing, services and infrastructure in such a way that emissions and environmental loads are minimized and resource use becomes as efficient as possible. The planning undertaken can identify areas or buildings and protect them by exempting them from development.

Attaining the environmental objectives often requires planning cooperation between local authorities or at the regional level. The Planning and Building Act requires municipalities to consider one another in their planning, and also contains special provisions on regional planning (Chapter 7) that enable them to engage in voluntary joint inquiries and adopt regional plans. To favour regional growth and sustainable development, regional development programmes must be drawn up by regional autonomous bodies, municipal joint bodies or county administrative boards. These programmes are not land use plans; rather, they are intended to constitute a coherent strategy for binding together the local authorities' comprehensive planning and other planning processes with a bearing on sustainable regional development.

Measures for environmentally sound land use planning and urban and regional development

The reports on individual objectives and sectors show that land use planning is not used as a tool for attaining the environmental objectives to the extent that would be desirable. Measures in the planning package (see Table 6.3.1) are aimed at ensuring environmentally sound land use planning and urban development or contributing to regional sustainable development. There is also a comprehensive proposal for an investment programme for knowledge development, basically relating to all the environmental quality objectives and all three action strategies. The proposals in the planning package come from the (in some cases preliminary) reports on four environmental quality objectives – *Good-Quality Groundwater*, *A Magnificent Mountain Landscape*, *A Good Built Environment* and *A Rich Diversity of Plant and Animal Life* – and from the sector reports from the National Board of Housing, Building and Planning, the Swedish Energy Agency and the Swedish Road Administration.

The proposals include measures of varying nature. They relate to building up the expert knowledge about environmental objectives and planning possessed by the public-sector stakeholders concerned; raising the quality of knowledge used as a

Table 6.3.1 Planning: an overview of key proposed measures and policy instruments for more environmentally sound land use planning and urban and regional development.

For fuller accounts, see the background reports on individual objectives and sectors. Please note, however, that most of the impact assessments are incomplete.

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Launch a knowledge development programme, linked to the environmental objectives, for land use planning.	Financial support for local authorities, county administrative boards and non-profit organizations.	SEK 200 million a year for four years, including resources costing approximately SEK 119–195 million annually for local authorities, county administrative boards etc.	Mobilization of non-profit sector knowledge, increased civic involvement and higher employment.	Better consideration of all the environmental objectives in planning, and more efficient use of resources.
Improve application of the Planning and Building Act by means of better consultation between county administrative boards and local authorities and clearer responsibility for the former.	Administrative and legal.	Rise of SEK 43–55 million a year in county administrative boards' costs.		Increased environmental consideration in basic data for planning: a key precondition for cost-effective, eco-friendly solutions.
Review principles for funding of decision-support data for public sector users.	Administrative.	Redistribution of public sector funds ('zero sum game').		Increased scope for ensuring that decisions are well founded on relevant data.
Advise on how spatial planning should be conducted for a long-term sustainable water supply.	Administrative and legal.			Safeguarding of drinking water supplies and greater preparedness for extreme weather.
Support quality assurance of regulations on noise abatement measures in housebuilding.	Economic.	Better cooperation and coordination among public agencies.		Better coordination of noise abatement measures.
Compile an overview of processes and tools to promote nature in and near urban areas and make it accessible.	Administrative, knowledge building.	Approx. SEK 1.5 million, excluding public agencies' working hours.	Enhanced well-being through access to nature.	Conservation of biodiversity. Use of nature to combat air pollution.
Issue guidelines on expansion of wind power in the Swedish mountains without adverse effects on natural, cultural or recreational assets.	Administrative.			Greater consideration for conservation interest in expansion of wind power.
Define criteria for environmentally sound construction for design of new builds.	Administrative.	Small.	Enhanced health and well-being.	More environmentally sound new buildings.
Provide guidance for local authorities on environmental requirements for construction (including where authorities transfer land for development).	Administrative.	Cost of production for the public agencies concerned.	Enhanced health and well-being.	More environmentally sound new buildings.

(Continued overleaf)

Table 6.3.1 (continued)

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Coordinate various policy instruments for construction, with the emphasis on a strong connection with national objectives.	Administrative and economic.	Cost of working time for harmonizing various policy instruments for construction and drawing up follow-up criteria.		Better environmental management effect of central government funding. Environmentally superior buildings.
Draw up regional water supply plans, with county administrative boards as lead agencies.	Administrative.	Increased costs incurred by county administrative boards, with a rise in cost-effectiveness at the same time.		Improved water use planning, taking into account various claims, and safeguarding of water resources in the event of climate change.
Compile regional knowledge bases from county administrative boards for local authorities concerning energy issues, green structure and outdoor recreation, cultural assets and planning data for aggregates provision.	Administrative data.	Cultural assets, approx. SEK 1 million. Regional planning data for aggregates provision, approx. SEK 9.5 million. Costs of other data should be investigated further.		More solidly based decisions, better collaboration among local authorities and more efficient use of resources.

basis for decisions; and improving intersectoral work and consensus among different stakeholders. Most of the measures are administrative, but the package contains the essentials to ensure that the whole chain of legislation, application and supervision is workable.

The purpose of the proposal for a special programme of knowledge development is to enhance the skills of politicians and administrators in local authorities and at county administrative boards, but also to develop the resources of the non-profit sector in municipal planning and to attain increased citizen involvement in local environmental issues. The background is the fact that many municipalities and county administrative boards are deemed to have limited resources and skills to vigorously address the task of developing environmental stewardship in planning. There is also extensive knowledge of local conditions in various non-profit organizations, not least in local heritage societies and local environmental groups, that is not sufficiently put to use. This measure promotes all the environmental objectives, since greater knowledge improves the prospects of taking into account and implementing environmental goals and of using resources more efficiently. It also enhances opportunities to develop potential synergies and counteract conflicts among local authorities. The estimated cost of the knowledge development programme to central government is SEK 200 million a year for four years.

The proposal to improve the application of the Planning and Building Act is based on the county administrative boards' fundamental task of representing and coordinating state interests in local authority land use planning. In this planning, requirements for various forms of environmental stewardship have been progressively stepped up, for example with the introduction of the environmental objectives and the entry into force of the Environmental Code. All in all, this stewardship has imposed greater demands on the county administrative boards in this function, without corresponding increments in resources or skills. Boosting the boards' resources in these respects affords better prospects of taking the

environmental objectives into account at early stages of planning and decision-making processes, and of promoting economically cost-effective planning and building projects. The proposal also includes clarifying the county administrative boards' responsibility for supervision with a view to achieving greater compliance with legal requirements. This improves prospects of attaining the environmental objectives. The cost to central government finances of strengthening the boards' resources so as to improve their capacity to collaborate with local authorities within the framework of the Planning and Building Act is estimated at SEK 43–55 million a year.

Several proposals relate to efforts to develop guidelines and decision-support data regarding various interim targets or aspects of implementation of the environmental objectives. One question involved is how spatial planning should be conducted to safeguard a sustainable water supply in the long term; others are rules on noise abatement measures, processes for dealing with nature in and around urban areas, and guidelines on wind power. What these issues have in common is an endeavour to enhance inter-agency coordination and interaction and a common approach within the framework of agencies' various core activities. In this context, the proposal to review means of financing public agencies' use of public data should be mentioned, since access to cartographic data and statistics relating, for example, to the environmental objectives is a precondition for stewardship in land use planning.

Three proposed measures relate to making construction environmentally sound. The first concerns the development of criteria for environmentally sound building, as a basis for a clear dialogue with operators in the building and property sectors. A second proposal is aimed at promoting the imposition by local authorities of environmental requirements when municipally owned land is made available for development. A third involves coordinating various government grants for building construction and conversion, and also linking them to relevant environmental objectives. The use of financial measures from central government to promote construction can thus become more efficient, while helping to bring about greater environmental effectiveness.

One purpose of the proposal to draw up regional water supply plans is to provide data for planning that takes into account the effects of climate change. Another is to reduce the risks of groundwater contamination. It is assumed that the increased costs of drawing up these plans can be compensated for by synergic and coordination gains in relation to the water authorities' work on water plans and programmes of measures.

The proposal to develop knowledge bases at regional level is based on the conclusion that many issues relevant to the environmental objectives are of a regional, rather than a local, nature. This applies particularly to energy issues, where a regional perspective is considered necessary both as a basis for siting facilities for renewable energy, and for energy distribution or use. The need for regional data is also considerable with respect to green structure issues. A well-developed knowledge base concerning this and other matters is thought capable of helping to bring about better collaboration among local authorities, and between the local and regional levels.

Both these proposals involve heavier costs for planning at regional level, in particular. This must be balanced against the benefits of enhanced skills and improved regional coordination of urgent environmental issues. The cost of compiling regional knowledge bases is estimated at some SEK 10.5 million.

STEWARDSHIP

Environmental stewardship in economic sectors and activities is of paramount importance for sustainable use and for achieving the environmental quality objectives. 'Stewardship' means consideration and good environmental practice: adjusting activities and measures for the purpose of preventing adverse effects on the environment. Since the greater part of Sweden's land and water area is subject to active use, measures aimed at developing and improving stewardship of land, water, and natural and cultural assets are of the utmost importance for good management of natural resources and the built environment.

Table 6.3.2 Stewardship: an overview of key proposed measures and policy instruments.

The table summarizes types of measures and instruments, and identifies implications for various interests. For fuller accounts, see the background reports on individual objectives and sectors. Please note, however, that most of the impact assessments are incomplete.

Measures	**Policy instruments**	**Impacts**		
		on the state	***on individuals***	***on the environment***
Reduce eutrophication from agriculture, e.g. by reduced tillage, buffer zones and catch crops.	Financial compensation, advice and information.	Cost: SEK 170–740 million a year.	Farmers set aside land, receive payments and sometimes incur extra work and reduced harvests.	Leaching of nitrogen cut by 3,400–5,570 tonnes and phosphorus by 12 tonnes; increased humus content; reduced soil compaction.
Enhance biodiversity and cultural heritage assets in the farmed landscape through e.g. uncultivated field margins, management of landscape elements and land left fallow for diversity.	Financial compensation, advice and information.	Cost: SEK 75–90 million a year.	As above. Risk of increased use of plant protection products in weed control after fallow periods.	More small features and habitats for species and a more varied arable landscape. Preservation and exposure to view of cultural heritage.
Reduce acidification from forestry, e.g. by recycling wood ash, shelterwood felling and creating buffer zones around water environments.	Advice and information.	Cost: SEK 0.25–0.7 million a year for communication concerning wood ash recycling.	Time and money for planning. Cost: SEK 7–10.5 million a year for ash producers.	Ash helps to promote recovery from acidification. Shelterwood and buffer zones reduce leaching of nitrates and organic matter.
Enhance biodiversity in forests, e.g. with more hard dead wood and forest with a large deciduous element, and by retaining habitats that require particular care.	Information, advice and training, revised rules of consideration and penalty charges.	Increased efforts by public agencies to provide information and advice and exercise supervision.	Raised skills requirements, time for planning. Production loss: SEK 285 million + SEK 6–17 million a year. Investment costs.	More dead wood and forest with large deciduous element favour species richness, and also promote amenity value.
Reduce damage to soil, water, and natural and cultural assets by e.g. drawing up off-road driving plans and applying greater consideration in ditch clearance. For forestry, other requirements are better planning, increased coordination in building of forest roads, and buffer zones along watercourses.	Advice and information, revised rules of consideration and penalty charges. Consultation obligation and grants for planning of forest roads, more careful site preparation, review of legislation on ditch clearance.	Greater agency efforts: administration, information, advice and consultation. Cost: SEK 7 million a year for grants for forest roads and SEK 4.5 million a year for consultation obligation.	Increased skills requirements and time and money for planning. Possible reduction in costs of forest roads. Investment costs for less environmentally harmful machinery. Production loss of approx. SEK 15–37 million a year for buffer zones in forestry.	Improvement of water quality and retention of wetland hydrology. Reduced risk of mercury leaching. Biodiversity is favoured, and cultural heritage and recreational assets in the landscape are safeguarded.

(Continued opposite)

Table 6.3.2 (continued)

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Reduce illegal release and deliberate spread of alien species in water.	Information to retail sector and public, tightened supervision, training of fishery management advisers.	Greater agency efforts: information, monitoring and supervision.	Water owners, consumers and sales staff may perceive regulation as negative.	Reduced threat, from invasive species and genetic depletion, to ecosystems and indigenous species.
Adapt harvesting of fish and reduce bycatch of marine mammals and birds. Eliminate overcapacity in the fishing industry.	Alternative forms of management, e.g. licences for various fisheries and individual transferable quotas. Grants for vessel scrapping. Subsidies for introducing and developing selective gear, environmental certification.	Greater agency efforts: administration, information, advice and consultation. The scrapping programme has priority within the Financial Instrument for Fisheries Guidance and requires full Swedish co-funding.	Improved profitability for remaining commercial fishermen. Changed working conditions for fishermen obliged to seek new occupations. Costs of certification and development of new gear. Better profitability in the long term when stocks have recovered.	Recovery of threatened fish stocks, reduction in bycatch of marine mammals and birds. Recovery of disturbed ecosystems.
Improve stewardship of the natural environment in and near urban areas and in coastal and archipelago areas through e.g. prudent use, reduced noise and waste, establishment of special consideration zones.	Training, information, advice. Restrictions and prohibitions on shipping, anchoring and diving.	Agencies' costs of providing information and advice. Increased employment in tourism and experience industry.	Local and regional development. More job opportunities. Healthier environment.	Conservation of natural and cultural heritage assets. Improved recreational assets.
Improve management of natural resources, e.g. by protecting groundwater through sustainable groundwater extraction, and reducing extraction of natural gravel.	Legislative review. New provision on and inventory of natural gravel pits. Development of regional planning data for aggregates supply.	Increased or reduced agency efforts. Cost: SEK 9.5+3.2 million for planning data and inventory. Cheaper production of drinking water.	Clearer regulations, increased or reduced administration. Less risk of tap water being unfit for drinking. Better drinking-water quality.	Reduced degradation risk for drinking water, aquatic environments, and natural and cultural assets. Increased energy use for alternative gravel.

Knowledgeable and well-motivated stakeholders – in agriculture, forestry and fishing, urban development and the infrastructure sector – are a fundamental requirement for long-term sustainable use of natural resources through careful consideration for land, water, and natural and cultural assets.

Environmental stewardship is regulated in several ways. The state does so mainly through legislation, payments and charges. In addition, to a varying extent, various activities involve stewardship on a voluntary basis: certification systems are one example. The sectoral objectives for forestry (Swedish Forest Agency, 2005) develop the implications of state policy in terms of both environmental and production aspects. Public agencies have a key function of supporting skills development in these sectors through education and training, advice and information.

Chapter 2, the 'General rules of consideration etc.', of the Environmental Code (1998:808) applies

generally and to all types of activity. The very risk of damage or detriment entails an obligation to take steps to prevent, hinder or combat adverse effects on human health and the environment. Activities must be pursued and measures taken in such a way that raw materials and energy are used as efficiently as possible while, at the same time, consumption and waste are minimized.

Besides the provisions of the Environmental Code, there are rules applying specifically to various activities in other legislation, such as Section 30 of the Forestry Act (1979:429) and the Swedish Forest Agency's regulations. In all forestry operations, there must be general consideration of the interests of nature and cultural heritage conservation. The objective is to foster biodiversity and avoid detrimental effects on outdoor recreation, as well as damage to land, water, sensitive habitats, archaeological remains and valuable cultural environments. Fishing is regulated through the EU's Common Fisheries Policy (CFP), which includes total allowable catches and minimum fish sizes, for example.

Stewardship in activities often entails balancing environmental and other interests, commonly economic ones. In some cases, the state levies charges to attain a certain degree of stewardship through restrictions. In others, the state compensates operators for adapting their methods. The agri-environmental payment schemes under the Rural Development Programme are one way for operators to sell environmental services to society, and the foremost example of an economic instrument to promote environmental consideration. These schemes exist, for example, for measures to conserve natural and cultural heritage assets through management and restoration, and to adapt the timing of ground preparation and leave buffer zones alongside watercourses for the purpose of reducing nutrient leaching.

The measures proposed (see Table 6.3.2) relate mainly to farming, forestry and fishing. The stewardship package contains measures designed both to increase legislative compliance and to strengthen stewardship over and above the legally required level.

Stewardship in agriculture

In farming, broadly two groups of practical environmental measures to improve stewardship are proposed: first, those aimed at reducing leaching of plant nutrients and, second, those aimed at enhancing biodiversity and cultural heritage assets in the farmed landscape. These proposals are contained in the background reports on *A Varied Agricultural Landscape* and *Zero Eutrophication*.

In general, it is the state that will bear the costs of the measures, while farmers will be given compensation in the form of payments for the modifications and work inputs required. The modifications may entail additional costs to farmers in the form of extra work and the opportunity cost of arable land if it is used for any purpose other than that for which the farmer would primarily have chosen to use it.

Measures to reduce leaching of nutrients consist mainly of reducing tillage and switching tillage from autumn to spring. Measures such as leaving uncultivated field margins, too, reduce the risk of nutrients entering watercourses, especially on land that is susceptible to erosion. Implementation of these measures is expected to cut nitrogen leaching by 3,400–5,570 tonnes and phosphorus leaching by 12 tonnes. Costs in the form of payments to farmers amount to SEK 170–740 million a year.

Restoration and establishment of wetlands are aimed at increasing nutrient retention and creating species habitats, but these measures are dealt with in the restoration package.

Measures to increase biodiversity and enhance cultural heritage assets will affect some 60,000 ha. These consist mainly of increasing the proportion of small-scale habitats in the arable landscape by such means as non-harvesting of cereal crops and leaving field margins uncultivated. Leaving land fallow for diversity purposes is the most widespread measure, affecting 50,000 ha. The measures proposed will provide a more varied arable landscape and a greater supply of food and nesting sites for birds and insects. Some of the measures will also boost the soil humus content, which has a bearing on the capacity of the soil to provide plants with water and nutrients. The cost to the state of measures to adapt the manage-

ment of arable land amounts to SEK 75–90 million a year.

Altogether, the proposed measures to promote good environmental practice in agriculture involve a cost of at least SEK 245–830 million a year, mainly funded through the Rural Development Programme (RDP), which has already been adopted. Administrative costs to county administrative boards and other public agencies are not included. As for economic gains from reduced eutrophication and enhanced biodiversity and cultural heritage assets, these have not been possible to estimate in monetary terms.

Stewardship in forestry

In forestry, measures are proposed mainly to improve stewardship of land, water, and natural and cultural heritage assets, and to reduce acidification. The proposed measures come from the background reports (in some cases preliminary) on *Natural Acidification Only*, *Flourishing Lakes and Streams*, *Thriving Wetlands* and *Sustainable Forests*.

The measures are based both on voluntary action and on restrictions. Landowners will largely defray the economic costs of the proposed measures. Their costs will above all relate to production losses, extra costs of measures and investments, and the additional work of planning and collaboration. Almost all the proposals entail extra work for public agencies: providing information, advice and training; consultation; follow-up, supervision and monitoring. To promote compliance with current legislation on good environmental practice in forestry, there are proposals for administrative and technical measures and for tightened legal instruments in the form of consideration rules under the Forestry Act and scope for levying penalty charges. Advice and information are seen as central means of bringing about forestry that involves more careful management of natural and cultural heritage assets with, for example, felling that does not damage archaeological remains.

The measures aimed at improving environmental practice in forestry are largely a matter of increased consideration for aquatic environments, wetlands, and archaeological and cultural remains. By leaving wooded buffer zones, taking care in site preparation and coordinating the building of forest roads, adverse impacts on water quality, habitats and cultural heritage assets can be reduced. Costs to central government of grants for planning and administration of the consultation obligation for forest roads are estimated at some SEK 11.5 million a year. The annual economic costs of buffer zones will be SEK 15–37 million. More hard dead wood and more mature forest with a large deciduous element, for the purpose of promoting species diversity, would cost the forest industry SEK 285 million and SEK 6–17 million a year respectively.

Broadly, the measures to reduce the acidifying effects of forestry involve reducing the risk of acidic runoff water entering areas where it may have harmful environmental effects. Shelterwood felling can reduce nitrate leaching by more than 90%, but there is a risk of the trees retained blowing down and losing their function. Recycling of wood ash, which contains substances that exert an alkaline effect, may compensate for the acidifying impact of forestry. The increased costs to ash producers, compared with alternative uses for the ash, are estimated at some SEK 7–10.5 million a year. Consequential costs to energy consumers involve some thousandths of a Swedish krona per kWh.

Summing up, it may be said that landowners and the state alike will both pay for and gain from these changes. Landowners and contractors can benefit if the measures also involve making forestry more efficient, or afford coordination gains in the form of 'more nature conservation for the money'. Information and advice are policy instruments that mainly result in synergies. With such policy instruments as sanctions and penalty charges, landowners lose money if they fail to meet the requirements of sufficient consideration for environmental assets. If a measure involves a large-scale reduction in yield or a major production loss for landowners, they bear the costs to a higher degree. Those who stand to gain include the public, thanks to a more varied forest environment that offers a greater wealth of recreational opportunities, and in the longer term there will also be improvements in the biodiversity, species richness and cultural heritage assets of forest land.

Stewardship of fisheries and aquatic environments

The proposals concern consideration in coastal areas, protection of groundwater, reduced effects of alien species and measures relating to marine fisheries. The proposals may be found in the background reports (in some cases preliminary) on three objectives – *Flourishing Lakes and Streams*, *Good-Quality Groundwater* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* – and in 'In-depth evaluation of the interim target regarding natural gravel under A Good Built Environment' (Geological Survey of Sweden Report 2007:21, in Swedish).

The proposed measures and instruments for fisheries are aimed at reducing fishing mortality and adverse impacts of fisheries on other species, such as marine mammals and birds, and also damage to habitats caused by the effects of fishing gear on, for example, the seabed. The nature of these measures and instruments is such as to adjust the sector to the true resource base by eliminating surplus capacity. The purpose is to avoid collapse of stocks and permit profitability for remaining fishery enterprises.

The beneficiaries in the long term are fish as a resource and marine ecosystems, and eventually the fishing sector, when the recovery capacity of disturbed ecosystems has improved and fish stocks have increased. Where fishermen are affected by vessel decommissioning, the state intervenes to provide support from the structural funds. Since decommissioning is, in one scenario analysed, expected to affect about a third of crews, both fishermen and central government will bear the cost to a high degree. Small-scale fishermen may be seen as relative gainers, owing to certain adjustments to licensing, permit, charge and quota instruments. If certification systems are introduced for fishing that is eco-friendly, in terms of avoiding undesirable bycatch of marine mammals and birds, fishermen potentially stand to gain since their incomes may be expected to increase as consumers come to appreciate the added value of this fishing.

The action and instrument proposals relating to stewardship in coastal and archipelago areas and in shipping are aimed at bringing about development of coasts and archipelagos that takes place in a manner that is not harmful to natural and cultural heritage assets. The diversified economies of archipelago areas may be seen as benefiting, while the state will pay for educational instruments to encourage prudent use of resources. These measures may yield local and regional development, with increased employment and accessibility to the public.

Information and also restrictions or prohibitions in relation to 'special consideration' zones are proposed as policy instruments for shipping, to tackle noise and waste problems in coastal and archipelago areas. This is to be attained with such instruments as training, information and advice, which will entail costs to the state of some SEK 14 million a year.

PROTECTION AND CONSERVATION

Good environmental practice and sectoral integration are fundamental to preserving the values of the wider countryside. But in some cases more far-reaching stewardship of the environment is required than is generally practised. Special regulations to protect natural and cultural environments against the risk of damage in conjunction with use are then needed. Site protection is still important, to preserve our cultural history and biodiversity and safeguard human health. This protection also exists to improve scope for outdoor recreation. Some environments require modified management to ensure that their assets are maintained. Several of the environmental quality objectives involve conservation of habitats or cultural heritage assets, and the dominant type of measure proposed here is protection of sites.

Swedish environmental legislation provides for protection of areas as well as species and groups of organisms. Site protection under Chapter 7 of the Environmental Code, in the form of national parks, nature reserves and habitat protection areas, is the most common way of protecting nature. Today, more than 5 million hectares are protected in this way (Statistics Sweden, 2006). General shore protection also applies. Sweden's clearest international commitment to nature protection is the EU Natura 2000 network, under the Birds and Habitats Directives

(Council Directives 79/409/EEC and 92/43/EEC respectively). Besides site protection, the state can enter into time-limited agreements with landowners, such as nature conservation agreements.

Protection of natural resources, such as sources of water supply, and no-fishing areas can also be regulated by law: Chapter 7, Section 21 of the Environmental Code for the former and the Fisheries Act (1193:787) for the latter. In addition, several new methods for long-term protection of aquatic environments, in particular, are being developed. Conservation and management plans may be a way of protecting valuable watercourses and marine areas, to supplement statutory protection as a means of preserving large areas.

Valuable landscapes moulded by human habitation can be preserved by means of cultural heritage reserves (Chapter 7, Section 9 of the Environmental Code). These are a relatively new protective instrument that is still being developed. Their purpose is to protect and care for whole areas: their natural and cultural heritage assets, including buildings, remains, land, and also knowledge and traditions.

The Heritage Conservation Act (1988:950) contains basic provisions for protection of key elements of cultural heritage. These include provisions to protect valuable buildings, ancient monuments and remains, ancient finds, ecclesiastical cultural heritage and certain cultural objects. Ancient monuments and remains are generally protected and may not be damaged. A monument or remain includes an 'ancient remains area', i.e. an area on land or the seabed that is required to preserve the feature concerned. A building, environment or installation of particular cultural and historical value may be declared by the county administrative board to be a 'cultural heritage building'. The purpose of such designations is to preserve traces of history that have a major bearing on understanding of our present and future society, and to guarantee people's right to a key component of the cultural heritage.

Protection and conservation in agriculture

In the farm sector, management-related action proposals predominate. These proposals may be found in the background reports on *A Varied Agricultural Landscape* and *A Magnificent Mountain Landscape*.

Land should be managed in such a way that biodiversity and cultural assets are preserved and enhanced. Cultural heritage reserves are to be set up, but other measures affording site protection play a less prominent part than in forest and aquatic environments. Management entails extra work for landowners and farmers, but they receive some degree of compensation through various payment schemes, including those within the framework of the Rural Development Programme (RDP).

To achieve the interim target of 550,000 ha of meadow and pasture land under *A Varied Agricultural Landscape*, and also the target of 30,000 ha of meadows by 2020, management of at least 20,000 ha more meadow land is required. This increase is expected to take place in stages: 10,000 ha more by 2015 and another 10,000 ha by 2020, at an estimated cost of SEK 34.5 million a year. Management of 500,000 ha of meadow and pasture land is expected to cost SEK 780–830 million a year in the form of agri-environmental payments from the RDP.

Agri-environmental payments for conservation of small-scale habitats, cultural traces and built environments are expected to total SEK 280 million a year. In addition, the state will incur costs in providing information and advice. Management measures of this kind are also beneficial in terms of keeping the countryside alive. For example, new functions for older buildings can satisfy local demand for buildings for service, cultural and commercial activities.

Research initiatives are proposed to achieve improved and more efficient management of meadow and pasture land as the structure of the farm sector changes. A study of how redistribution of grazing animals from temporary grass leys to semi-natural pasture land can take place, for example, is proposed.

Cultural heritage reserves are proposed in agricultural, Sami, freshwater and marine environments. The cost up to 2020 of establishing all 74 proposed reserves of this kind is estimated at some SEK 350 million. In addition, there will be operating costs of approximately SEK 285 million, and administration at the county administrative boards costing

Table 6.3.3 Protection and conservation: an overview of key proposed measures and policy instruments.

The table summarizes types of measures and instruments, and identifies implications for various interests. For fuller accounts, see the background reports on individual objectives and sectors. Please note, however, that most of the impact assessments are incomplete.

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Conserve and manage forest land of high conservation value by protecting 450,000 ha and voluntarily conserving 50,000 ha. Safeguard nature in and near urban areas and use recreation-oriented management.	Land purchase, compensation payments, nature conservation agreements; information and advice; increased management grants; and LONA grants for local nature conservation projects.	Increased agency efforts. Lower employment in the forest sector. Costs: SEK 19.3 billion for protection and SEK 750 million for management of formally and voluntarily protected forest. LONA as a permanent measure: SEK 150 million a year.	Landowners' (including state's) production falls by equivalent of SEK 14.5 billion but financial compensation paid. Local and regional development, increased employment for management of sites. Increased access to outdoor activities and recreation.	Forest areas of high conservation value protected in the long term. Reduced risk of damage to land, water, and natural and cultural heritage assets. Benefits in terms of recreational, natural and cultural heritage values.
Protect freshwater sites by means of new and modified nature reserves, habitat protection areas, nature conservation agreements, conservation plans, inventory of natural assets associated with fresh waters etc.	Land purchase, compensation payments, nature conservation agreements; purchase of hydroelectric rights; information and advice; increased resources for county administrative boards; legislative review; planning, development and guidance; inventory.	Ecosystem services generated. Stepped-up agency provision of information and advice, administration, management and inventories. Set-up costs: approx. SEK 100–290 million in 2010–15 plus hydroelectric rights and water rights judgments.	Landowners set aside land, can be restricted in their commercial operations, but get financial compensation. Increased recreation value. Local and regional development due to e.g. tourism; better knowledge of natural assets associated with fresh waters.	Valuable freshwater habitats and species protected in the long term. Reduced risk of adverse impacts on land, water, and natural and cultural heritage assets.
Protect cultural heritage assets by means of cultural heritage reserves, under Planning and Building Act etc. Develop strategy for management of biological cultural heritage. Carry out inventories of cultural heritage values of forests and wetlands.	Compensation payments; information and advice; site protection; supervision; increased resources for county administrative boards; strategy; inventory.	Increased agency efforts. Costs of cultural heritage reserves: approx. SEK 725 million in 2010–20, including management. Inventory costs: SEK 90–100 million up to and including 2015.	Landowners set aside land but get financial compensation. Benefits for outdoor activities and recreation. Better knowledge of cultural heritage assets and ancient monuments and remains. Local and regional development.	Valuable coherent cultural heritage sites become known and get long-term protection. Biodiversity may be fostered by management of cultural heritage reserves.
Establish further marine nature reserves of 750,000 ha and review existing ones. Coordinate a national marine protection network; develop use of marine conservation plans; carry out inventories and develop management plans for Baltic Sea Protected Areas.	Area protection; information and advice; increased resources for county administrative boards; coordination among public agencies.	Increased agency efforts for monitoring and management: SEK 29 million a year. Administration: 2–3 full-time annual equivalents per county plus mapping and inventories costing SEK 110–150 million a year in 2011–15.	Restrictions on commercial operations and activities result in loss of benefits of roughly SEK 40 million a year. Prevention of anchoring, dredging, and building on coastal land. Improved data for protection of marine environments.	Risk of overexploitation of coastal and marine areas decreases, noise is abated and regional development becomes sustainable.

(Continued opposite)

Table 6.3.3 (continued)

Measures	Policy instruments	Impacts *on the state*	*on individuals*	*on the environment*
Implement the revised Mire Protection Plan; provide long-term protection for a further 378,000 ha of mires altogether.	Land purchase, compensation payments and nature conservation agreements; increased resources for county administrative boards.	Costs: SEK 2.5 billion (including SEK 2.3 billion for purchases of or compensation payments for productive forest land), 2007–15.	Restrictions on current land use, especially in forestry, where 85,000 ha of productive forest land needs to be excluded from production. Benefits for outdoor recreation and hunting.	Areas of high conservation value receive long-term protection. Reduced risk of adverse impacts on natural and cultural heritage assets and water conservation in the landscape.
Manage meadow and pasture land, cultural traces, buildings, coherent agrarian environments, small-scale habitats and shielings. Carry out research to identify effective management methods and redistribute grazing livestock from temporary grass leys to semi-natural pasture land.	Information, advice; agri-environmental payments under Rural Development Programme; other financial incentives; research.	Increased costs, e.g. gradually rising costs to SEK 69 million a year up to 2020 for management of another 20,000 ha of meadow land, SEK 280 million a year for management of small-scale habitats etc.; SEK 18 million a year for active use of shielings.	Farmers set aside land, receive compensation, sometimes incur extra work and production losses. Researchers gain access to increased grants.	Management of meadow and pasture land safeguards long-term conservation of natural and cultural assets. Reduced numbers of grazing livestock require research on effective management methods.
Continue to manage mountain environments of high natural, cultural and recreational value.	Increased resources for county administrative boards.	Increased agency efforts; SEK 33 million for review of management plans.	Increased knowledge of natural and cultural heritage assets; local and regional development; benefits for outdoor activities and recreation.	Natural and cultural heritage values, especially Sami, in mountain areas receive protection and undergo development.

roughly SEK 90 million. Cultural heritage reserves are intended to bring about local participation, but they may impede activities that are not conducted with sufficient consideration for natural, cultural and recreational assets, in which case compensation payments will be made. Thanks to these reserves, natural and cultural heritage assets will be preserved and become more accessible to the public. They may also favour biodiversity and help to bring about local and regional development.

Protection and conservation in forestry

Measures in forestry are dominated by formal protection of forest land. The proposed measures are contained in the background reports on the two objectives *Sustainable Forests* and *A Rich Diversity of Plant and Animal Life*.

The proposals under *Sustainable Forests* involve setting aside an additional 350,000 ha of forest land outside, and 100,000 ha of forest land within, the montane forest zone. Protective measures for conservation of forest land are also based on voluntary participation. The proposal is that the forestry sector should voluntarily conserve an additional 50,000 ha outside the montane forest zone (the areas and costs stated being over and above the target for 2010). The policy instruments to be used are land purchase, compensation payments or nature conservation agreements with landowners. The state will largely bear the costs of these measures.

Setting-up of nature reserves and other types of formal protection will result in costs for land purchase, compensation payments and payments under nature conservation agreements. These costs are expected to amount to SEK 19.3 billion, including costs of formal protection, decreases in taxes and charges, and tax revenue for formal protection. The measures will also require official action in the form, for example, of negotiations with landowners and also planning and inventory work. Purchases of productive forest land should not be seen solely as costs: they are also investments, since the land will be an asset both in balance sheets and in the event of any land requirements for the state in the future.

The economic cost of setting aside forest land, by means of both formal protection and voluntary action, is expected to be some SEK 13–16 billion, which basically corresponds to the economic production loss. Income has not been estimated. The forestry sector's voluntary conservation measures will limit the effects on public finances to, principally, a loss of tax revenue owing to a decline in felling. In addition, there will be financial support of SEK 750 million for forest owners, to compensate them for management of both formally protected and voluntarily conserved forest land. This management is to include at least 150,000 ha of forest close to urban areas, and to achieve this special planning, skills development for landowners and information measures are proposed. It is also proposed that, owing to its success, the local nature conservation initiative LONA should continue. The cost of making LONA permanent is estimated at SEK 150 million a year.

These measures will generate job opportunities through an expansion of ecotourism and the hospitality industry and also management of protected forest land, while employment in the forest sector will suffer. Measures aimed at obtaining basic data for protection, such as an inventory of cultural environments on forest land (SEK 50–60 million a year), are needed to improve nature and cultural heritage conservation and enhance their efficiency.

Protection and conservation of aquatic environments and wetlands

For aquatic environments, too, the proposed measures are largely a matter of establishing protected areas, such as nature reserves. The proposals derive from *Thriving Wetlands*, *Flourishing Lakes and Streams* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*.

Reserves and other forms of protection will enable favourable conservation status to be achieved for freshwater and marine environments, and for cultural environments. Local and regional development due to tourism and outdoor recreation may ensue, although in some cases reserve designation may result in restrictions applying to outdoor activities as well. The formation of reserves calls for major contributions by public agencies in the form of, for example, negotiations with owners, inventories, planning and management.

Under *Thriving Wetlands*, it is proposed that the revised Mire Protection Plan should be implemented by 2015, extending long-term protection to mires totalling another 378,000 ha. This, too, involves land purchase, compensation payments and nature conservation agreements. Implementation of the plan will favour biodiversity, outdoor recreation and hunting. There will also be a reduced adverse impact on local climate and improved water conservation in the landscape. The Mire Protection Plan will restrict current land use, thereby resulting in production losses for forestry. The cost to the state of implementing the plan is estimated at SEK 2.5 billion. Inventories of cultural environments are proposed at the 381 sites that have not yet been protected under the revised plan, and the cost of this is estimated at just over SEK 40 million.

For the environmental quality objective *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*, new marine nature reserves totalling 750,000 ha in area are proposed. These would reduce the risk of overexploitation of marine areas. The reserves may also result in restrictions on commercial operations and other activities. Among the data required for the new marine nature reserves are inventories, which are expected to cost SEK 110–150

million. In addition, there will be costs to central government of purchasing land and areas of water, and of compensation payments. One indication of the order of size of these costs is provided by the rough estimate of just over SEK 40 million a year in losses to commercial operations and other activities. Proposals to supplement marine area protection include, for example, development of new approaches to long-term preservation by means of marine conservation plans and the elaboration of management plans.

For *Flourishing Lakes and Streams*, designation of at least 250 nature reserves for freshwater conservation purposes, involving compensation payments and purchase of hydroelectric rights, is proposed. The set-up costs are estimated at SEK 50–210 million for the 150 reserves proposed during the period 2011–15. Purchase of hydroelectric rights and inquiries relating to water rights judgments mean that the costs will vary greatly from one case to another. Care and management are needed on a limited scale to maintain the natural assets of fresh waters, and this cost is therefore assumed to be relatively low. Moreover, at least 200 freshwater habitat protection areas and at least 50 nature conservation agreements, costing SEK 20–50 million and SEK 7–14 million respectively, are proposed. These figures exclude administrative costs to county administrative boards and other public agencies.

Protected freshwater sites retain or generate such ecosystem services as natural variations in water flows, nutrient retention and fish reproduction. To supplement site protection measures, it is proposed that agencies should draw up regional and county conservation plans, revise their management plans for reserves with particularly valuable freshwater environments and carry out inventories of the natural assets of such environments. Another proposal is that the county administrative boards should strengthen their resources for protection of drinking-water sources. The costs of these measures are not always defined exactly, but the total is likely to be at least SEK 150 million.

When it comes to cultural environments associated with fresh and marine waters, the designation of 40 cultural heritage reserves and 20 cultural heritage buildings is proposed, along with protection of 40 new cultural environments under the Planning and Building Act. The cost is estimated at SEK 50 million in 2010–15, excluding the cultural heritage reserves (the costs of which are summarized under the heading 'Protection and conservation in agriculture'). The intention is that cultural heritage reserves should afford protection for areas on the basis of a broad definition of 'the environment'. One of the most important factors is the degree of support among users. Reserves of this kind will contribute to greater knowledge of assets in the natural and cultural environments, and may promote local and regional development.

RESTORATION AND RE-CREATION

Previous activities have sometimes modified the environment and damaged natural functions. Restoration of various habitats and structures is needed for the environmental objectives to be achievable. At present, the main proposed measures (see Table 6.3.4) relate to lakes and watercourses, hay meadows and pasture land, coastal areas, wetlands, and buildings of cultural heritage interest. The purpose of restoration and, in some cases, re-creation is to favour biodiversity and cultural heritage assets and to improve water quality. In the agricultural plains, above all, measures to enhance habitat diversity and landscape variation are needed.

In the longer term, there is a great need for biological restoration of forest environments – the required area assessed in investigations being at least 500,000 ha. However, protection of forest land is currently regarded as the most urgent priority, while restoration of large areas will have to wait until after 2020.

The RDP affords scope to apply for payments for restoration or establishment of wetlands in the farmed landscape, restoration of pasture land and hay meadows, and restoration and maintenance of redundant farm buildings.

Restoration measures in aquatic environments include removal of physical barriers to migration, and re-creation of habitats and spawning grounds for fish and other organisms. Re-establishing natural water levels and floodplains is important, not only

Table 6.3.4 Restoration and re-creation: an overview of key proposed measures and policy instruments.

The table summarizes types of measures and instruments, and identifies implications for various interests. For fuller accounts, see the background reports on individual objectives and sectors. Please note, however, that most of the impact assessments are incomplete.

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Restore lakes and watercourses, and draw up regional plans for their restoration; intensify efforts relating to freshwater sites by e.g. speeding up the rate of review of water operations and improving supervision by county administrative boards; locate incorrectly placed road culverts.	Strategy for restoration of valuable watercourses, supported by economic, legal and administrative policy instruments. Increased resources and skills development.	Costs of restoration: approx. SEK 250–375 million in 2011–15 and approx. SEK 70 million a year in 2011–15 for regional restoration plans. More efficient management of supervision and licensing.	Better conditions for ecotourism, fishing tourism and recreation. Scope for local businesses and a vibrant countryside may increase.	Land, water and biodiversity favoured by correctly performed restoration measures. Improved preconditions for ecosystem services, e.g. natural flow variations and fisheries.
Establish and restore wetlands in the agricultural landscape, using planning data and outreach activities; convert arable land close to lakes to leys for grazing.	Financial compensation; information and advice; increased resources for county administrative boards.	Costs: SEK 150–200 million a year in 2011–15 to establish and restore 5,000 ha of wetlands and SEK 0.55–1.2 million a year for conversion of land near lakes to ley. Costs of planning and outreach activities.	Enhanced recreational assets; positive effects on enterprise and rural development. Wetlands can be used for irrigation. Closer cooperation among landowners is needed.	The right wetlands in the right places. Removal of nitrogen and phosphorus and enhanced biodiversity. Enhanced progress towards several environmental quality objectives, especially those associated with water.
Restore meadow and pasture land, and establish structures in the arable landscape for enhanced biodiversity and cultural environments, e.g. forest edges, no reforestation after final felling, and arable land for conservation of threatened arable weed species. Restore small redundant farm buildings.	Financial compensation; information and advice.	Costs of restoring meadow and pasture land and enhancing biodiversity on arable land: SEK 35–40 million a year, mostly within the Rural Development Programme. Restoration of buildings will involve a total cost to society of SEK 114.4 million.	Enhanced recreational assets; recreated and retained natural and cultural environments. Landowners have more work but receive financial compensation.	Improved conditions for ecosystem services, e.g. more pollinators. Better conditions for enhanced biodiversity and management of cultural heritage assets. Increase in number of small-scale habitats in farmed landscape and safeguarding of dispersal routes. Restored buildings make the whole landscape more attractive.
Restore and establish structures on forest land for enhanced biodiversity and cultural heritage assets.	Financial compensation; information and advice.	Extended agency efforts; compensation for farmers. Rise of approx. SEK 15 million a year in costs.	Enhanced recreational assets. Landowners have more work but receive financial compensation.	Recreated and retained natural and cultural environments.

(Continued opposite)

Table 6.3.4 (continued)

Measures	Policy instruments	Impacts		
		on the state	*on individuals*	*on the environment*
Restore cultural heritage assets in mountain areas.	Financial compensation; information and advice.	Costs of restoration measures.	Increased knowledge of natural and cultural heritage assets; popular education and recreation; local and regional development; increased employment; enhanced accessibility of outdoor activities and recreation.	Preservation of natural and social assets, and cultural heritage assets – especially Sami ones – in mountain areas.
Restore coastal areas and draw up overall regional action programmes for disturbed marine habitats.	Interregional action programmes for disturbed habitats.	Costs to state of restoration in coastal areas from Skåne to Norrbotten: SEK 800 million. Interregional action programmes: SEK 28 million for the 13 coastal counties.	Improved recreational amenities.	Biodiversity as a whole is favoured and the areas become less sensitive to disturbance. Better water quality in coastal areas.

for plants and animals but also to counteract effects of climate change, such as further eutrophication and extreme flows.

Restoration in the agricultural landscape

For agriculture, three types of restoration-oriented measures are proposed, aimed at reducing eutrophication, increasing biodiversity or preserving natural and cultural environments. The proposed measures are contained in the background reports on *A Varied Agricultural Landscape*, *Thriving Wetlands*, *A Magnificent Mountain Landscape* and *Zero Eutrophication*.

In general, it is the state that will bear the costs, while landowners will receive financial compensation for the requisite modifications. These modifications may entail extra costs to farmers in the form of additional work and the opportunity cost of arable land when it is used for purposes other than those for which the farmer would primarily have chosen to use it.

Measures to reduce leaching of nutrients or improve conditions for biodiversity consist of establishing and restoring wetlands in the farmed landscape, converting arable land near lakes to leys for grazing, and restoring lakes and watercourses. In some cases, collecting planning data, drawing up regional plans for restoration and engaging in outreach activities will reinforce restoration efforts.

The cost to the state of restoring wetlands in the agricultural landscape amounts to at least SEK 150–200 million a year for the establishment and restoration of a total of 5,000 ha during the period 2011–15. Financial compensation to farmers and/or landowners under the RDP makes up most of this cost.

In addition, there are costs of planning data and outreach activities prior to wetland measures. Conversion of arable land near lakes to leys for grazing is expected to cost between SEK 550,000 and SEK 1.2 million a year. Administrative costs to county administrative boards and other public agencies are not included.

Establishing and restoring wetlands and converting arable land near lakes into leys are measures that boost the number of small-scale habitats in the farmed landscape, thereby favouring biodiversity. Other measures aimed at enhancing biodiversity or preserving natural or cultural environments are restoration of meadow

and pasture land, and of arable land for conservation of threatened arable weeds; creation of forest edges; no active reforestation after final felling; restoration of small redundant buildings in the agricultural landscape; and restoration of cultural heritage assets in mountain areas. The various restoration measures mentioned will affect at least 23,500 ha. The cost to central government of these measures in agriculture is roughly estimated at SEK 35–40 million a year, most of which will be funded through the RDP. In addition, there will be a cost of more than SEK 114 million for restoration of redundant farm buildings. Administrative costs incurred by county administrative boards and other public agencies are not included.

Restoration in forest areas

In the forestry sector, restoration measures have three purposes: enhancing biodiversity; exposing cultural environments to view; and developing the social values of forest land. Measures intended to enhance biodiversity include, for example, restoration of forest wetlands, controlled burning, and release cutting to favour large trees. Measures to preserve cultural environments may consist of restoration of shielings and hollow ways, and management that favours the biological cultural heritage. Measures to develop the social values of forest land may be called for in forests near urban areas, and along hiking trails.

In the long term, there is a large-scale need for restoration of forest environments that are mainly intended to be remedied after 2020. Until then, there is a need for small-scale restoration measures aimed at improving environments, and as preparation and knowledge building before the large-scale initiative begins. These efforts are expected to entail increased costs to the state of around SEK 15 million a year, over and above the payments for nature and heritage conservation measures (NOKÅS), which are currently available in a similar amount.

Restoration of aquatic environments

The reports on the environmental quality objectives *Flourishing Lakes and Streams* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos* contain a number of proposals for measures relating to restoration. Their main purposes are to enhance biodiversity, improve conditions for fish stocks and reduce eutrophication. Other positive effects of restoration measures are improved prospects for local businesses and a vibrant countryside; new job opportunities, created by the measures as such; and enhanced values in terms of fishing, recreation and tourism.

Policy instruments for the proposed measures are mainly of three types: guidance, information and legislative amendments. The measures put forward usually mean that the operator pays, sometimes according to the 'polluter pays' principle. The total cost to the state of attaining the interim target for restoration under *Flourishing Lakes and Streams* will be SEK 250–375 million during 2011–15. In addition, there will be an annual cost, estimated at SEK 400,000, of evaluating the impact of measures on cultural heritage assets; and the cost of drawing up regional plans for restoration, amounting to SEK 70 million a year, as a resource increment for the county administrative boards.

The cost to central government of developing interregional action programmes for disturbed marine habitats amounts to a total of SEK 28 million a year for 13 coastal counties. Altogether, the economic cost of implementing these action programmes totals SEK 800 million for the coastal areas between Skåne and Norrbotten. The economic benefit of improved water quality and reduced eutrophication has previously been estimated for the Stockholm and Roslagen archipelagos at some SEK 500 million. If this benefit is representative of other parts of Sweden's east coast as well, total benefit is likely to exceed total cost. With respect to interregional action programmes for disturbed marine habitats, the public may be seen as among those who stand to gain, while owners of land and water areas, boat owners and fishermen will be the ones who pay.

COSTS AND BENEFITS OF ACTION PACKAGES

Administrative costs incurred by county administrative boards and other public agencies are, in exceptional cases, specified and included in the stated costs of

the measures. Estimating the environmental benefits of the proposed measures in monetary terms has not been possible. It is very difficult to reply to the question of how costs to the state correspond to the advantages of the environmental improvements that are sought. However, the economic gains from better water quality and reduced eutrophication, enhanced biodiversity and cultural heritage assets, and improved prospects for human well-being and health should be seen as substantial. In-depth impact assessments that can put a monetary value on these environmental and health gains to society as a whole are needed.

Within the stewardship package, measures and management inputs costing a total of SEK 200–800 million a year are proposed. These are largely included in the Rural Development Programme that has already been adopted. Increased stewardship in forestry is expected to result in a production loss of some SEK 300 million a year.

In monetary terms, the largest package is the one composed of protection measures. These entail costs to the state totalling around SEK 22 billion, of which by far the largest item is the purchase of, and compensation payments for, productive forest land. In addition, forestry will be affected by production losses of SEK 13–16 billion.

Costs of specified restoration measures, if they are fully implemented, total more than SEK 2 billion. Of this sum, annual costs make up SEK 200–300 million and non-recurring costs some SEK 1 billion.

In the planning package, the biggest cost to central government arises from the proposal for a knowledge development programme to promote environmental stewardship in planning. The estimated drain on state finances is SEK 200 million a year over four years. Increased resources for county administrative boards are estimated at SEK 43–55 million a year and the cost of regional knowledge bases at some SEK 10.5 million. In addition, there will be the costs of the agencies' work on, for example, guidelines and instructions. Overall costs to the economy are hard to estimate.

6.3.4 Strategic considerations

Work within the HUM Strategy has focused on the measures proposed in background reports on environmental quality objectives and sectors. Analyses of the action packages in the areas of stewardship, protection, and land use planning and urban development show that the environmental objectives alone will not collectively ensure good management of natural resources, land, water and the built environment. In addition, there is a large 'implementation deficit', in the sense that limited resources – and politically weak decisions in the case of the EU's Common Fisheries Policy – mean that the objectives adopted are not being achieved, even though many of the requisite measures have begun to be applied. It is therefore worth emphasizing that current measures should continue and be supplemented by the measures now proposed. The present document should be seen as the first stage in an ongoing strategic effort aimed at creating coherence and assigning priorities.

The challenge is to control use, production and consumption by means of methods that can gain broad acceptance. An approach is needed that combines intensified environmental stewardship in all activities; more restrained and efficient use of resources; and substitution of renewable raw materials for finite resources. For this purpose, it is necessary to raise our sights and address the issues from an angle that is relevant to all the environmental objectives, such as that of production and consumption patterns.

In developing the HUM Strategy, some gaps in the action packages have been identified. Here, further measures are deemed necessary to achieve good management of natural resources, land, water and the built environment. Moreover, a number of general issues need to be developed to make progress in pursuit of the HUM Strategy and the environmental quality objectives.

OVERALL PERSPECTIVE ON SUSTAINABLE MANAGEMENT

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL CONSIDERS** that regional planning must be strengthened and developed so that the sustainable management perspective more distinctly permeates the development of our society. Better interplay between land use planning and other processes is needed.

For better or worse, the individual environmental quality objectives focus on habitat types or problem areas. So they cannot fully tackle the broader issue of sustainable management of natural resources, land and water. Different habitat types, with their resources and values, cannot be seen as isolated phenomena: rather, they are part of the mosaic that is the landscape, including the built environment. Processes that affect a specific part of the landscape often have effects elsewhere as well.

To bring about genuinely sustainable use of land, water and the built environment, there must be a comprehensive view of the landscape. Planning, use and conservation must be based on all the assets and resources of the landscape. One precondition for this is intersectoral ways of working and solutions. Long-term, all-round planning of land and resource use is one of the main tools, but there is still little concrete experience of how planning and other policy instruments can interact in a coherent manner.

Few proposals relate to climate change and planning for its consequences. The Swedish Commission on Climate and Vulnerability (SOU 2007:60) has, however, worked concurrently with the in-depth evaluation. Climate change may increase the need for planning to cover entire catchment areas, in order to conserve water in the event of drought and water scarcity, control measures to avoid flooding, or deal with wastewater problems and landslide risk. A changed climate also means that planning for a greater spreading of risks is needed in agriculture, fishing and forestry. There have been a few proposals for sustainable management and planning of water resources in preparation for climate change, but corresponding proposals for land are lacking.

The measures included in the HUM Strategy are highly relevant to health issues. Our ways of using land and water, and shaping the built environment, have a major bearing on how people perceive and can make use of their surroundings. Accordingly, these uses are a crucial factor in our well-being. At the planning stage, there is scope for working in the long term and preventing adverse environmental effects and detriment to human health. Health issues must be a key part of overall planning work. Examples of important health aspects associated with land use are noise, drinking-water issues and our local environment. The form taken by our outdoor environment is a fundamental component of the experience values we need for recreation and relaxation.

Present-day policy instruments and forms of planning do not entirely meet the requirements of an all-round, landscape-based approach. True, the local authorities' comprehensive plans under the Planning and Building Act afford ways to manage land and water use, but they often lack a resource management perspective when it comes to use of the landscape. More forums, based on a clear, overall (municipal, regional or national) planning perspective, are needed to discuss such major issues as climate change, urban sprawl, regional enlargement, infrastructure and food and energy supply.

Consumption of housing and transport services – the nature of demand, the location of new homes and infrastructure, and the design and interaction of buildings and infrastructure – is, in part, what determines how sustainably our society develops. Today, this development is increasingly affected by consumer preferences and market range. Intersectoral land use and spatial planning, at various levels, is important for developing a sustainable built environment and infrastructure, and for the ways in which urban areas and infrastructure are distributed. Coordinated planning of settlements and communications can reduce the amount of land used and distances between different community functions, and may thereby affect people's housing and travel patterns.

Strategic and intersectoral planning, mainly at regional level, is needed to coordinate and resolve

structural issues optimally with respect to the environment, health and resources. Further analysis is needed of the form this kind of general planning can take as a basis for sustainable use. The purpose should be to elucidate synergic effects and goal conflicts in key areas. Examples of such areas are the implications of regional enlargement in terms of transport needs and infrastructure extension; the ongoing dispersal of urban development in relation to the wish for denser development; the desire for rural development that takes place with consideration for landscape values and resources; and the need to adapt urban and infrastructure development to climate change. Analyses should comprise both methodological development on the one hand and review and coordination of the legislation involved on the other.

ECONOMY AND ENVIRONMENT

▶ **THE COUNCIL CONSIDERS** that methods of valuing ecosystem services, biodiversity and the cultural heritage need to be developed, to permit economic analyses and allow the cost of measures in pursuit of the environmental objectives to be compared with their benefits to the environment and human health.

Motives for acting to improve the environment are ecological, ethical, aesthetic, cultural and economic. Despite the difficulty of valuing biodiversity, cultural heritage and good quality of life, for example, in monetary terms, valuations are nonetheless carried out by means of certification systems and official decisions, and in political processes. The global value of ecosystem services has been estimated at close to twice global GNP (Costanza et al., 1997). In adopting the environmental quality objectives, Swedish politicians have also indirectly judged that the benefits of achieving them exceed the cost of doing so.

Resources are overused partly because the costs of environmental impacts are insufficiently known. Adverse effects on biodiversity and ecosystems can often cost society more than the short-term benefit, if any, to individuals (Millennium Ecosystem Assessment, 2005b). The higher the cost and the risk to human health, or of irreversible changes associated with impact on ecosystems, the more caution should be exercised.

Impact assessments for the in-depth evaluation of progress towards the environmental quality objectives are, in many cases, restricted to the costs to the state and society. For a better appraisal of how suitable and cost-effective proposed measures are, however, it must be possible to quantify both costs and revenues. In an economic perspective, a given measure should afford gains, and for this to be assessed it must, above all, be possible to calculate the resulting benefits in monetary terms. These benefits include enhanced biodiversity, preserved cultural heritage assets, improved health and social assets, and putting a price on them is in most cases very difficult. In the impact assessments they are, broadly, described in qualitative terms.

Consequently, judging whether the measures are, overall, economically worthwhile is no simple or straightforward matter. There is a danger in the fact that health and environmental benefits, in descriptive terms, are usually compared with actual monetary costs. For the pursuit of the environmental objectives to gain broader understanding and long-term support, the costs to society arising from environmental degradation – and the gains from improvements – need to be more clearly comparable to the costs of measures. This would, for example, be relevant in justifying the payments to farmers for environmental services under the RDP, especially since such payments may be an option to develop further in other sectors as well.

Valuation studies of environmental factors do exist (see, for example, the list in the Nordic Environmental Valuation Database at www.norden.org), but this kind of valuation cannot yet be readily generalized since the calculations depend heavily on conditions in the particular studies concerned (Söderqvist, 2005). The Swedish National Institute of Economic Research finds that there are methods of valuing individual species, but that methods of valuing the productivity, stability and resilience of ecosystems still need to be developed (National Institute of Eco-

nomic Research, 2007). This also applies to the way changes in human amenity values and well-being affect production and economic factors.

The fact that non-monetary gains must nonetheless be deemed substantial emerges clearly from the certification commitments of the forest industry – commitments that are often costly. Certification costs may be seen as a valuation of the environment and social values, driven by market requirements regarding stewardship in resource use. Voluntary conservation measures alone in forestry mean that the sector refrains from using resources to an economic value in the order of SEK 20–30 billion. These commitments must be seen as profitable, in terms of business economics, to forestry.

DIFFERING CONTROL MECHANISMS OF VARIOUS INSTRUMENTS

▶ **THE COUNCIL CONSIDERS** that the use of policy instruments needs to be analysed, to identify the most environmentally efficient and cost-effective instruments and their interaction. Instruments that prevent environmental problems by involving operators and consumers need to be used on a larger scale.

Measures are what must be done to attain an objective, while policy instruments are society's tools to bring about the necessary action. The usual distinctions drawn are between administrative, economic and information instruments. Administrative instruments comprise legal and political tools, such as the drafting and application of legislation and regulations of various kinds. Economic instruments are taxes, charges, investments, grants or agri-environmental payments. Information instruments include environmental labelling, certification and environmental management systems, and initiatives involving provision of advice and information.

One fundamental question when the action packages are devised is what instruments, singly or in combination, will best achieve the environmental quality objectives. Only a minority of the objectives are actually covered by formally binding regulations. Various stakeholders in society are assumed to make large-scale voluntary contributions. A study of how various measures and types of instrument function in varying trend scenarios has been carried out as part of developing the action strategies (Svenfelt et al., 2007). In brief, the conclusion is that varying the use of different instruments is needed if measures are to be practicable regardless of whether it is mainly market forces or the state that governs social development. In a market-governed world, acceptance of more regulations, and increased supervision and control, is low. Information and advice, and also support for research, technological development and procurement procedures, for example, are more workable. If the trend is towards a more regulated market, interest in voluntary contributions and information instruments may decrease, since stakeholders consider that responsibility then lies mainly with the state and not themselves. Administrative and economic instruments, however, have a good potential.

Many of the tools traditionally used by central government agencies, such as advice and financial compensation, are also called for by local authorities, interest organizations and the business sector. The proposals in the action packages focus on administrative instruments, and the agencies responsible have only on a very small scale attempted to foster instruments outside their own remits.

But more policy instruments that encourage voluntary solutions and affect companies' and consumers' behaviour through market price, and other instruments conforming to the market, may be needed. There is probably greater acceptance of control in matters where risk awareness already exists in society, for example regarding risks associated with climate change. On the other hand, voluntary measures may be less effective if risk awareness is low.

Measures that have been traditionally used are often of the 'counteraction' type – reactive remedies to prevent or reduce adverse environmental effects. The instruments are usually administrative or economic and often address various operators as more or less passive recipients. Measures of the 'prevention' type are proactive and aimed at reducing

environmental pressures or enhancing environmental benefits by affecting processes earlier in the chain. This calls for instruments that involve operators and consumers to a larger extent. The agencies' provision of knowledge through advice and information may be an instrument of this kind.

Stewardship is a preventive measure. However, only a few proposed measures deal with certification systems or the like, or instruments focusing on the market and consumers. Similarly, only a small number of proposals make use of penalty charges as an instrument. This may be compared with the emphasis on taxes and charges in the action proposals relating to energy and transport (see the Strategy for More Efficient Energy Use and Transport).

The package of measures relating to stewardship contains proposals for administrative, economic and information instruments. The purpose of these instruments is both to bring about consideration for the environment by regulatory means and to encourage operators, voluntarily or on a paid basis, to enhance their stewardship. Relatively few proposals concern changes in legal policy instruments or statutory application. Landowners and users sometimes maintain that legislation differs from one type of land to another, impeding a comprehensive view of landscape assets. There are also differences in the state's ways of implementing stewardship in, for example, agriculture and forestry. The new RDP has, however, made agri-environmental payments available as a method of increasing stewardship of collective assets in forestry as well. As a whole, the stewardship package is thought to be relatively robust. Moreover, the need for regulatory policy instruments may decrease if good environmental stewardship can be attained by voluntary means, in accordance with the 'sustainability triangle'.

Different environmental problems will continue to require different, adapted measures. The mix of administrative, economic and information instruments should be determined by their cost-effectiveness, which in turn is based on their actual environmental effects. The picture of how policy instruments affect one another needs to be clarified to improve the development and use of measures to achieve the environmental quality objectives.

CONSUMPTION AND ATTITUDES

▶ **THE COUNCIL CONSIDERS** that the environmental quality objectives and good management of resources in Sweden and other countries must exert a greater influence on consumption and consumers. Targeted instruments are needed to improve environmental stewardship in private and public stakeholders' consumption.

Today, consumption of goods and services is the foremost driver of our use of ecosystem services. The environmental impact of consumption – private and public alike – is a fundamental problem for sustainable management of natural resources, land, water and the built environment. Prevailing production and extraction methods and the scale of consumption are jeopardizing development that is sustainable in the long term, in Sweden and globally. Policy instruments that take note of household and business consumption alike need to be strengthened. The state must take a more distinct lead in bringing about responsible consumption by means, for example, of environmental certification and green public procurement.

Most of the proposed measures contained in the background reports on the environmental objectives focus on how production takes place and stewardship in the use of resources should be practised. Few measures are aimed at changing consumption and attitudes to reduce pressure on resources. A change at consumption level, through food and product choices, could exert a favourable effect on fulfilment of several environmental quality objectives. On the other hand, the effect of measures that nip problems in the bud can often exceed indirect influence on the consumer. For this reason, it is important to select measures that have substantial, and not merely symbolic, effects.

The reason why consumer-oriented measures are lacking is probably that the public agencies

concerned regard consumption and lifestyle issues as lying outside their sphere of responsibility. Consumption issues are hard for individual agencies to tackle and are extremely seldom bound up with single environmental quality objectives. Agencies focusing on consumption have not been involved in the HUM Strategy.

Ways of improving land and water management through modified consumption patterns and substitution need to be devised. Strategic analyses of every aspect of consumption – resource extraction, energy use, emissions and waste generation – need to be carried out, for example through life-cycle assessment. The purpose should be to identify activities or production stages in which less resource-consuming alternative means of meeting demand must be developed. Lifestyle issues are vital in this context, and consumer attitudes can be influenced.

Sweden's 'export' of environmental problems, for example the use of ecosystem services in other countries for food and energy production, deserves greater attention. It is paramount to monitor the implications of our consumption, or of measures to attain the environmental quality objectives, in the form of effects on land, water and the built environment in other countries. This is something the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles addresses as one of its major concerns, along with changed production and consumption patterns. The issue needs to be dealt with jointly within the three strategies.

INCREASED SECTORAL INTEGRATION

▶ **THE COUNCIL CONSIDERS** that the state-owned enterprises' directives should specify responsibility for the environmental quality objectives. Public agencies' appropriation directions should contain requirements to report on how their activities affect progress towards the objectives. Efforts to fulfil the objectives need to permeate society better, through increased sectoral integration and local participation.

It is important for there to be long-term efforts to bring about a sustainable society, on a politically solid foundation and based on the best knowledge available. The system of environmental objectives is central to these efforts, but the principles concerning the relative priority of the environment, the economy and social values need to be clarified.

The state bears a heavy responsibility for setting a good example and making its own activities eco-friendly. This can be done through environmental requirements in the agencies' appropriation directions, directives for state-owned enterprises and procurements, and thorough environmental assessments of decisions, plans and programmes. The state is also responsible, through the agencies, for working to achieve progress in various sectors of society.

In preparation for the in-depth evaluation, a few proposals for measures of a more general nature, relating to all the environmental quality objectives, were put forward. One is that the government should clarify responsibility for the environmental objectives in the state-owned enterprises' directives. Similarly, the appropriation directions of the agencies concerned should require them to report on how their activities affect the environmental quality objectives, and on their contributions to the pursuit of these objectives. Another proposal that has been discussed, but which calls for more work, is for all new state policy instruments to be subject to clear rules and undergo impact assessments in terms of the environmental quality objectives.

The absolute majority of policy instruments now proposed are agency tools, such as grants, advisory services and supervision. This involves increased work for the agencies. But government agencies are not alone in bearing responsibility: private, non-profit and other public stakeholders should be given more encouragement to play an active part in pursuit of the environmental objectives. Instruments that boost incentives for businesses, local authorities and individuals are needed.

The four action packages for planning, stewardship, protection and restoration are deemed to provide a sound basis for cooperation among various stakeholders. The municipalities are the key agents

of land use planning. The business-led sectors have a marked responsibility for environmental stewardship. The state, in the main, is responsible for protection of natural and cultural environments. Restoration work is often initiated by local or central government, but non-profit associations, too, make significant contributions.

Increased participation in local and regional efforts to develop and manage natural resources, and natural and cultural assets, is essential. Well-planned application of the subsidiarity principle (i.e. that decisions should be taken at the lowest efficient level, whether national, regional or local) may possibly make environmental efforts more effective and enhance target fulfilment. Decision-making at the 'right' level, based on local knowledge where applicable, should make policy instruments more efficacious owing to increased understanding and compliance. Arrangements for dialogue and cooperation among central and local government, interest organizations, businesses and, for example, landowners therefore need to be developed.

FURTHER WORK ON THE HUM STRATEGY

In the agencies' work on the Strategy for the Management of Land, Water and the Built Environment, conceiving a common image of what the strategy involves and how to develop a comprehensive approach has been problematical. To bolster efforts to bring about a sustainable society, the agencies responsible for the strategy intend to jointly specify how the overall management perspective should permeate public policy instruments and be dealt with in the environmental objectives system. Developing national guidelines for dealing with management issues in a landscape perspective may be advisable. This can best take place in a dialogue with various sectors on how, in their activities, they can help to enhance stewardship and prudent management of existing resources. The HUM Strategy should primarily comprise the environmental dimension of sustainable development, but also address its relationship with the economic and social dimensions.

Several of the agencies responsible for the strategies are currently engaged in tasks with a bearing on the HUM Strategy. The Swedish Forest Agency, the Swedish Board of Agriculture and the Swedish Board of Fisheries are, pursuant to their appropriation directions for 2006, to develop and specify the implications of 'sustainable use' for their respective sectors. The Environmental Protection Agency is developing guidance on how to apply the ecosystem approach in various sectors. The Swedish Energy Agency and the National Board of Housing, Building and Planning, jointly and severally, have a remit to promote the expansion of renewable energy, especially wind power, and to pinpoint ways of adapting urban development to climate change. The National Heritage Board has the task of proposing how to implement the European Landscape Convention in Sweden.

Implementation of the HUM Strategy now needs to reach beyond the sphere of the central government agencies. A forum for discussing environmental aspects of resource management with local authorities, businesses and interest organizations should be initiated. Cooperation among agencies and with other stakeholders improves the prospects of dealing with conflicts among environmental objectives and in relation to other goals of society. Objective, transparent and simultaneously flexible methods are needed to enable society to balance various environmental and other policy objectives that are affected by one and the same activity. And it is important for those who are primarily affected by a decision to have the opportunity of taking part in open discussions on how different interests, and various environmental and other policy objectives, should be balanced against one another. In this context, comprehensive land use planning under the Planning and Building Act has an obvious potential owing to the regulated, open planning process and requirements to balance various public interests. These can then be dealt with in the framework of a comprehensive approach to the future development of local communities.

Reducing the greenhouse effect and attaining the environmental quality objective *Reduced Climate Impact* are critical for present and future generations. This environmental quality objective is bound up with the pursuit of other policy goals, especially in the energy and transport sectors. Fulfilling the objec-

tive of reducing society's impact on the climate also paves the way for attaining several other environmental quality objectives. Many small but purposeful and coordinated steps to reduce greenhouse gas emissions will be needed. Replacing fossil fuels with bioenergy is one stage in this process.

Cultivation of bioenergy crops, however, lays claim to natural resources and areas. Use of non-depleting forms of energy such as wind and solar power affects the visual appearance of the landscape, in particular. This entails a risk of conflicts between the climate objective and other environmental quality objectives. Natural and cultural environments and the long-term productive capacity of ecosystems must not be depleted by excessively hard use, be it for bioenergy or other production.

A changed climate has implications for water supply, ecosystems and production in agriculture, forestry and fishing. Forest growth and harvests may come to increase in Sweden, as may the risk of extreme weather events with high water flows as a result. The risk of floods may increase pressure to construct banks along, and regulate, watercourses or to increase land drainage. Moreover, human use of land and water has a bearing on the effects of climate change. Land use may also, as such, affect the climate; deforestation, for example, reduces natural absorption of carbon dioxide.

Issues that the HUM strategy should deal with henceforward include adaptation to climate change and restructuring of the energy system; the importance of consumption for sustainable resource use, and measures for attaining sustainable consumption patterns; methods of valuing ecosystem services, biodiversity and the cultural heritage; and tools and methods to make strategic priority choices on varying scales in the landscape, including overall planning at regional level.

6.4 Overall objective and strategy issues

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL NOTES** that to bring about sustainable development of infrastructure, production and consumption, there needs to be a major reorientation of society, across a wide spectrum of policy areas. The decisions needed to make that happen will require firm resolve at all political levels. Conflicts of interest will have to be addressed, to enable the objectives set by politicians, and ultimately by citizens, to be achieved. It may need to be made clear whether certain objectives, such as those relating to the environment, take precedence over others. Otherwise, resolving the conflicts that arise could prove difficult.

In the background documents for the Council's report, several gaps in current knowledge have been identified. In areas where knowledge exists, it also needs to be put to work and result in effective environmental policy measures. With strategic research initiatives, scope for achieving the environmental objectives more quickly increases. The Council also considers that Sweden should, to a greater extent, learn from other countries' experience of translating research findings into action.

Since a comprehensive, in-depth evaluation of progress towards the environmental objectives concerns many sectors of society and policy areas, the Council's assessment is that methods etc. need to be improved:

- The in-depth evaluation needs to evolve to reflect better what is being done throughout society to achieve the environmental objectives. One need is to identify more effectively potential synergies with other social processes, and to identify conflicts with other interests in society.
- For the next in-depth evaluation, it is important to look beyond 2020, since the current assessment is that a large number of environmental quality objectives will not be achieved in the time laid down. The Council sees a pressing need to develop the public sector's monitoring of societal and global developments and use of futures studies.
- The Council expects climate change to affect virtually all the environmental quality objectives in ways that are hard to ascertain. Thus, it is particularly urgent to shed light on how a changed climate will affect prospects of achieving the environmental objectives.
- Methods of estimating costs and benefits, and making economic assessments, need to be developed. This applies above all to ways of valuing the benefits of attaining the environmental objectives, so that they can be compared more clearly with the costs.

▶ **THE COUNCIL FINDS** that the process of reviewing and analysing measures and policy instruments in the framework of the three action strategies affords good scope for assigning priorities, obtaining an overview and also seeing potential synergies and conflicts with other interests in society. The Council therefore considers that efforts to develop these strategies must continue.

Within the three action strategies, the Council puts forward a range of proposals for measures and instruments that it considers effective means of achieving the objectives. Several of the initiatives needed for the objectives to be attained exert effects on the entire structure of society and have been difficult to cover comprehensively and in general terms in an in-depth evaluation of the individual environmental quality objectives. One requirement is to identify opportunities and obstacles, synergies and conflicts. The Council's assessment is that the most important conflicts regarding the environmental objectives are not among the objectives themselves but, rather, arise when the environmental objectives are juxtaposed with other objectives our society adopts. On the other hand, in some cases measures to achieve different environmental objectives may conflict with one another.

This section covers certain general issues cutting across the individual objectives and strategies, and also issues that warrant more attention in subsequent attempts to evaluate Sweden's pursuit of its environmental objectives.

6.4.1 Synergies and conflicts, opportunities and obstacles

In the pursuit of the environmental objectives, problems and difficulties are often emphasized and discussed in detail while opportunities and positive synergic effects are less often given prominence. In the background reports for this in-depth evaluation, discussion of problems and conflicts in furthering the environmental quality objectives still predominates. On the other hand, there are favourable trends and examples of objectives and measures that have had, or may have, highly positive effects on areas other than those primarily targeted. Synergies of this kind need to be pinpointed.

SYNERGIES AND CONFLICTS

Goal conflicts may arise for various reasons. The different types of such conflicts that may conceivably occur are described theoretically in reports including *Society, Systems and Environmental Objectives* and 'Environmental objectives and other wishes' (Swedish Environmental Protection Agency Report 5272, 2003, and Report 5747, 2007 (in Swedish), respectively).

Goal conflicts may be internal, i.e. arise between objectives in the same policy area or sector of society, or they may be external, i.e. arise between objectives in different policy areas or sectors of society.

Goal conflicts may also be 'false' or 'genuine'. 'False conflicts' are not real conflicts; instead, they are due to poorly designed policy instruments or carelessly worded objectives, or may be technically possible to resolve, through better application of improved or more efficient technology. A 'genuine goal conflict' is one that cannot be solved within a reasonable period with new technology or improved efficiency. Finally, there are also 'dilemmas', which are particular problems manifested in 'either–or situations', where choices must be made. Dilemmas cannot be solved with compromises, which is usually possible in other conflict situations.

Goal conflicts may also be divided into potential and actual conflicts. In the former, a resource can be used for more than one purpose. In an actual conflict, the environment is threatened by the use of the resource.

The time aspect is a key determinant of the seriousness of a goal conflict. If the time perspective is short, the conflict may be a genuine one. But over a longer period the same problem may be a conflict that can be technically resolved.

There is synergy between two measures or policy instruments when they both help to achieve the same objective and their aggregate impact exceeds the sum of their two separate impacts. Synergic effects are also obtained when a measure or instrument promotes attainment of two or more objectives. A relevant term is then 'coordination gain', which arises when a measure helps to fulfil more than one objective adopted by society.

CAUSES OF CONFLICTS AND SYNERGIES

Conflicts between the environmental quality objectives and society's other objectives are caused mainly by increases in the scale of various activities. There

may be opposing interests between exploiting or using land, water and natural resources for economic purposes, on the one hand, and restricting or adapting their use. To a varying extent this applies, for example, to the energy and infrastructure sectors, urban development and agriculture, forestry and fishing.

On the other hand, synergies often arise because the conduct of activities becomes more efficient and resource-saving. Resource management may entail economic rationalization or gain but be environment-friendly at the same time. When people use resources in ways that are sustainable in the long term, there are also many interactive effects between the environmental objectives and other policy areas. 'Experience' industries, technological development in forestry, organic food production, eco-friendly construction and improved public transport are examples of areas where synergies exist. But there is still ample scope for better linking of measures and policy instruments in distinct sectors of society.

The issue of conflicts and synergies between the environmental quality objectives and other driving forces in society is highly complex. Human resource use is, for example, often a precondition for maintaining landscape assets, but imprudent use can damage cultural traces, archaeological remains and biodiversity. The Environmental Objectives Council asked central government agencies and county administrative boards to list, in their background submissions for this report, the policy areas other than environmental policy in which they consider it important to implement changes for the environmental objectives to be attained. Activities in virtually all policy areas have been identified, and need to be analysed in terms of synergies and conflicts with measures and instruments for achieving the environmental objectives. However, it is consistently the case that the largest obstacles, but also in various respects the greatest opportunities, may be found in economic trends.

INSTITUTIONAL BARRIERS

The in-depth evaluation proposes measures for attaining the objectives and interim targets. However, the Council finds that many measures have been proposed before but, in numerous cases, have not been adopted and implemented despite the existence of the proposals.

There are many aspects of institutional barriers of this kind, which are sometimes termed 'implementation deficits'. *Clean Air* is a clear example of an environmental quality objective for which proposals for measures and instruments have been put forward earlier but not implemented. This is one of the primary reasons why this objective is judged very difficult to achieve. The measures that have not been adopted or implemented are mainly those proposed within the framework of action programmes to meet environmental quality standards for air.

There are several reasons why measures are not implemented. The foremost, in all probability, is some form of conflict, i.e. that the measure conflicts with other interests, often economic. It may also be because proposals have not undergone adequate impact assessment, or because of their design. Prevailing political views are, of course, what govern priorities in these situations. Another aspect is judicial application. In section 4.5, the Council refers to a study of the extent to which the environmental quality objectives are taken into account in the courts' application of the Environmental Code. There, the Council states that it should be possible for the environmental quality objectives to serve to a greater extent as guidance for application of the Code.

Changes in institutional and political systems greatly affect the prospects of achieving the environmental quality objectives. The changes in decision-making structures and responsibilities at regional level proposed by the Committee on Public Sector Responsibilities may come to influence the work of the county administrative boards in pursuit of the environmental objectives. The Council finds that county administrative boards and local authorities are key players in the attainment of these objectives. Their interactions with businesses and citizens, and also their functions in terms of spatial planning, schools etc., are crucial. One conclusion is that public

agencies and other stakeholders need to collaborate better and, for a start, agree on common aims, i.e. in this case the environmental quality objectives. One problem that needs to be tackled is that the efforts of county administrative boards and local authorities alike with regard to environmental issues of various kinds, and their scope for using the environmental objectives as active tools, are hampered by inadequate resources.

EXAMPLES OF SYNERGIES

There are several examples of measures that have proved to exert synergic effects, i.e. favourable effects on more than one objective. Synergies between environmental policy and public health policy are particularly large. One example is the zero vision for road accidents: lower speed limits should reduce the number of accidents and deaths on the road, but they also exert favourable effects in terms of several environmental quality objectives, since greenhouse gases and traffic noise decrease. Measures implemented under the Montreal Protocol to reduce the use of ozone-depleting substances and stop the thinning of the ozone layer are another clear example of synergy. Thanks to these measures, the primary aim looks achievable: the ozone layer is not being depleted and substances causing its depletion are not being emitted to the same extent as before. One synergic effect that was not anticipated during the Protocol negotiations was that the action taken would also help to curb the greenhouse effect.

A further example of a synergic effect may be found in measures to enhance energy efficiency. Through these measures energy consumption is reduced, which in turn enables the use of fossil fuels to decrease, bringing about lower greenhouse gas emissions and affording better scope for achieving the environmental quality objective *Reduced Climate Impact*. Furthermore, reduced combustion requirements in the energy sector result in lower emissions of pollutants, affecting the *Clean Air* objective, irrespective of which type of fuel is used. Switching from one fuel to another, too, may afford synergic effects due to reduced emissions of air pollutants. Choices in the climate and energy sectors may result in both synergies and conflicts. This emerges clearly from the analyses in both the EET and the HUM Strategies. Finally, reducing energy requirements means imposing less pressure on the natural resource base when it comes to renewable energy, both for biofuels and for wind power. Accordingly, the prospects of attaining the targets for biodiversity improve and the risks of noise in the outdoor environment and impact on cultural environments are reduced. For measures to tackle noise, there are synergies with measures relating to climate change and air pollution. Reduced use of studded tyres and lower speed limits are examples of such measures. Improved insulation of homes and better windows afford lower energy requirements and less indoor noise as well. But noise issues also entail major areas of conflict.

EXAMPLES OF GOAL CONFLICTS

In their background reports for the present in-depth evaluation, several of the agencies that perceive ways of resolving the conflicts cited state that the solutions lie beyond their control. Often they are a matter of resource distribution or political decisions, rather than cooperation, advice or the pursuit of particular issues. The gravest goal conflicts are the genuine ones, given a specific time frame, or those of the dilemma type. Some examples of pitfalls in the form of serious goal conflicts encountered in the pursuit of the environmental objectives are given below.

Land use and regional development

The majority of conflicts between environmental objectives and the aims of regional development policy concern infrastructure and regional expansion. The report 'Environmental objectives in regional development' (Environmental Protection Agency Report 5645, 2006, in Swedish) identifies two major potential sources of conflict between the environmental objectives and regional development initiatives. One is intensified use of land and resources for housing, infrastructure and businesses. The other is initiatives that result in increased emissions from the energy, transport and agricultural sectors.

Within the time frame laid down for the environmental objectives, i.e. up to 2020, there is a clear, genuine goal conflict between different interests and policy objectives when it comes to land use. Objectives in energy, agricultural and forest policy and those relating to recreation and construction compete with environmental objectives in terms of the use of productive land. There is little likelihood of technological development or improved efficiency in various sectors of society solving these problems of different land use wishes within the time frame specified. Given the current state of knowledge, it is not possible to determine whether this genuine conflict can be entirely solved by compromises or whether there is a real dilemma, i.e. a situation in which Sweden must choose which goals are more important than others in terms of land use. It might have to be asked what should be given priority: raw material for paper pulp, high-quality timber, renewable energy, biodiversity, recreational assets or food production? Unless the situation is to result in Sweden exporting these problems by importing more goods, choices will in all probability have to be made in the near future.

Use of land and water has become ever more intensive. Economic considerations often govern this use, and the consequence is that consideration of other values and interests is sometimes lacking or resources are simply overused.

Growing renewable energy needs may entail contradictions in relation to management of land, water and natural resources. Renewable sources of energy, too, have an impact on the environment. They must be used with due consideration of land and water, cultural heritage assets, and plant and animal life. For example, the landscape is changed when fast-growing energy forest is planted on arable land. Large-scale biofuel crop cultivation may have an impact on the flora and fauna of the farmed landscape; on the other hand, there are benefits in terms of a reduction in leaching of nutrients. The forest sector is substantial in Sweden and dominates land use. Growing interest in forest raw materials for energy purposes creates pressure for intensification and may contribute to conflicts with other interests. Increased use of hydroelectric power would be highly detrimental to the environmental quality objective *Flourishing Lakes and Streams*, even if it helps to achieve *Reduced Climate Impact*. Wind turbines change the appearance of the landscape, require land and may entail noise disturbance. Nevertheless, measures to counteract climate change are significant for retaining the key factors for ecosystems and their diversity, for preserving cultural heritage assets and for protecting human health.

Regional enlargement is regarded in regional development policy as being a precondition for economic growth. But it also involves an expansion in transport operations and, by the same token, more emissions from vehicles, more noise and extended infrastructure. Building development, roads and other communication routes require land and can fragment valuable cultural and natural environments and act as barriers to people and animals. Denser development in built-up districts outside central urban areas improves the prospects of better public transport, allowing road traffic to be reduced.

Transport

In the transport sector, there are large-scale conflicts between environmental objectives and other aims adopted by society. Transport operations, especially road transport services for passengers and goods, are expected to continue expanding within the time frame associated with the environmental quality objectives. This is due to several factors. More goods and products are demanded by consumers and shipped over longer distances. Regional expansion trends increase the need for passenger transport, while improved household finances mean that people can afford to travel. Transport operations give rise to conflicts of interest relating to energy. The transport sector is largely dependent on petroleum products, combustion of which entails emissions of greenhouse gases. Combustion also involves the release of other pollutants, which affect air quality and result in acidification and eutrophication. Furthermore, transport gives rise to large-scale problems of environmental noise.

Here, there are goal conflicts between, above all, aims in terms of economic development and growth on the one hand and policy objectives concerning

the environment, health, resource use and renewable energy on the other. These goal conflicts vary in nature. Some must be regarded as genuine conflicts and/or dilemmas, above all when it comes to the use of fossil fuels in the transport sector. Here, there is no realistic hope that, by means of greater efficiency and alternative fuels, fossil fuels can be replaced in this sector by 2020. Up to 2050 the assessment is more favourable, but the International Energy Agency considers that only large-scale research, development and demonstration efforts and measures to boost energy efficiency can, by that year, reduce carbon dioxide emissions from energy conversion to 2003 levels. In this assessment, too, it is the transport sector that offers the greatest challenges. Another conclusion is that heavy investments in infrastructure will be necessary.

Fishing

Many fish stocks are threatened by overfishing – and worldwide, the marine ecological balance is thereby at risk. Nevertheless, objectives of growth and sustained levels of employment, and to some extent also goals concerning cultural assets in coastal environments, call for an active, diversified fishing fleet. Here, there are genuine goal conflicts when it comes to certain fish stocks, such as cod. Fishing bans or, for other stocks, sharply reduced catches are needed to build up and save stocks. In the short term, then, portions of the fishing industry that depend on incomes from cod fishing are under threat.

GOAL CONFLICTS FOR INDIVIDUAL CITIZENS

Perhaps the most important goal conflicts are those perceived by individuals, and which affect them financially. In Chapter 4, the Environmental Objectives Council observes that individual citizens are among the key agents in achieving the environmental objectives. This perspective, which needs more analysis, prompts questions about how, through policy instruments and infrastructure, society can lay the foundations of more sustainable consumption patterns, but also about how other aspects of behaviour can be modified.

6.4.2 Urgent overall issues

INTERNATIONAL PERSPECTIVE

The Environmental Objectives Council notes that the international dimension is important for Sweden's pursuit of its objectives. To achieve most of the environmental quality objectives, progress both in Europe and elsewhere is required, to reduce emissions and other environmental impacts. Decisions on environmental issues are being increasingly shifted to international forums and the EU. Successful efforts in the EU are thus a key to attaining many of the objectives. Sweden should continue to press for further progress in EU and international negotiations. The Council therefore proposes that the environmental objectives should serve as one of the starting points for Sweden's approach in these negotiations. But this should apply not only to environmental policy: just as important are negotiations relating, for example, to fishing, agriculture, transport and trade. In these areas, there are both obstacles and opportunities.

NO EXPORT OF ENVIRONMENTAL PROBLEMS

In pursuing the environmental objectives, it is important to design policy instruments and measures in such a way that Sweden does not export environmental problems. This should be made a clearer premise of environmental policy. A new fundamental value underpinning efforts to achieve the objectives, an international dimension, may be one option. The Council has not adopted any proposal as to how this should be done, but proposes that the Government should look into the most suitable way of introducing this dimension into the environmental objectives system (see Chapter 3).

COMPETITIVE ADVANTAGES OF ENVIRONMENTAL OBJECTIVES

In the business sector, the view is often expressed that environmental requirements imposed on Swedish companies must not be such that they incur competitive disadvantages compared with companies abroad. The Environmental Objectives Council can see that there is a balancing act involved here, but

wishes to point out that Swedish businesses can very often derive advantages from developing their skills and methods, and adapting their products to stringent environmental requirements, in good time. They can then be in the lead when ever tighter requirements are imposed internationally as well. Transport services, vehicles, fuels and other goods are increasingly traded on an international basis and international requirements are thus ever more important.

Public-sector activities and enterprises need to show the way in terms of practical action. Exporting environmental ideas and knowledge in the Swedish public sector to other parts of the world may help the countries concerned to improve their environment. It is also likely that exporting the public sector's environmental expertise would help to enhance Swedish companies' own export potential.

CONSUMPTION PATTERNS

What is produced and consumed, and how, i.e. production and consumption patterns, change constantly over time. There are also massive differences from one part of the world and one group of people to another. Achieving the environmental quality objectives calls for measures and instruments that boost the efficiency of the chain from raw materials (including land and water), through production, transport and consumption, to waste products, and make it more of a closed loop. For individuals, in simplified terms, this may be said to be about three areas: transport, food and housing. Almost all activities in modern society are a matter of these three areas. Environmental and resource issues relating to them have been investigated and analysed in several contexts. Two of these are the Environmental Protection Agency's futures study 'Sweden in the Year 2021', carried out in collaboration with a range of other government agencies and key stakeholders, and a government inquiry about sustainable burdens in the three key areas mentioned above (*Bilen, Biffen, Bostaden*, SOU 2005:51). The message of these and other investigations is clear: that greater efficiency of resource use, with less environmental impact, conservation of natural and cultural environments and, moreover, improved public health and prosperity can be achieved by means of small changes. One requirement is implementation of the proposals relating to these areas that are contained in the three action strategies described in this report.

6.4.3 Put existing knowledge to use

The background documents for the in-depth evaluation, chiefly the 16 reports on individual objectives and the three action strategies, show that there are major gaps in the knowledge needed to attain the environmental quality objectives. A number of research needs are reported. However, further systematic work is required to identify the most serious knowledge gaps. Not least for the public sector, general implementation research is therefore highly important.

The Environmental Objectives Council considers that there is a great need for increased knowledge that can be applied in practical ways and that may result in increased collaboration between separate scientific disciplines. The Council wishes to emphasize the importance of developing knowledge about how society can make better use of limited resources for successful, cost-effective environmental efforts.

It is imperative that, in its forthcoming bill on research and innovation, the Government should inject resources into the whole knowledge chain with a view to attaining the environmental quality objectives. These resources are required for everything from basic and applied research and innovation know-how to demonstration facilities and market start-ups. Accordingly, it is important to involve the private sector and other research users at an early stage in this process, and for these stakeholders also to contribute their knowledge, skills and resources.

Sweden's comprehensive and systematic life-cycle approach is a source of strength. With strategic investments in research, development and demonstration in areas that are essential for achieving the environmental quality objectives, it would be possible for Sweden to maintain or develop its positions internationally.

More resources need to be devoted to putting research results to work by processing them and converting them into effective environmental policy measures, and to knowledge transfer to other groups of users. Nevertheless, the quest for complete knowledge must not become an excuse for inaction in environmental policy.

To impart continuity to environmental policy, research must have a long-term perspective. Methods and approaches used in futures studies can be useful here. Climate models are an example of how, with a long-term historical perspective, it has been possible to incorporate relevant causal connections and use them as a basis for scenarios.

6.4.4 More comprehensive evaluations

During 2008, the Environmental Objectives Council will be commissioning a review of the present in-depth evaluation exercise.

Carrying out, on a single occasion, an all-round evaluation of efforts to achieve the environmental objectives requires a great deal of time and resources. At the same time, it generates a large and detailed body of data that provides a coherent picture of Sweden's prospects of meeting the objectives. It would be advisable, before the Council's next in-depth evaluation, to review the methods to be used in carrying it out. Already, the Council finds that a more comprehensive picture of the scope for attaining the objectives is needed, especially in the following areas:

- The in-depth evaluation needs to evolve to reflect better what is being done throughout society to achieve the environmental objectives. One need is to identify more effectively potential synergies with other social processes, and to identify conflicts with other interests in society. In the two evaluations of the environmental quality objectives carried out to date, the focus has been laid on evaluating the state of the environment in relation to the objectives.
- For the next in-depth evaluation, it is important to look beyond 2020, since the current assessment is that a large number of environmental quality objectives will not be achieved in the time laid down. In the work of compiling the background material for the Council's report to the Government on progress towards the objectives, future scenarios have been used. The Council intends to continue with these scenarios, and sees a pressing need to develop the public sector's monitoring of societal and global developments and use of futures studies.
- The Council expects climate change to affect virtually all the environmental quality objectives in ways that are hard to ascertain. Thus, it is particularly urgent to shed light on how a changed climate will affect the objectives, i.e. the prospects of achieving them and the required measures and instruments.
- Methods of estimating costs and benefits, and making economic assessments, need to be developed. This applies above all to ways of valuing the benefits of attaining the environmental objectives, so that they can be compared more clearly with the costs.

6.4.5 Further work on action strategies

The Environmental Objectives Council finds that the process of reviewing and analysing measures and policy instruments in the framework of the three action strategies affords considerable added value. It provides better scope for assigning priorities and obtaining an overview, and also for perceiving potential synergies and conflicts with other interests in society. The Council therefore considers that efforts to develop these strategies must continue. Extended cross-strategy collaboration regarding issues relating to more than one of the strategies is also valuable. In the Council's view, the division of responsibility among agencies for each of the action strategies should function in a similar way. The Council proposes that the division of roles among the agencies involved in the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles should be reviewed.

CHAPTER 7.

Economic effects of the environmental objectives

7.1 Costs and benefits of achieving the environmental quality objectives

▶ **THE ENVIRONMENTAL OBJECTIVES COUNCIL MAKES** the assessment that the economic benefits to society of taking action to achieve the environmental quality objectives, as proposed in this report, will, overall, outweigh the costs. The benefits are often difficult to quantify, but the estimates that have been made, in both economic and qualitative terms, suggest that implementing the proposed measures will be economically efficient. Assuming that these environmental investments strengthen the economy, long-term growth will be greater than it would have been if the money spent on them had been saved. A number of studies show that the costs associated with failing to act, on the other hand, will be very high.

On top of the just over SEK 8 billion (bn) a year which measures to attain the environmental objectives currently cost central government, the additional action proposed will entail another SEK 5–10bn in annual state spending, depending on how policy instruments are designed. Over and above that, there will be a cost to other sectors of SEK 10–15bn. The total bill to the economy for the new proposals will thus end up at around SEK 20bn.

At present, local authorities and companies spend some SEK 30bn a year on environmental protection, in addition to the SEK 8bn invested by central government. The overall annual cost to the economy of efforts to meet the environmental objectives thus currently stands at almost SEK 40bn. The combined cost of existing and proposed measures is accordingly estimated at some SEK 60bn, or around 2% of GDP. That corresponds to roughly the revenue currently being raised by environmental taxes.

7.1.1 BENEFITS OF ENVIRONMENTAL POLICY

Environmental initiatives benefit and safeguard public health, biodiversity, cultural heritage, the long-term productive capacity of ecosystems and wise management of natural resources, i.e. the fundamental values underpinning environmental policy in Sweden. They can also help to boost productivity, bring about the requisite structural transformation and enhance the country's international competitiveness.

Society's benefits from environmental investments should be compared with the situation that would have prevailed otherwise. Better public health affords benefits in the form of saved lives, reduced sickness absence and higher labour productivity. Protecting biodiversity may be seen as an insurance premium, raising the odds of ecosystems recovering from various forms of disturbance. Cultural heritage assets safeguard our understanding of our historical development, give us a context for our present-day lives and make recreation and tourism more attractive. If the long-term productivity of ecosystems declines, so too do long-term production volumes in agriculture, forestry and fisheries.

Failing to pursue the environmental quality objectives always entails a cost. Conversely, much of our environmental policy – and the view that all policy must be seen in terms of sustainable development – is based on the very idea that economic outcomes and the social development of our society are favoured by good environmental practice.

If the viability of ecosystems is impaired by environmental impact or unsound management, we human beings will also derive less pleasure from communing with nature. In valuation studies, the recreational value of, and our willingness to pay for, a healthy environment usually exceed the value of the market-priced goods and services that ecosystems produce.

To achieve the environmental quality objectives, environmental policy needs to be developed in a number of areas. Sweden's failure to achieve the objectives so far costs money. Environmental impacts in the form of air pollution, and especially ground-level ozone, cause production losses in farming and forestry, reducing incomes from these sectors, according to estimates, by a couple of billion kronor every year. Adverse health effects of air pollution, chemicals etc. result in higher healthcare costs. But these health problems also lead to falls in production throughout the economy. As a result, there is both a decrease in tax revenues and a rise in social insurance transfers. Environmentally related ill health, in fact, emerges in every study as the main cost of environmental impact. The reason for this is that our own health is regarded as the most valuable possession we have. Payments to the labour force, moreover, make up two-thirds of GDP. Decreases in hours worked and labour productivity therefore have major direct impacts on the economy.

In developing countries, according to some studies, up to half of all ill health is more or less environmentally related. In rich countries like Sweden, which has a relatively good environment according to all the measurements, this is hardly the case. But even if only a tenth of all ill health were environmentally related, it would cost up to some SEK 50bn a year, with production losses making up the largest item. The Environmental Objectives Council has funded a study carried out at the Swedish Road Administration on how road transport affects public health. The study, expected to be completed in spring 2008, shows that our transport choices affect health at three different levels:

- Our own health is affected by the stress of travelling by car, as opposed to walking and cycling.
- The health of local residents suffers from particles and other airborne pollutants.
- Globally, greenhouse gas emissions contribute to climate change, which in turn is expected to result in higher mortality in many parts of the world.

The value of all the ecosystem services a healthy environment provides is incalculable. The added value afforded by agriculture, forestry, fishing and the hydroelectric power industry – the sectors accounting for our industrial use of the environment – amounts to roughly 5% of GDP. These sectors, in turn, form the basis of such industries as the food sector, saw-

milling and woodworking, and paper and pulp, which account for a far higher proportion of GDP, not least because of the substantial export revenues they command. Tourism, which is based on a good environment, is increasingly important – especially in local terms. In a system perspective, all activities depend on a healthy environment, not least in view of how environmental factors affect our own health. It is somewhat easier to value changes than to estimate the total value of a particular state of the environment. Here, the estimate concerns the implications, in terms of costs and benefits, of a deterioration or improvement in the environment. The sum total of environmental damage incurred by Swedish society here and now, even after environmental policy has been implemented and all environmental investments have been made, may be said to drain at least SEK 20bn a year from the economy. Costs to society are probably several times larger than this if lost recreational assets are included and the value of everything affected, but not studied, is estimated. Moreover, if no environmental policy had been pursued at all to date, and no environmental investments had been made, the costs would have been a great deal higher. This would have been manifested mainly in lower GDP due to poorer public health, but also to larger production losses in forestry and farming.

Translated into Swedish terms the 'worst-case scenario' estimate in the Stern Report, a 20% decline in GDP due to adverse climate impact, would represent an annual loss of nearly SEK 600bn. And that still does not include all the relevant values. It should, however, be pointed out that the part of the world where Sweden is located is expected to withstand climate change better than average.

The global perspective may be gleaned from the latest environmental report from the United Nations Environment Programme (UNEP) , *Global Environment Outlook: environment for development* (GEO-4), which is also the 20th anniversary follow-up of the World Commission on Environment and Development (the Brundtland Commission). According to this report, a situation is approaching in which the state of the environment is beginning to arouse grave worldwide concern. The UN research reports on ecosystem health in the 'Millennium Assessment' show that 15 of the 24 key services that ecosystems globally provide us with (and which human beings cannot live without) have been and are being degraded. Both the quantity and the quality of many of the goods and services that nature provides are declining. The reports state clearly that both food shortages and major adverse health impacts may arise.

7.1.2 COSTS OF ENVIRONMENTAL POLICY TO THE STATE IN 2004–2006

Appropriations for environmental policy make up about 1% of the Swedish government budget, and less than that in most other countries. Increasingly strong market forces and a rapidly expanding global economy, with growing world trade, mean that the Swedish environmental quality objectives are unattainable through Swedish environmental policy measures alone. The key to success lies in, first, support for environmental policy from financial, economic and trade policy and, second, the pursuit by other countries, too, of policies conducive to favourable environmental trends. It would hardly help if appropriations several times larger were made for Swedish environmental policy unless the tax system, and also environmentally significant aspects of the other 99% of spending in the budget, were made as eco-friendly as possible. This applies both in Sweden and elsewhere. Thus, for example, the state must use economic instruments to make it profitable for companies and consumers to make environmentally sound investments and purchases.

Attaining the environmental quality objectives is costly. On the other hand, other costs are avoided as we get closer to achieving them. The exact costs incurred, and who must bear them, depend on the nature of environmental policy. Besides the state, local authorities, businesses and households also spend money on improving the environment for themselves or others. Environmentally related taxes, by comparison, amount to just over SEK 60bn.

During 2004–6, the lead agencies for the environmental objectives incurred costs directly connected

Table 7.1 Annual direct costs to the state of each environmental quality objective, averages for 2004–2006. Source: Lead agencies' cost summaries reported to the Environmental Objectives Council.

Environmental quality objective	SEK million*	Largest cost item
Reduced Climate Impact	435	Climate Investment Programme (Klimp), Local Investment Programmes (LIPs)
Clean Air	145	Klimp, LIPs
Natural Acidification Only	255	Liming
A Non-Toxic Environment	1,000	Soil remediation
A Protective Ozone Layer	15	Environmental research
A Safe Radiation Environment	255	Monitoring of radiation environment
Zero Eutrophication	460	Payments for measures
Flourishing Lakes and Streams	185	Payments for measures
Good-Quality Groundwater	55	Water protection
A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos	200	Payments for measures
Thriving Wetlands	200	Management and protection
Sustainable Forests	1,300	Purchases and measures
A Varied Agricultural Landscape	3,200	Payments for measures
A Magnificent Mountain Landscape	25	Minor items
A Good Built Environment	400	Many different items
A Rich Diversity of Plant and Animal Life	165	Payments for measures
Total	**8,295**	

* These costs are estimates, subject to several sources of uncertainty. Some costs of research and development with a bearing on the environmental objectives, for example, are not included.

with their work for the objectives averaging just over SEK 8bn a year. This emerges from the summaries drawn up by the lead agencies of their costs connected with the objectives. This is almost double the figure for 2001–3. The primary factors underlying this increase are government budget appropriations for protection of biodiversity, agricultural management measures and purchase of forest land.

Implementing management measures in farming, purchasing forest land of high conservation value or compensating forest owners for enhanced environmental stewardship has a bearing on several environmental quality objectives. The payments made to the farm sector also, in practice, affect other policy objectives. Some of the costs that involve increases in state assets, such as purchases of forest land, might also be envisaged as a redistribution of the state's asset portfolio. Other cost items that boost real capital assets, too, may be seen as investments – if that distinction is made in the environmental budget. Examples of items that can be regarded in this way are soil remediation and other measures that bring about lasting improvements, thereby increasing the value of land, and the Klimp and LIP investment programmes.

At the current level of appropriations, not even half the environmental objectives are deemed possible to achieve within the set time frame. On the other hand, in many cases this is due not only to insufficient funding but also to the fact that the time scale of nature's recovery is so prolonged that it is not possible for environmental quality to be restored by 2020, even if preconditions can be created for subsequent attainment of the desired quality of the environment. Environmental appropriations in the state budget have doubled in the past few years as a result of government stepping up its efforts to pursue the environmental objectives. It should be noted that the costs of remedying emissions of ozone-depleting substances have halved. This suggests that when policies succeed and environmental objectives are attained, costs also decrease.

State expenditure on meeting the environmental quality objectives is thus estimated at just over SEK 8bn a year. The Statistics Sweden report commissioned by the Environmental Objectives Council, *Environmental economic indicators in the Swedish state budget 1995–2006*, shows that the budget appropriations that promote the environment are larger than the figures reported by the lead agencies for the environmental objectives. These appropriations rose from just over SEK 4bn to just under SEK 13bn annually during the years studied. They have a wider purpose than just fulfilling the environmental objectives, including, for example, environmental development cooperation. Nevertheless, budget items that result in increased environmental impact had, in percentage terms, risen almost as much (but from a level nearly three times as high) – from just under SEK 12bn to almost SEK 30bn. State budget funds go, above all, to activities that affect the climate (air transport and road building), and to those that contribute to eutrophication (farming).

7.1.3 Local authorities' and businesses' costs of compliance

Depending on the nature of the policies adopted and who is obliged to do what, the costs of environmental policy may shift between the state and other stakeholders.

Local authorities' costs for achieving the environmental objectives are hard to estimate. They arise within the framework of local environmental policy and urban development: spatial planning, local infrastructure, construction, transport, business issues, public utilities, natural resource management, nature conservation etc.

In Sweden, local authorities are responsible for household waste management and water and sewage treatment. The total cost is in the region of SEK 20bn a year, and payment is effected by means of charges on businesses and households. The costs are affected by waste management methods and by the treatment requirements imposed. The environmental quality objectives primarily concerned are *Zero Eutrophication*, *Flourishing Lakes and Streams*, *Good-Quality Groundwater* and *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*.

The investments and costs defined by companies each year as mainly environment-related, which are thereby registered in Statistics Sweden's figures on environmental protection costs, amount to just under SEK 10bn a year.

Nevertheless, as environmental and sustainability issues are increasingly integrated into every activity, there is ever more blurring of the dividing lines between environmental protection costs, incurred with the primary purpose of solving environmental problems, and normal investments that usually result in more energy- and resource-efficient, eco-friendly production and products. Of all investments in industry and in the service sector, 20–30% and 10% respectively – some SEK 100bn altogether – are usually considered to be clearly associated with the environment, but are not classified as environmental protection costs according to international definitions.

Households, too, devote portions of their budgets to environmental protection costs, but no summaries of these have been compiled. Investments in air purifiers, water filters and other means of improving the indoor environment or reducing the environmental

burden caused by housing may be among the factors to be included in Statistics Sweden's forthcoming study of society's environmental protection costs. This study is intended to cover the whole of the Swedish economy, including households.

Other stakeholders' direct costs of pursuing the environmental quality objectives can thus be estimated at over SEK 30bn a year. Other than isolated studies, however, thorough economic analyses have not been carried out. Combined with the state's own expenditure, the costs to society of measures to improve the environment may be said to amount, at a conservative estimate, to some SEK 40bn a year.

7.2 Costs of pursuing the objectives up to 2020

THE ENVIRONMENTAL OBJECTIVES COUNCIL PROPOSES that resources should be made available to develop models that can form a basis for high-quality impact assessments in pursuit of the environmental objectives. The Council also considers that the relevant agencies' expertise in environmental economics and, specifically, analysis of the cost-effectiveness and economic impacts of measures to achieve the objectives needs to be strengthened. This should be done to ensure that the information on which decision-making related to the objectives is based better meets the formal requirements of the budget process.

In large measure, efforts in pursuit of the environmental objectives up to 2020 rest on the three action strategies. The costs of implementing the proposals contained in them can be estimated in round figures only. The ultimate cost outcome will depend on policy design.

If all the costed proposals submitted in the background reports for this in-depth evaluation from the agencies concerned are added together, the cost to the state amounts to SEK 10–15bn a year. The priority choices and coordination gains ensuing from the proposals being packaged in the action strategies, however, reduce the cost to the state to SEK 5–10bn. This range is due to the fact that the way policies are framed will affect the distribution of costs. On the other hand, policy instruments entailing tax revenues of SEK 10–15bn annually are also proposed, especially in the transport sector.

The background data for estimating the costs to the wider economy of all the existing proposed measures are not nearly as comprehensive, but the total cost is estimated at some SEK 20bn a year. Depending on policy design, stakeholders other than the state thus incur SEK 10–15bn of these costs. The economic benefits of investing these funds in attaining the environmental quality objectives are described mainly in qualitative terms. Appendix 2 (published separately in Swedish Environmental Protection Agency Report 1268) presents a summary of the combined impact assessments of all the proposed measures, including cost estimates to date. The chapter on the action strategies does not include all the proposals, and the costs it presents therefore do not exactly add up to the sums given here.

In the remaining 12 years before 2020, Sweden's GDP – the value of annual production of goods and

Table 7.2 Annual costs of pursuing the environmental objectives, SEK billion.

	2004–2006	New action proposals	Up to 2020
Whole of society	approx. 40	approx. 20	approx. 60
State only	8	5–10, depending on design	approx. 15

services purchased for end use – is set to rise from its current level of some SEK 3,000bn to around SEK 4,000bn. Underlying this prediction is an assumption that the long-term historical growth rate of *2%* annually will persist. A rise from SEK 40bn to SEK 60bn in the costs to the economy of environmental programmes during the same period must be regarded as low-cost insurance against the economy losing its impetus owing to environmental degradation or environment-related human ill health. The extra environmental investment of SEK 20bn a year must be weighed against the SEK 1,000bn rise in annual GDP compared with its level today. One-fiftieth (*2%*) of this growth will thus be devoted to the new environmental initiatives. Moreover, according to many analysts it is these very initiatives that will provide the country with the knowledge that Swedish companies can then export around the world.

Accordingly, only *2%* of GDP growth is to be devoted to the proposed new environmental efforts. Assuming that these efforts make no contribution whatever to the productivity trend, the growth rate will thus fall from 2.00% to 1.96%. Nationally, in economic terms, this amounts to no more than a rounding error, even if the costs added over the period total many billions of kronor. If the environmental programmes are economically profitable, long-term growth will be higher than it would have been if the money spent on them had been saved. What can, on the other hand, prove extremely expensive – as the Stern Report, for example, shows with respect to the possible repercussions of climate change – is a failure to take environmental issues seriously.

7.2.1 STRATEGY FOR MORE EFFICIENT ENERGY USE AND TRANSPORT

The Strategy for More Efficient Energy Use and Transport (the EET Strategy) involves applying a range of phased measures to ensure that the environmental objectives can be met. Improving energy efficiency is merely the first phase. It may be followed, in turn, by fuel switching, pollution abatement technology and volume restrictions. In purely practical terms, the right kind of energy must be used for the right energy purpose.

For the state, the measures and instruments proposed in the EET Strategy mainly involve increased revenues. However, this applies if policy is not focused on incentives for green cars but on raising tax so that 'fuel-guzzling' vehicles are charged according to their environmental and climate impact. Measures to reduce emissions from shipping are expected to cost roughly SEK 2bn a year. Depending on instrument choices, these costs may be partially incurred by the state. Economically, the strategy is difficult to evaluate as its environmental effects are to be attained partially by consumers choosing smaller and cheaper models when they replace their cars, thereby in a sense saving money. The economic costs presented amount to just under SEK 10bn a year for this action strategy. The benefits will be manifested in the form of better health, above all, and in the long term a reduced risk of truly serious climate change. The reduction in air pollution alone, however, is expected to result in economic health benefits of SEK 2–8bn a year.

7.2.2 STRATEGY FOR NON-TOXIC, RESOURCE-SAVING ENVIRONMENTAL LIFE CYCLES

One purpose of the Strategy for Non-Toxic, Resource-Saving Environmental Life Cycles (the GRK Strategy) is to phase out highly harmful substances. As far as possible, these harmful substances are to be replaced with safer options or technologies, according to the substitution principle. Through changes in production and consumption of chemical and other goods and products, dispersion of dangerous substances into the environment is to decrease while the scope for recycling and efficient use of natural resources improves.

The most important measures to create prospects for non-toxic, resource-saving environmental life cycles involve developing regulations concerning chemicals and waste in the EU and internationally. For chemicals, the regulations required are those that restrict the use of hazardous substances in chemical and other products, and also improve provision of information about component substances. For waste, it is a matter of regulations on waste disposal and requirements for recycling of products and materials.

To supplement this development of regulations, other policy instruments need to be elaborated as well: economic instruments, environmental product profiles, 'green' purchasing and procurement, information and capacity building, etc.

Pressure to step up progress towards safer and more recyclable products can be exerted by companies, public agencies and individuals demanding information about dangerous substances and other environmental characteristics from suppliers and dealers. To make it easier to impose purchasing requirements, the rules about information concerning such matters as the hazardous substances contained in products need to be developed at the same time.

The state's costs for the GRK Strategy will continue to arise largely from initiatives to clean up contaminated land. The clean-up rate will determine the cost, but the total will be some SEK 600 million a year for private sources of funding and the same amount for the state if the most pressing needs are to be met by 2050 as planned. Various agencies will also be commissioned to investigate and otherwise promote non-toxic and resource-saving environmental life cycles, and the cost of doing so is expected to be SEK 100–300 million a year.

Two expensive projects are in the offing. One is to remedy eutrophication, which for single-household sewage systems is included in this strategy; the other is radon remediation of buildings, which will cost a total of SEK 5–10bn. At present, property owners bear most of the financial responsibility for radon remediation.

The total cost of remedying eutrophication may add up to SEK 4–5bn a year. An investigation is currently under way to identify new policy instruments to ensure that the most cost-effective measures are being undertaken, and to answer the question of how to distribute these costs between the state and all other stakeholders concerned, in a manner that is acceptable to all parties. Who pays will depend on how the proposed measures are allocated among the agricultural sector, municipal wastewater treatment works, industrial facilities, individual sewage systems and other sources. The state can then also assume responsibility for a greater or lesser share of the cost, depending on the policy instruments used.

Preventive efforts are paramount, and it is hard to estimate how much they will cost. The major tasks of prevention are deemed to be further development of regulations, research, provision of information about substances contained in products, and international collaboration. If the public sector is to set a good example by making its procurement as non-toxic and resource-saving as possible, there may be an additional cost, at least initially. But this may also give a powerful stimulus to more sustainable development. Benefits from the strategy will come mainly in the form of better public health, but also of fewer ecosystems incurring symptoms of toxicity and scope to use natural resources, such as fish, without restrictions due to the presence of hazardous substances. These measures will also make a positive contribution by reducing the greenhouse effect.

7.2.3 STRATEGY FOR THE MANAGEMENT OF LAND, WATER AND THE BUILT ENVIRONMENT

The Strategy for the Management of Land, Water and the Built Environment (the HUM Strategy) focuses on environmental stewardship in the use of land and water to prevent adverse effects on the environment and ensure a decrease in the vulnerability of ecosystems. Good environmental practice is crucial for sustainable use and sound management of resources. Where necessary, areas must be protected. If extensive damage has already taken place, steps must be taken to restore productive capacity and natural and cultural assets. In the long run, it is hoped that environmental stewardship will reduce the need to protect and restore assets of the natural and cultural environments.

The aggregate cost to the state of preventing adverse effects within the scope of the HUM Strategy is estimated at around SEK 4bn annually for the period 2011–20, over and above current spending. In terms of the environmental quality objectives, measures in pursuit of *Sustainable Forests* will cost an estimated SEK 2bn. Those for *A Varied Agricultural Landscape* will cost approximately SEK 1.5bn. Action related to the other objectives relevant to this strategy will cost around a billion kronor. For example,

measures in agriculture contributing to *Zero Eutrophication* will cost the state around SEK 0.5bn a year. The GRK Strategy, too, involves steps to remedy eutrophication.

A cost to society arises as a result of the restrictions on agriculture, forestry and fishing entailed by the requirement of environmental stewardship. The cost as regards *Sustainable Forests* is estimated at SEK 0.7bn a year more than at present. Estimating the cost of good environmental practice in the farm sector is difficult but, according to the sector itself, stewardship has led to a certain production loss and some cost increases. Fishing would have yielded larger incomes today if fisheries policy had previously been designed and implemented according to the long-term capacity of fish stocks and the environment, rather than the industry's needs in the short term.

The HUM Strategy's benefits will be expressed in sustainable forestry and farming, and in thriving coasts and archipelagos with viable fish stocks. One result will be the enhancement of recreational assets. This can bring dividends in the form of increased tourism, especially in a future characterized by climate change.

7.2.4 THE ECONOMY'S DEPENDENCE ON ECOSYSTEM PRODUCTIVITY

Increasingly, with every new version, UN reports on the implications of climate change and impacts of the expanding global economy on the health of ecosystems stress our economic dependence on all of nature's goods, services and life-sustaining functions. Henceforward, all economic activity will need to take account of the capacity of ecosystems not only to deliver renewable natural resources sustainably, but also to dispose of all waste products in sustainable ways. Tapping, by methods that will be viable in the long term, enough renewable natural resources to meet the needs of a growing world economy is a huge challenge, and this challenge is boosted even more by the need to make the global economy more sustainable. Accordingly, the environmental impact of using finite resources must not exceed the capacity of ecosystems to absorb all the emissions and waste. Finite resources too, of course, will always need to be used, but not to an extent that is allowed to jeopardize ecosystems' capacity to keep supplying renewable natural resources. What will be in shortest supply in the future is probably not natural resources – nor even the renewable resources around which sustainable development must be built – but this very capacity of ecosystems to deal with our environmental impact.

The goal conflict between economic growth and good environmental practice that is sometimes postulated may possibly apply in the short term, but in the long term this conflict is an illusion or a misconception. Without viable ecosystems there will be no economic growth.

Charging for all the benefits that ecosystems provide is difficult. For this reason, they are almost always excluded from the calculations of business economics. The sum total of ecosystem assets and services is also hard to value in national economic terms, but a growing number of studies are being presented in this research field. Economic estimates are thus becoming more complete. But even the best of all possible estimates will never succeed in capturing all the benefits that nature provides.

In its report 'Growth and the environment in a global perspective' (2007, in Swedish), the Swedish Environmental Advisory Council opted instead to clarify the connection between the environment and the economy mainly by means of facts from the natural sciences. In its graph, the trend line for the growing world economy crosses that for shrinking ecosystems. But the economy cannot grow at the expense of the environment in the long term. Rather, the scientists behind the report emphasize that the worse trends are for ecosystems, the more likely it is that the economy, too, will deteriorate. Thus, the economy cannot flourish in the long term without a sustainable natural resource base. The Environmental Objectives Council agrees with the researchers on whose work the Advisory Council's report is based: the current trend, with the economy growing while the vitality of ecosystems is on the wane, is not sustainable in the long term.

7.3 Future challenges for economic analyses relating to the objectives

The purpose of economic impact assessments is to provide a basis for assigning priorities in situations requiring political decisions. To ensure that the conditions of life in ecosystems incur no lasting damage, the environmental quality objectives should be an extra checkpoint in all decision-making. Exactly what sustainable use of ecosystems entails is hard to define, but the environmental quality objectives may be seen as an initial attempt to describe it.

7.3.1 Economic impact assessments in the areas of health and cultural heritage

In the report of the Committee on Environmental Objectives (2000), *The Future Environment – Our Common Responsibility*, environmentally related ill health is estimated as costing society SEK 8–10bn a year. Nonetheless, the report did not include all emissions with effects on the environment and health, or all diagnoses. The total is based on direct costs of sickness absence, hospital visits and stays, and medicines. To calculate more indirect changes in welfare, other methods need to be used as well. For example, many individuals set store by quiet, unpolluted environments even in places they have neither visited nor plan to visit.

One of the problems is that the value, or price, of the aggregate effect of pollution on the environment and health is unknown. During 2007, the Environmental Objectives Council funded studies to compile an evidence base for health-related valuations of the health effects of air pollution and noise. These studies, which were conducted by the National Institute of Economic Research, describe opportunities for and difficulties in carrying out economically based impact assessments with respect to environment-related health effects. One conclusion is that more information is needed about how society values estimated effects on health, to permit impact assessments of measures or policy instruments aimed at remedying environmentally related health effects. Values of this kind could be used to make better impact assessments of environment policy measures and improve the economic decision-making basis of Swedish environmental policy.

The remit of the cultural heritage sector has been extended from conservation of monuments and selected sites to including the whole of our human surroundings as we perceive them. Scope for preserving and making use of the cultural environment depends very much on the design of measures concerning the environment as a whole. The policy instruments available for cultural heritage conservation have not been sufficiently adapted to efforts in the broader perspective of the environmental objectives. Valuation of the cultural environment includes both measurable assets and those that cannot be directly quantified.

7.3.2 Proposed measures – need for impact assessments

One fundamental problem besetting environmental policy measures is uncertainty regarding the effects of these measures on health and the environment. Without impact assessments, we cannot know what

costs and benefits to society are associated with environmental policy. Analyses are needed to clarify whether the costs proposed are in reasonable proportion to the environmental objectives to be attained. The in-depth evaluation of 2004 showed that impact assessments are lacking for many proposed environmental policy measures. Despite the somewhat better situation now, in the in-depth evaluation of 2008, impact assessment work must be improved further.

The National Institute of Economic Research has carried out a questionnaire survey aimed at the lead agencies for the environmental objectives. The main conclusion of the survey, which focused solely on impact assessments of measures to achieve the objectives, was that these assessments are of varying quality. This is largely due to the amount of time devoted to them: in general, impact assessments are not given high priority, and the level of ambition varies greatly from one agency to another.

Performing impact assessments of efforts to attain the environmental quality objectives is difficult. One difficulty is to determine what measures are required for their attainment; another is to establish the effects of these measures on the environment and health in scientific terms, and their effects on the economy. Valuing the environmental and health benefits is also difficult.

There is statutory regulation of when an impact assessment is to be performed, but not of how it is to be carried out or what, in detail, it is to comprise. The information and analysis on which decision-making related to the environmental objectives is based must fulfil the formal requirements of the budget process. Impact assessments that compare costs and benefits must invariably be carried out. It must be clear what proposed measures will cost the state directly, in the form of spending on appropriations, and preferably also indirectly through, for example, decreases in tax revenues. Moreover, the costs could be divided in two: investment and operating. The kind of item that boosts the value of the state asset portfolio would then be placed on the investment side, while items that should genuinely be regarded as costs would be classified as operating expenditure.

It should also be clear from the impact assessment why it is economically sound to implement the measure concerned. The costs of putting a proposed environmental measure into practice can often be estimated with greater reliability than the revenues anticipated from, for example, a better state of the environment and improved health. A range of key environmental policy proposals, such as radon reduction in buildings, remediation of contaminated land and protection of biodiversity, almost always affect stakeholders other than the state; and when the environmental objectives are not fulfilled, the question always arises of how the costs of achieving faster progress should be apportioned. The targeting of environmental policy is, of course, enhanced if it is based on the state paying for what it wants done, state finances permitting. To prevent state budget restrictions from impeding the requisite environmental measures, however, it should always be asked whether and how the environmental benefits could be secured in other ways that cost less for society and the state alike.

Environmental benefits are hard to measure in monetary terms. There is therefore a great need to develop methods of valuing non-monetary resources capable of gauging environmental utility. A reasonable point of departure, when it comes to describing several alternative measures, may be to identify the impacts. A proposal is economically beneficial if its aggregate advantages outweigh the sum total of its disadvantages. An impact assessment of environmental benefit focuses on qualitative assessments, and benefits to society are largely described in verbal terms and as pluses and minuses. The minimum requirement for an impact assessment is that all positive and negative effects should be identified. The idea of adding to an impact assessment factors that have not undergone monetary valuation is inspired by multi-criterion analysis. This differs from a cost–benefit analysis in that it leaves more of the responsibility to the decision-makers. Multi-criterion analysis is a structured means of comparing the advantages and disadvantages of a proposal.

Environmental effects that cannot be measured in monetary terms can be valued in some other type of

weighting system to illustrate the importance of various effects to society. The impacts can be presented together, although they are a mix of qualitative, quantitative and monetary information. Just as in an economic analysis, certain assumptions are made. There are always subjective elements when the value of different effects is assessed. The alternative is to refrain entirely from using analytical methods of this kind, but the result is more complicated and incomplete background material for the decision-makers. An analysis focusing on qualitative assessments is therefore necessary.

In such areas as economics, transport, and food and agriculture there are special institutes engaged in using and developing models. For the environment, no such institute exists. In the Environmental Objectives Council's view, there is a great need for longer-term efforts to develop models that can form a basis for high-quality impact assessments in pursuit of the environmental objectives. The lead agencies for the objectives, too, need to bolster their resources and develop their skills in carrying out impact assessments. The need for expertise in environmental economics, for analyses of the cost-effectiveness and economic impacts of measures to achieve the environmental objectives, should also receive attention. These steps should be taken to ensure that the information on which decision-making related to the objectives is based better meets the formal requirements of the budget process.

Summary of objectives and targets

Summary of current and proposed environmental quality objectives and interim targets

1. REDUCED CLIMATE IMPACT

Current	Proposed
The UN Framework Convention on Climate Change provides for the stabilization of concentrations of greenhouse gases in the atmosphere at levels which ensure that human activities do not have a harmful impact on the climate system. This goal must be achieved in such a way and at such a pace that biological diversity is preserved, food production is assured and other goals of sustainable development are not jeopardized. Sweden, together with other countries, must assume responsibility for achieving this global objective.	The UN Framework Convention on Climate Change provides for the stabilization of concentrations of greenhouse gases in the atmosphere at levels which ensure that human activities do not have a harmful impact on the climate system. This goal must be achieved in such a way and at such a pace that biological diversity is preserved, food production is assured and other goals of sustainable development are not jeopardized. Sweden, together with other countries, must assume responsibility for achieving this global objective.

Interim target

GREENHOUSE GAS EMISSIONS As an average for the period 2008–12, Swedish emissions of greenhouse gases will be at least 4% lower than in 1990. Emissions are to be calculated as carbon dioxide equivalents and are to include the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC. In assessing progress towards the target, no allowance is to be made for uptake by carbon sinks or for flexible mechanisms.	**GREENHOUSE GAS EMISSIONS** (unchanged) As an average for the period 2008–12, Swedish emissions of greenhouse gases will be at least 4% lower than in 1990. Emissions are to be calculated as carbon dioxide equivalents and are to include the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC. In assessing progress towards the target, no allowance is to be made for uptake by carbon sinks or for flexible mechanisms.

2. CLEAN AIR

Current	Proposed
The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets. This environmental quality objective is intended to be achieved within one generation.	The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets.

Interim targets

1. SULPHUR DIOXIDE A level of sulphur dioxide of 5 µg/m³ as an annual mean will have been achieved in all municipalities by 2005.	To be withdrawn. Achieved by the target year 2005.

2. NITROGEN DIOXIDE A level of nitrogen dioxide of 60 µg/m³ as an hourly mean and of 20 µg/m³ as an annual mean will largely not be exceeded by 2010. The hourly mean may not be exceeded for more than 175 hours per year.	**CONCENTRATIONS OF NITROGEN DIOXIDE** (revised) From 2010 onwards, concentrations of nitrogen dioxide of 60 µg/m³ as an hourly mean and of 20 µg/m³ as an annual mean will by and large not be exceeded. The hourly mean may not be exceeded for more than 175 hours per year.
3. GROUND-LEVEL OZONE By 2010 concentrations of ground-level ozone will not exceed 120 µg/m³ as an 8-hour mean.	**GROUND-LEVEL OZONE – PROTECTION OF HUMAN HEALTH** (revised) By 2015, concentrations of ground-level ozone will not exceed 100 µg/m³ as an 8-hour mean. This value is to be calculated as a running average over the last three years, and may not be exceeded on more than 35 days per year.
4. VOLATILE ORGANIC COMPOUNDS By 2010 emissions in Sweden of volatile organic compounds (VOCs), excluding methane, will have been reduced to 241,000 tonnes.	**EMISSIONS OF VOLATILE ORGANIC COMPOUNDS** (revised) By 2020, emissions of non-methane volatile organic compounds (NMVOCs) in Sweden, in tonnes per year, will be in line with the country's undertaking under a new National Emission Ceilings Directive.
5. PARTICLES A level of particles (PM10) of 35 µg/m³ as a daily mean and of 20 µg/m³ as an annual mean will not be exceeded by 2010. The daily mean may not be exceeded for more than 37 days per year. A level of particles (PM2.5) of 20 µg/m³ as a daily mean and of 12 µg/m³ as an annual mean will not be exceeded by 2010. The daily mean may not be exceeded for more than 37 days per year.	**CONCENTRATIONS OF PARTICLES** (revised) By 2015, concentrations of particles of 30 µg/m³ as a 24-hour mean for PM10, 10 µg/m³ as an annual mean for PM2.5, and 18 µg/m³ as an annual mean for PM10 will not be exceeded. The 24-hour mean concentration may not be exceeded on more than 35 days per year.
6. BENZO[A]PYRENE A level of benzo[a]pyrene of 0.3 ng/m³ as an annual mean will largely not be exceeded by 2015.	**CONCENTRATIONS OF BENZO[A]PYRENE** (unchanged) A level of benzo[a]pyrene of 0.3 ng/m³ as an annual mean will largely not be exceeded by 2015.
	GROUND-LEVEL OZONE – PROTECTION OF VEGETATION (new) By 2015, concentrations of ozone during the growing season will be reduced so as to achieve an acceptable level of exposure and thus avoid damage to vegetation, i.e. the value of AOT40 from April to September will not exceed 20,000 (µg/m³)·h, calculated as an average over the last five years.

3. NATURAL ACIDIFICATION ONLY

Current	Proposed
The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water. In addition, deposition of acidifying substances must not increase the rate of corrosion of technical materials or cultural artefacts and buildings. This environmental quality objective is intended to be achieved within one generation.	The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water. In addition, deposition of acidifying substances must not increase the rate of corrosion of technical materials located in the ground, water main systems, archaeological objects and rock carvings.

Interim targets

1. ACIDIFICATION OF LAKES AND STREAMS By 2010 not more than 5% of all lakes and 15% of the total length of running waters in the country will be affected by anthropogenic acidification.	**ACIDIFIED FRESH WATERS** (revised) By 2015, the proportion of fresh waters acidified as a result of human activities will not exceed 25% in south-west Sweden or 5% in central and south-east Sweden. In northern Sweden, no increase in acidification will occur. Definition: The interim target is defined in terms of numbers of lakes with an area of more than 1 hectare and watercourses with a catchment area larger than 2 km². Limed waters which according to the national environmental quality criteria are classed as affected by acidification will also be considered to be acidified.
2. ACIDIFICATION OF FOREST SOILS By 2010 the trend towards increased acidification of forest soils will have been reversed in areas that have been acidified by human activities, and a recovery will be under way.	**ACIDIFIED FOREST SOILS** (revised) By 2015, the area of forest land in south-west Sweden with high or very high soil acidity will be reduced by 20% compared with 2000. In other acidified areas of Sweden, a continued improvement will be seen.
3. SULPHUR DIOXIDE EMISSIONS By 2010 emissions of sulphur dioxide to air in Sweden will have been reduced to 50,000 tonnes.	To be withdrawn. Achieved before the target year 2010.
4. NITROGEN OXIDE EMISSIONS By 2010 emissions of nitrogen oxides to air in Sweden will have been reduced to 148,000 tonnes.	**NITROGEN OXIDE EMISSIONS** (revised) By 2015, emissions of nitrogen oxides to air in Sweden will have been reduced to 130,000 tonnes.
	ACIDIFYING EFFECTS OF FORESTRY (new) By 2015, the acidifying effects of forestry in acidified areas will not exceed levels that are offset by natural processes.
	EMISSIONS FROM SHIPPING (new) By 2015, emissions of sulphur dioxide from ships bunkering in Sweden will have been halved and emissions of nitrogen oxides will have decreased compared with 2005.

4. A NON-TOXIC ENVIRONMENT

Current	Proposed
The environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity.	The environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity.

Interim targets

1. DATA ON HEALTH AND ENVIRONMENTAL PROPERTIES OF CHEMICAL SUBSTANCES By 2010 data will be available on the properties of all deliberately manufactured or extracted chemical substances handled on the market. For substances handled in larger volumes and for other substances which, for example after initial general tests, are assessed as being particularly dangerous, information on their properties will be available earlier than 2010. The same information requirements will apply to both new and existing substances.	**INFORMATION ON HEALTH AND ENVIRONMENTAL PROPERTIES OF CHEMICAL SUBSTANCES** (revised) By 2018, sufficient information will be available on the hazardous properties of manufactured, imported and extracted chemical substances with respect to human health and the environment. For the interim target to be judged to be met, the following specifications must be fulfilled:

In addition, by 2020 data will be available on the properties of the most important unintentionally formed and extracted chemical substances.	• For medicinal products, sufficient information will be available on the environmental hazards they present, based on expected concentrations of the substances concerned in the environment. • It is particularly important that information is available on chronic toxicity to aquatic organisms and on persistent, bioaccumulative and toxic (PBT) properties. • Based on expected concentrations of the substances in the environment, sufficient information will be available on the environmental hazards of food additives, particularly in the case of substances that are persistent in the environment. • For chemical substances manufactured or imported in significant quantities (over 10 tonnes), information will be available on the health and environmental hazards they present, corresponding to the information requirements of REACH. For individual substances, a lower level of information will be acceptable only if it does not adversely affect the possibility of ensuring safe handling. • For chemical substances manufactured or imported in smaller quantities (1–10 tonnes), information will be available on the health and environmental hazards they present, corresponding to the information requirements for substances that are currently priority low-volume substances under REACH. • No specific information requirements are defined at present for substances manufactured or imported in quantities of less than 1 tonne. • When methods become available that are reasonable from an animal welfare and an economic point of view, the interim target should be supplemented to include additional information requirements. Information requirements should then be made more stringent for all substances below 10 tonnes. • For all substances, regardless of quantity, for which the information available is inadequate in relation to their handling, companies must take this uncertainty about risks into account in their assessment and perform further tests or take additional precautions to prevent damage to human health and the environment. • Information will be available on the health and environmental hazards of nanosubstances.
2. INFORMATION ON DANGEROUS SUBSTANCES IN PRODUCTS By 2010 finished products will carry health and environmental information on any dangerous substances they contain.	**INFORMATION ON DANGEROUS SUBSTANCES IN PRODUCTS** (revised) By 2018, anyone using a product will be provided with health and environmental information on any dangerous substances present in it. This information will be available throughout the life cycle of the product.

3. PHASE-OUT OF SUBSTANCES OF VERY HIGH CONCERN Regarding the phase-out of substances of very high concern, the following shall apply. Newly manufactured finished products will as far as possible be free from: • new organic substances that are persistent and bioaccumulating, new substances that are carcinogenic, mutagenic and reprotoxic, and mercury, as soon as possible, but no later than 2007; • other carcinogenic, mutagenic and reprotoxic substances, and endocrine disrupting substances or highly allergenic substances, by 2010, if the products that contain them are intended to be used in such a way that they will enter natural cycles; • other organic substances that are persistent and bioaccumulating, and cadmium and lead, by 2010. Nor will these substances be used in production processes unless the company can prove that human health and the environment will not be harmed. Already available finished products containing substances with the properties listed above, or mercury, cadmium or lead, will be handled in such a way that the substances in question are not released to the environment. The spread to Sweden by air or water of substances covered by this interim target will decrease continuously. This interim target applies to substances that are man-made or extracted from the natural environment. It also applies to substances giving rise to substances with the above properties, including those formed unintentionally.	**SUBSTANCES OF VERY HIGH CONCERN** (revised) 1. Newly manufactured products will as far as possible be free from substances of very high concern. 2. By 2015, products containing substances of very high concern will, throughout their life cycle, be handled in such a way that those substances are not released into the environment. 3. Emissions from production processes of substances of very high concern will as far as possible be reduced. By 2015, substances of very high concern will not be used in production processes unless the operator can demonstrate that no harm will be caused to human health or the environment. 4. The long-range transport to Sweden, by air or water, of substances of very high concern will be continuously reduced. This interim target applies to substances that are manufactured, recovered, or extracted from the natural environment. 'Substances of very high concern' means: • substances that are persistent and bioaccumulative (PB substances), • substances that are carcinogenic, mutagenic or toxic for reproduction (CMR substances), • endocrine-disrupting or highly allergenic substances, and • the heavy metals mercury, cadmium and lead.
4. CONTINUOUS REDUCTION OF HEALTH AND ENVIRONMENTAL RISKS OF CHEMICALS Health and environmental risks associated with the manufacture and use of chemical substances will be reduced continuously up to 2010, as measured by indicators and ratios to be established by the competent authorities. Over the same period, the occurrence and use of chemical substances which impede recycling of materials will decrease. This target applies to substances not covered by interim target 3.	**REDUCING HEALTH AND ENVIRONMENTAL RISKS OF CHEMICAL SUBSTANCES** (revised) The health and environmental risks associated with all handling of chemical substances will be continuously reduced and will by 2018 be so low that no harm will be caused to human health or the environment. Particular account is to be taken of children and sensitive groups. Over the same period, the use of chemical substances that impede recycling of materials will be reduced, so that recycling is not prevented.
5. GUIDELINE VALUES FOR ENVIRONMENTAL QUALITY By 2010 guideline values will be established by the competent authorities for at least 100 selected chemical substances not covered by interim target 3.	To be withdrawn. Achieved before the target year 2010.

6. REMEDIATION OF CONTAMINATED SITES Studies will have been carried out and, where necessary, appropriate action will have been taken by the end of 2010 at all contaminated sites that pose an acute risk on direct exposure, and at contaminated sites that threaten important water sources or valuable natural environments, today or in the near future.	**REMEDIATION OF CONTAMINATED SITES** (revised, combining interim targets 6 and 7) By 2015, priority contaminated sites will have been remediated to such an extent that the problem will be solved no later than 2050. Collated, clear and quality-assured information on contaminated sites will be generally available no later than 2015. For the interim target to be judged to be met, the following specifications must be fulfilled: • Identification of priority sites will ensure that contaminated sites posing very high risks to human health or the environment are remediated first. Particular priority will be given to sites which pose acute risks to humans on direct exposure or which, now or in the near future, threaten important water sources or valuable natural environments. • Generally available information on contaminated sites will ensure that sufficient data on potential and confirmed contaminated sites are available and capable of being utilized to avoid sites being used in ways that cause harm to human health or the environment.
7. REMEDIATION OF CONTAMINATED SITES Between 2005 and 2010, measures will be implemented at a sufficiently large portion of the prioritized contaminated sites to ensure that the environmental problem as a whole can be solved by 2050 at the latest.	
8. DIOXINS IN FOOD By 2010 clear action programmes will have been established to bring about a continuous decrease in levels in food of dioxins harmful to humans.	To be withdrawn after the target year 2010.
	UNINTENTIONALLY PRODUCED SUBSTANCES (new) By 2015, information will be available on the formation, sources, emissions and dispersion of the most important unintentionally produced substances. By the same date, studies will have been made of the environmental and health properties of the substances in question. Releases to the environment of these unintentionally produced substances will be continuously reduced.
9. CADMIUM By 2015 the dietary and occupational exposure of the population to cadmium will be at a level that is safe from a long-term public health point of view.	**DIETARY AND OCCUPATIONAL EXPOSURE TO CADMIUM** (revised) By 2015, the dietary and occupational exposure of the population to cadmium will be at a level at which the entire population is protected, with particular account taken of sensitive groups.

5. A PROTECTIVE OZONE LAYER

Current	Proposed
The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.	The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.

Interim target

EMISSIONS OF OZONE-DEPLETING SUBSTANCES By 2010 the great majority of emissions of ozone-depleting substances will have ceased.	To be withdrawn after the target year 2010.

6. A SAFE RADIATION ENVIRONMENT

Current	Proposed
Human health and biological diversity must be protected against the harmful effects of radiation in the external environment.	Human health and biological diversity must be protected against the harmful effects of radiation.

Interim targets

1. RADIOACTIVE SUBSTANCES By 2010 environmental concentrations of radioactive substances emitted from all human activities will be so low as not to represent a threat to human health or biological diversity. The additional individual dose to members of the public will be lower than 0.01 mSv per person per year from each individual operation.	To be withdrawn after the target year 2010.
	DISPOSAL OF RADIOACTIVE WASTE (new) By 2020, systems for safe disposal of all radioactive waste will be in place. For the interim target to be judged to be met, the following specifications must be fulfilled: • Decisions will have been made, under a national waste plan, on methods of dealing with all radioactive waste; these will include decisions on how disposal of spent nuclear fuel is to take place. • Long-term responsibility for management and final disposal of all types of radioactive waste will be determined. • A solution will have been found to the problem of long-term preservation of information about final disposal facilities (repositories) for long-lived radioactive waste, including their location and contents. • Historical and orphan radioactive waste will have been disposed of.
2. SKIN CANCER By 2020 the annual incidence of skin cancer caused by ultraviolet radiation will not be greater than it was in 2000.	**INCIDENCE OF SKIN CANCER** (unchanged) By 2020 the annual incidence of skin cancer caused by ultraviolet radiation will not be greater than it was in 2000.
3. ELECTROMAGNETIC FIELDS Risks associated with electromagnetic fields will be studied on an ongoing basis and necessary action will be taken as any such risks are identified.	**EXPOSURE TO ELECTROMAGNETIC FIELDS** (revised) By 2020, exposure to electromagnetic fields in workplaces and other environments will be so low that human health and the environment will remain protected. For the interim target to be judged to be met, the following specifications must be fulfilled: • There will be a programme of continuous environmental monitoring of exposure to EMFs among the public and employees, with regularly issued reports. These reports will cover exposure among the public and employees in various environments and for various applications, for fields ranging from 0 Hz to 300 GHz. • There will be a programme of continuous and effective supervision of activities entailing risks of harmful exposure to EMFs.

	• Risk assessments, based on the overall scientific state of knowledge of environmental medicine and of exposure levels, will exist for various EMF applications. These assessments will be updated annually. • All the local and regional supervisory agencies concerned will possess relevant knowledge of EMFs. • A plan for communication of information about risks to the public will have been drawn up by the agencies concerned, in cooperation with operators. • The county councils and primary care services will be kept informed about the state of knowledge and a common view will prevail on the kind of care that should be provided for people suffering from, or worried about, damage to their health.

7. ZERO EUTROPHICATION

Current	Proposed
Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.	Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.

Interim targets

1. PHOSPHORUS EMISSIONS By 2010 Swedish waterborne anthropogenic emissions of phosphorus compounds into lakes, streams and coastal waters will have decreased by at least 20% from 1995 levels. The largest reductions will be achieved in the most sensitive areas.	**PHOSPHORUS EMISSIONS** (revised) By 2016, action will have been taken to reduce Swedish waterborne anthropogenic emissions of phosphorus compounds to the Baltic Sea by 290 tonnes from the level of 1997–2003, in accordance with HELCOM's preliminary burden-sharing formula.
2. NITROGEN EMISSIONS By 2010 Swedish waterborne anthropogenic emissions of nitrogen compounds into sea areas south of the Åland Sea will have been reduced by at least 30% compared with 1995 levels.	**NITROGEN EMISSIONS** (revised) By 2016, action will have been taken to reduce Swedish waterborne anthropogenic emissions of nitrogen compounds to the Baltic Sea by 20,780 tonnes from the level of 1997–2003, in accordance with HELCOM's preliminary burden-sharing formula.
3. AMMONIA EMISSIONS By 2010 emissions of ammonia in Sweden will have been reduced by at least 15% compared with 1995 levels.	**AMMONIA EMISSIONS** (revised) By 2015, emissions of ammonia in Sweden will have been reduced by 13% compared with 2005 levels.
4. NITROGEN OXIDE EMISSIONS By 2010 emissions of nitrogen oxides to air in Sweden will have been reduced to 148,000 tonnes.	**NITROGEN OXIDE EMISSIONS** (revised) By 2015, emissions of nitrogen oxides to air in Sweden will have been reduced to 130,000 tonnes.

8. FLOURISHING LAKES AND STREAMS

Current	Proposed
Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded. This environmental quality objective is intended to be achieved within one generation.	Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded.

Interim targets

1. PROTECTION OF NATURAL AND CULTURAL ENVIRONMENTS By 2005 the competent authorities will have identified and drawn up action programmes for natural and cultural environments, in or in the vicinity of lakes or streams, that are of particularly high conservation value and require long-term protection. By 2010 long-term protection will be provided for at least half of these environments, which must be evenly distributed among the five water districts. There must be at least 15 no-fishing areas in every water district.	**CONSERVATION OF NATURAL AND CULTURAL ENVIRONMENTS** (revised) By 2015, two-thirds of natural and cultural environments of particular national value, in and in the vicinity of lakes and watercourses, will be conserved on a long-term basis. For the interim target to be judged to be met, the following specifications must be fulfilled: • Defined conservation objectives will be met in two-thirds of natural environments of particular value. • By 2015, two-thirds of cultural environments of particular value will have achieved good conservation status. • The qualities of aquatic environments for recreation and tourism will be used in a sustainable manner.
2. RESTORATION OF RIVERS AND STREAMS By 2005 the competent authorities will have identified and drawn up action programmes for the restoration of Swedish rivers and streams of high conservation value or with the potential to acquire high conservation value following remediation. By 2010 at least 25% of valuable and potentially valuable rivers and streams will have been restored.	**RESTORATION OF LAKES AND WATERCOURSES** (revised) By 2015, good conditions for species and habitats will have been restored in one-third of watercourses and lakes of national value or potential value that are judged to be in need of restoration. For the interim target to be considered to be met, the following specifications must be fulfilled: • Restored environments will, in the long term, be able to achieve favourable conservation status. • Measures will be planned and implemented taking the cultural environment into account and in such a way as to avoid damage to ancient monuments and remains.
3. WATER SUPPLY PLANS By 2009 water supply plans, including water protection areas and protection regulations, will have been adopted for all public and large private surface water sources. Large surface water sources are defined as surface waters used for the abstraction of water and serving more than 50 persons or providing more than 10 m^3 a day as an average.	**GOOD-QUALITY DRINKING WATER – SURFACE WATER** (revised) By 2015, all bodies of surface water used for the abstraction of drinking water will meet Swedish water quality standards with respect to pollutants resulting from human activities. There must be no deterioration of the present quality of raw water. For the interim target to be judged to be met, the following specifications must be fulfilled: • Water quality standards will have been adopted. • Water protection areas, with relevant regulations and boundaries, will be in place for all bodies of surface water providing more than 10 m^3 a day as an average or serving more than 50 persons.
4. RELEASES OF ANIMALS AND PLANTS By 2005 releases of aquatic animals and plants will be undertaken in ways which do not adversely affect biological diversity.	To be withdrawn. Achieved by the target year 2005. To be replaced with a revised interim target for releases of species and management of fish populations (see below).
	RELEASES OF SPECIES AND MANAGEMENT OF FISH POPULATIONS (revised) By 2015, releases and handling of fish and other organisms, and fishing, will be undertaken in ways that do not adversely affect biodiversity. For the interim target to be judged to be met, the following specification must be fulfilled: • There will be no deterioration in the status of naturally occurring habitats, species and populations in the freshwater system.

5. ACTION PROGRAMMES FOR THREATENED SPECIES By 2005 action programmes will have been prepared and introduced for threatened species and fish stocks that are in need of targeted measures.	To be withdrawn. Achieved by the target year 2005. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.

9. GOOD-QUALITY GROUNDWATER

Current	Proposed
Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.	Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.

Interim targets

1. PROTECTION OF WATER-BEARING GEOLOGICAL FORMATIONS By 2010 long-term protection from development activities that restrict water use will be provided for water-bearing geological formations of importance in meeting present and future water supply needs.	**PROTECTION OF GROUNDWATER** (revised) By 2015, long-term protection from development activities that restrict the use of water will be provided for water-bearing geological formations of importance in meeting present and future water supply needs. For the interim target to be judged to be met, the following specifications must be fulfilled: • Geological formations of particularly great importance in meeting water supply needs will be designated as resources of national interest. • Water protection areas, with associated regulations, will be in place for all municipal water supply sources. • Water protection areas, with associated regulations, will be in place for all groundwater bodies that could be of importance in meeting future water supply needs. • County administrative boards or other regional bodies, and local authorities, will have up-to-date water supply plans or the equivalent that can serve as a basis for the elaboration of local authority comprehensive plans and regional development programmes. • No extended or new permits will be granted for the extraction of natural gravel from deposits that are of great value for the supply of drinking water. • All water protection areas, including the associated regulations, will be regularly reviewed and, where necessary, revised.
2. GROUNDWATER LEVELS By 2010 the use of land and water will not cause changes in groundwater levels that adversely affect the water supply, soil stability, or the animal and plant life of adjoining ecosystems.	**GROUNDWATER LEVELS** (revised) By 2015, the use of land and water will not cause changes in groundwater levels that adversely affect the water supply, soil stability, or the animal and plant life of adjoining ecosystems. For the interim target to be judged to be met, the following specifications must be fulfilled: • Good quantitative status as defined in the Ordinance on Water Quality Management will be achieved. • All groundwater sources providing more than 100 m^3 a day will be the subject of an environmental court judgment relating to the abstraction of water.

	• County administrative boards and local authorities will be aware of groundwater-dependent ecosystems and take them into account when issuing permits. • Local authorities will be aware of large withdrawals of groundwater. • Underground construction, drilling for the purposes of water abstraction and extraction of energy, and hard landscaping will not result in harmful changes to groundwater levels.
3. GOOD-QUALITY DRINKING WATER By 2010 all bodies of water used for the abstraction of water intended for human consumption, and providing more than 10 m^3 a day as an average or serving more than 50 persons, will meet the Swedish standards for good-quality drinking water with respect to anthropogenic pollution.	**GOOD-QUALITY DRINKING WATER – GROUNDWATER** (revised) By 2020, all bodies of water used for the abstraction of water intended for human consumption, and providing more than 10 m^3 a day as an average or serving more than 50 persons, will meet Swedish standards for good-quality drinking water with respect to pollutants resulting from human activities. For the interim target to be judged to be met, the following specifications must be fulfilled: • Good qualitative status as defined in the Ordinance on Water Quality Management will be achieved. • Programmes of measures, as provided for in particular in the Ordinance on Water Quality Management, will be effective.
	PRIVATE WATER SUPPLIES (new) By 2020, drinking water from private water supplies will comply with Swedish guidelines. For the interim target to be judged to be met, the following specifications must be fulfilled: • The use of groundwater for private water supplies will not be restricted by pollutants resulting from human activities. • Groundwater-based drinking water obtained from private supplies will have been tested in accordance with the recommendations of the National Board of Health and Welfare. • New drilled wells will comply with the requirements set out in the Geological Survey of Sweden's guidance on drilling of heat pump boreholes and water wells, and suitable groundwater will be used for water supplies. • Guidance will be available on the construction of wells in superficial deposits. • Drinking water from private supplies will comply with the water quality recommendations set out in the National Board of Health and Welfare's general guidelines on precautionary measures relating to drinking water. • If treatment of raw water is necessary, easily operated, cost-effective and environmentally sound methods of treatment will be used to comply with the National Board of Health and Welfare's recommendations on drinking water quality. • Information on areas with a risk of elevated concentrations of harmful substances will be given in local authorities' comprehensive plans, as a basis, for example, for planning permission decisions.

10. A BALANCED MARINE ENVIRONMENT, FLOURISHING COASTAL AREAS AND ARCHIPELAGOS

Current	Proposed
The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance. This environmental quality objective is intended to be achieved within one generation.	The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance.

Interim targets

1. PROTECTION OF ENVIRONMENTS By 2010 long-term protection will be provided for at least 50% of marine environments of high conservation value and at least 70% of coastal and archipelago areas with significant natural and cultural assets. By 2005 another five marine areas, plus a further 14 by 2010, will be protected as nature reserves. Together, these will form a representative network of marine natural habitats. In addition, an area in which fishing is permanently banned will be established by 2006 for evaluation by 2010. A further three coastal and open sea areas with permanent bans will be established in the Baltic Sea and the North Sea respectively by 2010 for evaluation by 2015.	**CONSERVATION OF MARINE NATURAL ASSETS** (revised) By 2015, a representative network of marine areas of high conservation value, covering at least 15% of Sweden's total marine area, will be established and conserved. For the interim target to be judged to be met, the following specifications must be fulfilled: • The areas will be distributed over Sweden's marine geographical regions and will include all habitats occurring in the regions concerned. • Favourable conservation status will be achieved. • Long-term protection will be in place for at least 10% of Sweden's marine area. • For the remaining 5% included in the network, 'marine conservation plans' or corresponding management arrangements will be in place to ensure that the marine natural assets of the areas are conserved. • By 2010, three no-fishing areas (in inshore and offshore waters) will be established in the Baltic Sea and three in the Kattegat and Skagerrak, for evaluation by 2015.
2. STRATEGY FOR CULTURAL HERITAGE AND AGRICULTURAL LANDSCAPES By 2005 a strategy will have been adopted for the preservation and use of the cultural heritage and agricultural landscapes of coastal and archipelago areas.	To be withdrawn. Achieved by the target year 2005.
3. ACTION PROGRAMMES FOR THREATENED MARINE SPECIES By 2005 action programmes will have been prepared and introduced for threatened marine species and fish stocks that are in need of targeted measures.	To be withdrawn. Not achieved by the target year 2005. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.

4. BYCATCH By 2010 total annual bycatches of marine mammals will not exceed 1% of each population. Bycatches of seabirds and non-target fish species will have a negligible impact on the populations concerned and on the ecosystem.	**BYCATCH** (revised) By 2015, bycatch of marine mammals and seabirds will have no more than a negligible adverse impact on the populations concerned or the ecosystem. For the interim target to be judged to be met, the following specifications must be fulfilled: • Bycatch must not threaten favourable conservation status or prevent that status being achieved. • Quantitative milestone targets will be set in conjunction with the drawing up of action plans.
5. CATCHES AND RECRUITMENT OF FISH By 2008 catches of fish, including bycatches of juveniles, will not exceed levels commensurate with maintaining fish stocks of a size and composition sufficient to ensure that the ecosystem's basic structure and functions are preserved. Populations will have been restored to levels well above biologically safe limits.	**CATCHES AND RECRUITMENT OF FISH** (revised) By 2015, catches of fish, including bycatch, will have been brought into line with the ecological carrying capacity and resilience of the seas, by means of responsible and sustainable fishing of viable fish populations.
6. NOISE AND OTHER DISTURBANCE By 2010 noise and other disturbance from boat traffic will be negligible in particularly sensitive and designated archipelago and coastal areas. **7. DISCHARGES OF OIL AND CHEMICALS** By 2010 discharges of oil and chemicals from ships will be minimized and reduced to a negligible level by stricter legislation and increased monitoring.	**IMPACTS OF SHIPPING** (revised, combining interim targets 6 and 7) By 2015, shipping will operate in such a way that the spread of alien species is prevented, waste is properly disposed of, discharges of oil and other harmful substances do not occur, and low levels of noise are achieved in sensitive coastal and archipelago areas. For the interim target to be judged to be met, the following specifications must be fulfilled: • By 2015, all ships engaged in international trade which call at Swedish ports will have approved technical systems for treating ballast water that prevent the spread of alien species. • By 2015, ships engaged in domestic trade will have taken suitable measures based on risk analyses performed in accordance with guidelines supporting the Ballast Water Convention. • The number of waste receptacles, toilets and waste reception facilities in archipelago areas will have increased to meet existing needs. • The number of illegal discharges of oil will have decreased compared with 2007. • By 2015, areas with low levels of noise will be established in every county. • By 2015, we will have a better understanding of the effects of underwater noise on marine mammals and fish.
	RESTORATION OF INSHORE HABITATS (new) By 2020, by means of restoration measures, good conditions will be created for high biodiversity and natural recruitment of fish in shallow inshore environments. For the interim target to be judged to be met, the following specifications must be fulfilled: • By 2012, the relevant authorities will have identified disturbed but potentially valuable, shallow inshore habitats important for biodiversity, as well as freshwater habitats important for coastal fish populations, and drawn up regional action programmes for their restoration. • By 2015, half the sites included in action programmes will have been restored.

	USE OF THE COASTAL AND ARCHIPELAGO LANDSCAPE (new) By 2015, the natural, cultural and recreational assets of the coastal and archipelago landscape will be conserved and enhanced through sustainable use. For the interim target to be judged to be met, the following specifications must be fulfilled: • Local authority comprehensive plans will provide guidance for, and regional development programmes, other instruments and arrangements for regional/local cooperation will lend support to, sustainable use and development within the small-scale structures and diversified economies of coastal and archipelago areas. • Natural and cultural heritage assets will be known and accessible. • The coastal and archipelago landscape will be accessible for outdoor pursuits and recreation. • The area of islands, islets and coastal meadows used for grazing will increase. • Buildings and built environments from different periods in the coastal and archipelago landscape will be managed in such a way as to maintain diversity. • The number of particularly valuable environments where cultural assets are conserved on a long-term basis will be no less than 50.

11. THRIVING WETLANDS

Current	Proposed
The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.	The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.

Interim targets

1. STRATEGY FOR PROTECTION AND MANAGEMENT A national strategy for the protection and management of wetlands and wet woodlands will be drawn up by 2005.	To be withdrawn. Achieved by the target year 2005.
2. MIRE PROTECTION PLAN By 2010 long-term protection will be provided for all the wetland areas listed in the Mire Protection Plan for Sweden.	To be withdrawn after the target year 2010. To be included in the interim target for wetland conservation (see below).
	WETLAND CONSERVATION (new) By 2015, the natural and cultural environment of particularly valuable wetlands will be conserved. For the interim target to be judged to be met, the following specifications must be fulfilled: • The conservation objectives adopted will be met for at least 90% of wetlands. • All mires listed in the Mire Protection Plan for Sweden will enjoy long-term protection. • Cultural traces will be identified and documented.

3. FOREST ROADS By 2006 forest roads will not be built over wetlands with significant natural or cultural assets or in such a way as to adversely affect such wetlands.	To be withdrawn. Not achieved by the target year 2006. To be partly included in the interim target relating to consideration for wetlands (see below).
	CONSIDERATION FOR WETLANDS (new) By 2015, the natural and cultural heritage assets of valuable wetlands will no longer be adversely affected by human activities. For the interim target to be judged to be met, the following specifications must be fulfilled: • Land drainage, peat extraction and damage from off-road driving will not occur. • Felling and other forestry measures will be carried out with ample consideration for the environment. • Roads will be constructed in such a way as not to cause damage.
4. WETLANDS ON AGRICULTURAL LAND At least 12,000 hectares of wetlands and ponds will be established or restored on agricultural land by 2010.	**WETLANDS ON AGRICULTURAL LAND** (revised) By 2015, at least 5,000 hectares of wetlands will be established or restored on agricultural land. For the interim target to be judged to be met, the following specifications must be fulfilled: • Biodiversity will be fostered through habitat creation and improvement. • At least eight large (>150 ha) wetland areas or lakes in the agricultural plains will be re-established. • Wetlands will be designed with reference to the natural and cultural environment of the surrounding landscape. • Cultural traces will be preserved and exposed to view. • The nitrogen removal effect will amount to at least 650 tonnes a year.
5. ACTION PROGRAMMES FOR THREATENED SPECIES By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.	To be withdrawn. Achieved by the target year 2005. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.

12. SUSTAINABLE FORESTS

Current	Proposed
The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded. This environmental quality objective is intended to be achieved within one generation.	The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded.

Interim targets

1. LONG-TERM PROTECTION OF FOREST LAND A further 900,000 hectares of forest land of high conservation value will be excluded from forest production by the year 2010.	**CONSERVING FOREST LAND OF HIGH CONSERVATION VALUE** (revised) By 2020, the area of productive forest land of high conservation value that is excluded from forest production will amount to 1,600,000 ha with formal protection and 1,000,000 ha subject to voluntary conservation.

	MANAGEMENT OF FORMALLY PROTECTED AND VOLUNTARILY CONSERVED FOREST LAND (new) During the period 2011–20, forest land in need of management in formally protected and voluntarily conserved areas will be provided with the management required.
2. ENHANCED BIOLOGICAL DIVERSITY By 2010 the amount of dead wood, the area of mature forest with a large deciduous element and the area of old forest will be maintained and increased by: • increasing the quantity of hard dead wood by at least 40% throughout the country and considerably more in areas where biological diversity is particularly at risk; • increasing the area of mature forest with a large deciduous element by at least 10%; • increasing the area of old forest by at least 5%; • increasing the area regenerated with deciduous forest.	To be withdrawn after the target year 2010 and partly replaced with an interim target for structures of biological value on productive forest land (see below).
	STRUCTURES OF BIOLOGICAL VALUE ON PRODUCTIVE FOREST LAND (new) By 2020, in order to enhance and preserve biologically valuable structures, the volume of hard dead wood will increase by at least 30 million cubic metres standing volume nationwide. By the same year, the area of young and semi-mature forest with a large deciduous element will be at least maintained, and the area of mature forest with a large deciduous element will increase by at least 10%.
3. PROTECTION OF CULTURAL HERITAGE By 2010 forest land will be managed in such a way as to avoid damage to ancient monuments and to ensure that damage to other known valuable cultural remains is negligible.	**PROTECTION OF CULTURAL HERITAGE** (revised) Forest land will be managed in such a way that traces of historical human use and presence are preserved and ancient monuments and the sites they occupy are not damaged. By 2015, compared with 2010, the number of other cultural remains that are damaged annually in conjunction with forestry operations will be halved.
4. ACTION PROGRAMMES FOR THREATENED SPECIES By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.	To be withdrawn. Achieved by the target year 2005. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.
	ENVIRONMENT IN AND AROUND WATER IN FOREST LANDSCAPE (new) From 2010, forestry operations will not entail run-off of organic or inorganic material into watercourses. When watercourses are crossed, the natural bed of the watercourse will be preserved and no barriers to migration will be created. At least 90% of the length of watercourses and lake and marine shorelines affected by forestry operations will have buffer zones, the ecological functions of which will be preserved or enhanced.

13. A VARIED AGRICULTURAL LANDSCAPE

Current	Proposed
The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.	The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.

Interim targets

1. MEADOW AND PASTURE LAND By 2010 all meadow and pasture land will be preserved and managed in such a way as to preserve its value. The area of traditionally managed meadow land will increase by at least 5,000 hectares and the area of managed pasture land of the most endangered types will increase by at least 13,000 hectares by 2010.	**MEADOW AND PASTURE LAND** (revised) By 2020, meadow and pasture land will be conserved in such a way as to preserve and enhance its biodiversity and cultural heritage assets. For the interim target to be judged to be met, the following specifications must be fulfilled: • At least 550,000 ha of meadow and pasture land will be conserved. • The area of hay meadows will increase to 30,000 ha and road verges with meadow species will increase in extent so as to represent at least 10% of the road network in the farmed landscape. • The conservation status of habitat types and species will be improved. • The number of trees of high conservation value will not decrease. • Cultural traces will be conserved and exposed to view.
2. SMALL-SCALE HABITATS Small-scale habitats on farmland will be preserved to at least the same extent as today throughout the country. By 2005 a strategy will have been adopted to increase the number of such habitats on the agricultural plains of Sweden.	To be included in the new interim target for the arable landscape (see below). The aspect of the present target with 2005 as its target year has been met.
	ARABLE LANDSCAPE (new) By 2020, the biodiversity and cultural heritage assets of arable land will be conserved and the scope for enhanced diversity will be increased. For the interim target to be judged to be met, the following specifications must be fulfilled: • The total number of small-scale farmland habitats will not diminish. • Cultural traces will be conserved and at least half will be exposed to view. • The conservation status of threatened species will be improved. • The adverse trend for common species will be reversed. • The number of trees of high conservation value will not decrease. • In the agricultural plains, the area of land set aside to promote biodiversity will be increased to 80,000 ha.
3. CULTURALLY SIGNIFICANT LANDSCAPE FEATURES The number and extent of culturally significant landscape features that are managed will increase by about 70% by 2010.	To be withdrawn after the target year 2010. Cultural traces are to be included in the new interim target for the arable landscape (see above).

4. PLANT GENETIC RESOURCES AND INDIGENOUS BREEDS By 2010 the national programme for plant genetic resources will be fully developed and there will be sufficient numbers of individuals to ensure the long-term conservation of indigenous breeds of domestic animals in Sweden.	**CULTIVATED DIVERSITY** (revised) By 2015, valuable cultivated diversity will be conserved in a manner that is sustainable in the long term. For the interim target to be judged to be met, the following specifications must be fulfilled: • Conservation systems for all plant groups will exist, and the material will be easily accessible to users. • Criteria for determining what is worth conserving in the long term will have been adopted. • Conservation will take place with a view to long-term sustainability of use. • Documentation and information about the material will exist and be easily accessible. • The biological cultural heritage that the material represents will be brought to life.
	LIVESTOCK GENETIC RESOURCES (revised) By 2020, the livestock breeds that Sweden is responsible for conserving will be conserved for the long term and be sustainably used. For the interim target to be judged to be met, the following specifications must be fulfilled: • No later than 2020, the majority of the livestock breeds that Sweden is responsible for conserving will be in the FAO's 'Not at risk' category. • Other breeds are those whose status in 2007 was categorized as 'Critical' or 'Critical–maintained' and breeds for whose conservation Sweden has recently become responsible. These will, at worst, have attained the status of 'Endangered–maintained'. • The rate of inbreeding in commercial breeds should not rise by more than 1% per generation.
5. ACTION PROGRAMMES FOR THREATENED SPECIES By 2006 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.	To be withdrawn. Achieved by the target year 2006. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.
6. FARM BUILDINGS OF CULTURAL HERITAGE VALUE By 2005 a programme will have been prepared for the conservation of farm buildings of cultural heritage value.	To be withdrawn. Achieved by the target year 2005.
	BUILDINGS AND BUILT ENVIRONMENTS (new) By 2020, the buildings and built environments of the farmed landscape from various periods will be managed in such a way as to maintain their diversity. For the interim target to be judged to be met, the following specifications must be fulfilled: • At least half of the redundant buildings on farmland will be conserved and managed in such a way as to retain their qualities. • The negative trend for working and redundant buildings that lend character to an area will be reversed. • The number of shielings in use will not be below 230. • The number of particularly valuable coherent agrarian environments that are conserved will not be below 60.

	ORGANIC PRODUCTION (new) By 2020, at least 20% of farmland will be certified for organic production. For the interim target to be judged to be met, the following specification must be fulfilled: • Certified organic production in accordance with the interim target will be practised virtually throughout Sweden.

14. A MAGNIFICENT MOUNTAIN LANDSCAPE

Current	Proposed
The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.	The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.

Interim targets

1. DAMAGE TO SOIL AND VEGETATION By 2010 damage to soil and vegetation caused by human activities will be negligible.	**DAMAGE TO ASSETS IN MOUNTAIN AREAS** (revised) Damage to natural and cultural assets caused by human activities will be reduced so that, by 2015, it is negligible in the mountain region as a whole and has ceased in valuable natural and cultural environments.
2. NOISE Noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced to meet the following requirements: • by 2015 at least 60% of light off-road vehicles will meet stringent noise standards (below 73 dBA); • by 2010 the noise from aircraft will be negligible both in class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the national park area.	**NOISE IN MOUNTAIN AREAS** (revised) By 2015, noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced. For the interim target to be judged to be met, the following specifications must be fulfilled: • By 2015, at least 60% of light off-road vehicles will meet stringent noise standards (below 73 dBA). • By 2015, the noise from aircraft will be negligible both in Class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the area of each national park.
3. NATURAL AND CULTURAL ASSETS By 2010 long-term protection, including where necessary management and restoration measures, will have been provided for the majority of mountain areas with representative and significant natural and cultural assets.	**PROTECTION OF ASSETS IN MOUNTAIN AREAS** (revised) By 2020, long-term protection will be provided for 90% of environments with valuable natural, cultural and recreational assets.
4. ACTION PROGRAMMES FOR THREATENED SPECIES By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.	To be withdrawn. Achieved by the target year 2005. Related issues to be dealt with under *A Rich Diversity of Plant and Animal Life*.
	MOUNTAIN LANDSCAPE (new) By 2015, the area of extensive open mountain landscape characterized by reindeer grazing will not be decreasing.

15. A GOOD BUILT ENVIRONMENT

Current	Proposed
Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.	Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.

Interim targets

1. PROGRAMMES AND STRATEGIES FOR PLANNING By 2010 land use and community planning will be based on programmes and strategies for: • achieving a varied supply of housing, workplaces, services and cultural activities, in order to reduce transport demand and improve the scope for environmentally sound and resource-efficient transport; • preserving and enhancing cultural and aesthetic assets; • preserving, maintaining and enhancing green spaces and water bodies in urban and suburban areas for nature conservation, cultural and recreational purposes, and ensuring that the proportion of hard-surface areas in these environments does not increase; • promoting more efficient energy use – thereby reducing it over time – and promoting use of renewable energy resources and development of production plants for district heating, solar energy, biofuels and wind power.	**PROGRAMMES AND STRATEGIES FOR PLANNING** (revised) By 2015, land use and community planning will be based on programmes and strategies for an environmentally sound and healthy structure of the built environment. For the interim target to be judged to be met, the programmes and strategies must, in the light of local and regional needs and conditions, cover the following questions: • how to achieve a wide range of housing, workplaces, services and cultural activities, with a view to reducing transport needs and improving the scope for environmentally sound and resource-efficient transport; • how to protect and enhance cultural heritage assets; • how to protect and enhance aesthetic assets; • how to conserve, care for and enhance green spaces and water bodies in urban and suburban areas, for nature conservation, cultural heritage and recreational purposes, and how to continue restricting the proportion of hardened surfaces in these environments; • how to ensure that energy use becomes more efficient and is reduced, how to make use of renewable energy resources, and how to promote expansion of production facilities for district heating, solar energy, biofuels and wind power; • how to safeguard water supply and wastewater disposal in a healthy, resource-saving and environmentally sound manner; • how to address risks of flooding, subsidence, landslides etc. in the light of climate change.
2. BUILT ENVIRONMENTS OF CULTURAL HERITAGE VALUE By 2010 built environments of cultural heritage value will be identified and placed under long-term sustainable management.	**BUILT ENVIRONMENTS OF CULTURAL HERITAGE VALUE** (revised) By 2020, there will be good prospects of protecting and enhancing the cultural and historical value and diversity of our built heritage. For the interim target to be judged to be met, the following specifications must be fulfilled: • Skills and knowledge relating to cultural heritage will be used by the authorities concerned and by property owners in their management and modification of the built environment. • Municipal and regional knowledge in this area will have full geographical coverage and be continuously enhanced and used. • At least 30% of all buildings considered particularly valuable under the Planning and Building Act will enjoy formal protection.

3. NOISE By 2010 the number of people who are exposed to traffic noise in excess of the guide values approved by Parliament for noise in dwellings will have been reduced by 5% compared with 1998.	**NOISE** (revised) By 2020, levels of transport noise outdoors in housing environments will be at least 5 dBA lower than in 1998, mainly as a result of noise reduction at source. The emphasis will be on the most effective ways of reducing noise disturbance, on the people and housing environments exposed to the most noise, and on achieving the guide values for indoor residential spaces.
4. EXTRACTION OF NATURAL GRAVEL By 2010 extraction of natural gravel in the country will not exceed 12 million tonnes per year.	**EXTRACTION OF NATURAL GRAVEL** (revised) By 2020, extraction of natural gravel will take place only to meet essential needs and in areas where conflicting interests, in the form of drinking-water requirements and natural and cultural assets, are limited. For the interim target to be judged to be met, the following specifications must be fulfilled: • Natural gravel will be used only where it is not possible to use substitutes in specific applications. • No extraction of natural gravel will take place in deposits that are of great value for the drinking-water supply and the natural and cultural landscape.
5. WASTE The total quantity of waste generated will not increase and maximum use will be made of its resource potential while minimizing health and environmental effects and associated risks. In particular: • The quantity of waste disposed of to landfill, excluding mining waste, will be reduced by at least 50% by 2005 compared with 1994. • By 2010 at least 50% of all household waste will be recycled through materials recovery, including biological treatment. • By 2010 at least 35% of food waste from households, restaurants, caterers and retail premises will be recovered by means of biological treatment. This target relates to food waste separated at source for both home composting and centralized treatment. • By 2010 food waste and comparable wastes from food processing plants etc. will be recovered by means of biological treatment. This target relates to waste that is not mixed with other wastes and that is of such a quality as to be suitable, following treatment, for recycling into crop production. • By 2015 at least 60% of phosphorus compounds present in wastewater will be recovered for use on productive land. At least half of this amount should be returned to arable land.	**WASTE** (revised) By 2015, maximum use will be made of the resource potential of waste, while its impacts on and risks to health and the environment will be minimized. Waste management will be efficient for society and simple for consumers. For the interim target to be judged to be met, the following specifications must be fulfilled: • The total quantity of waste and its hazardousness will be reduced in comparison with 2004 (excluding mining waste). • Collection will take place in an aesthetically satisfactory way, with good accessibility and safety for households, and separate collection of hazardous waste will be ensured. At least 90% of households will be satisfied with the collection systems. • Litter in outdoor areas to which the public have access will have decreased by 50% compared with 2008. • At least 35% of food waste from households, restaurants, catering establishments and retail premises will be disposed of in such a way that the plant nutrients can be used. • At least 60% of the phosphorus compounds in waste water will be used as plant nutrients. At least half will be restored to arable land.
6. ENERGY USE ETC. IN BUILDINGS Total energy consumption per unit area heated in residential and commercial buildings will decrease, with target reductions of 20% by 2020 and 50% by 2050, compared with consumption in 1995. By 2020 dependence on fossil fuels for the energy used in the built environment sector will be broken, at the same time as there will be a continuous increase in the share of renewable energy.	**ENERGY USE IN BUILDINGS** (unchanged) Total energy consumption per unit area heated in residential and commercial buildings will decrease, with target reductions of 20% by 2020 and 50% by 2050, compared with consumption in 1995. By 2020 dependence on fossil fuels for the energy used in the built environment sector will be broken, at the same time as there will be a continuous increase in the share of renewable energy.

7. A GOOD INDOOR ENVIRONMENT By 2020 buildings and their characteristics will not have adverse impacts on health. It must therefore be ensured that • all buildings in which people frequently spend time or spend extended periods of time have ventilation of documented efficiency by 2015, • radon levels in all schools and pre-schools are below 200 Bq/m³ air by 2010 and that • radon levels in all dwellings are below 200 Bq/m³ air by 2020.	**A GOOD INDOOR ENVIRONMENT** (unchanged) By 2020 buildings and their characteristics will not have adverse impacts on health. It must therefore be ensured that • all buildings in which people frequently spend time or spend extended periods of time have ventilation of documented efficiency by 2015, • radon levels in all schools and pre-schools are below 200 Bq/m³ air by 2010 and that • radon levels in all dwellings are below 200 Bq/m³ air by 2020.

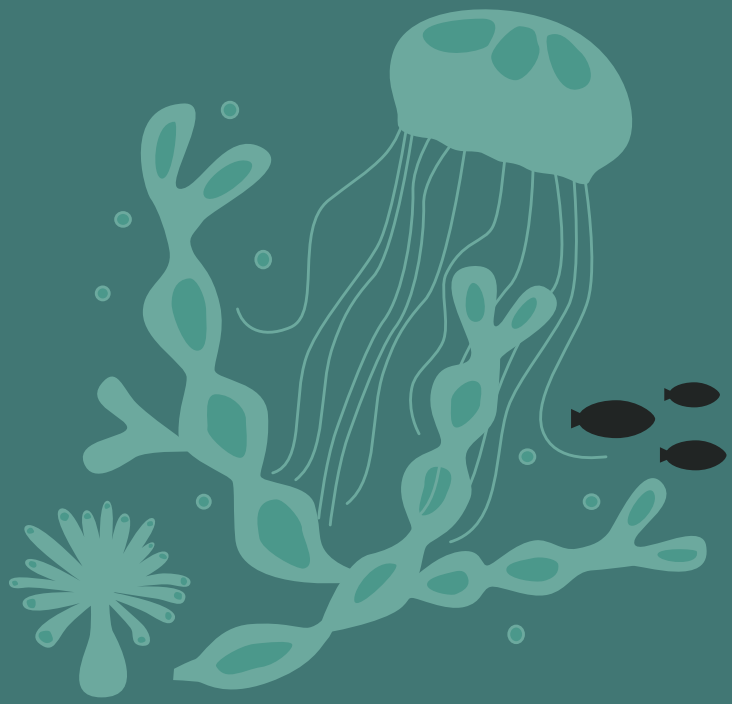
16. A RICH DIVERSITY OF PLANT AND ANIMAL LIFE

Current	Proposed
Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being.	Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being.

Interim targets

1. HALTING THE LOSS OF BIODIVERSITY By 2010 loss of biological diversity in Sweden will have been halted.	**LOSS OF BIODIVERSITY** (unchanged) By 2010 loss of biological diversity in Sweden will have been halted.
2. FEWER SPECIES UNDER THREAT By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.	**FEWER SPECIES UNDER THREAT** (unchanged) By 2015 the conservation status of threatened species in Sweden will have improved to the point where the proportion of evaluated species classified as threatened will have fallen by at least 30% on corresponding figures for 2000, with no increase in the percentage of species that have become regionally extinct.
3. SUSTAINABLE USE By 2007 follow-up methods will have been developed with a view to ensuring that biological diversity and biological resources, both terrestrial and aquatic, are used in a sustainable manner. By 2010 biological diversity and biological resources, both terrestrial and aquatic, will be used in a sustainable manner, so that biodiversity is maintained at the landscape level.	**SUSTAINABLE USE IN A LANDSCAPE PERSPECTIVE** (revised) By 2015, biological diversity and biological resources will be used in a sustainable manner, so that species and ecosystems are conserved and restored at the landscape level. For the interim target to be judged to be met, the following specifications must be fulfilled: • Ecosystems, processes, habitat types and structures will be present in the landscape on such a scale that all species occurring naturally in Sweden that are not under threat survive in viable populations within their natural ranges, and no previously viable species are threatened. • A landscape approach will be applied in the implementation and application of measures and policy instruments in nature conservation.

	• Effects on the wider landscape of measures undertaken will be taken into account in agriculture, forestry, fishing and other sectors. • The resilience of nature (its capacity to withstand and recover from change) will be maintained or increase. • Measures implemented in work on the other environmental objectives must not jeopardize biodiversity. • The landscape will be used in a way that enhances the scope for biodiversity to adapt to climate change, and the danger of species and habitats being lost owing to climate change will therefore have decreased. • The proportion of habitat types listed in the Habitats and Species Directive that enjoy a favourable conservation status will have increased.
	NATURE IN AND NEAR URBAN AREAS (new) By 2015, the population will have access to green space with valuable recreational, cultural and natural assets in and near urban areas. For the interim target to be judged to be met, the following specification must be fulfilled: • The recreational, cultural and natural assets of green space in urban and urban-fringe areas will be conserved, cared for, enhanced and made accessible. At least 150,000 hectares of urban and urban-fringe forest will be managed with a view to recreation.



Background reports and other references

Background reports and other references

Background reports on environmental quality objectives and cross-cutting issues

1. REDUCED CLIMATE IMPACT AND CHECKPOINT 2008

The **Swedish Environmental Protection Agency** and the **Swedish Energy Agency** were jointly commissioned to prepare a background report for the 2008 review of Sweden's climate policy (Checkpoint 2008). Their report (in Swedish) also forms part of the background material for the 2008 in-depth evaluation of the environmental objectives. For subsidiary reports and other background documentation, see the Environmental Protection Agency's website.

2. CLEAN AIR

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**. With appendices on regional implementation of the environmental objectives, ground-level ozone, an impact assessment relating to wood-based heating, and a national presentation of emissions and concentrations. The appendices have been published in the Environmental Protection Agency's report series.

3. NATURAL ACIDIFICATION ONLY

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**. With appendices on climate change and acidification, goal conflicts, acidification resulting from forestry, critical loads, the status of forest soils, and impact assessments relating to lakes, sulphur, nitrogen oxides, forestry and shipping. The appendices have been published in the Environmental Protection Agency's report series.

4. A NON-TOXIC ENVIRONMENT

Background report to the 2008 in-depth evaluation (in Swedish), from the **Swedish Chemicals Agency**. With a covering letter and impact assessments relating to proposed measures, interim targets 6–7, and pesticides.

5. A PROTECTIVE OZONE LAYER

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**.

6. A SAFE RADIATION ENVIRONMENT

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Radiation Protection Authority**.

7. ZERO EUTROPHICATION

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**. With impact assessments relating to interim targets 1–2 and bivalve farming.

8. FLOURISHING LAKES AND STREAMS

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**. With an impact assessment relating to long-term conservation of cultural environments.

9. GOOD-QUALITY GROUNDWATER

Background report to the 2008 in-depth evaluation (in Swedish), from the **Geological Survey of Sweden**. With a covering letter.

10. A BALANCED MARINE ENVIRONMENT, FLOURISHING COASTAL AREAS AND ARCHIPELAGOS

Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish**

Environmental Protection Agency. With impact assessments relating to interim target 1, interim targets 4–5, and the interim targets for shipping and sustainable use.

11. THRIVING WETLANDS
Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**.

12. SUSTAINABLE FORESTS
Background report to the 2008 in-depth evaluation (in Swedish), from the **Swedish Forest Agency**. With a covering letter.

13. A VARIED AGRICULTURAL LANDSCAPE
Background report to the 2008 in-depth evaluation (in Swedish), from the **Swedish Board of Agriculture**. With a covering letter.

14. A MAGNIFICENT MOUNTAIN LANDSCAPE
Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**.

15. A GOOD BUILT ENVIRONMENT
Background report to the 2008 in-depth evaluation (in Swedish), from the **National Board of Housing, Building and Planning**. With a covering letter and appendices on waste, noise, programmes and strategies for planning, natural gravel, and an economic impact assessment.

16. A RICH DIVERSITY OF PLANT AND ANIMAL LIFE
Background report to the 2008 in-depth evaluation (in Swedish, with a summary in English), from the **Swedish Environmental Protection Agency**.

'HEALTH ISSUES, A NATURAL ASPECT OF ENVIRONMENTAL ACTION' (in Swedish). Background report to the 2008 in-depth evaluation from the **National Board of Health and Welfare**.

'CULTURAL ENVIRONMENT AND CULTURAL HERITAGE VALUES' (in Swedish). Background report to the 2008 in-depth evaluation from the **National Heritage Board**.

'COUNTY ADMINISTRATIVE BOARDS – A RESOURCE IN ACHIEVING THE ENVIRONMENTAL OBJECTIVES' (in Swedish). Summary of the county administrative boards' reports to the Environmental Objectives Council, including proposals for measures and policy instruments and an evaluation of the monitoring system.

Background reports from experts to the Environmental Objectives Council

'NATIONAL ENVIRONMENTAL OBJECTIVES – A LOCAL CHALLENGE' (in Swedish). Report from the **Swedish Association of Local Authorities and Regions** to the 2008 in-depth evaluation.

REPORT FROM THE FEDERATION OF SWEDISH FARMERS to the 2008 in-depth evaluation (in Swedish).

'FAIR OBJECTIVES' (in Swedish). Report from **Friends of the Earth Sweden** to the 2008 in-depth evaluation.

'ENVIRONMENTAL ACTION IN THE BUSINESS SECTOR AND SWEDEN'S ENVIRONMENTAL OBJECTIVES' (in Swedish). Report from the **Confederation of Swedish Enterprise** to the 2008 in-depth evaluation.

'THE SWEDISH SOCIETY FOR NATURE CONSERVATION AND THE ENVIRONMENTAL OBJECTIVES' (in Swedish). Report from the **Swedish Society for Nature Conservation** to the 2008 in-depth evaluation.

Reports to the 2008 in-depth evaluation from agencies with special sectoral responsibility for the objectives

REPORT OF THE SWEDISH RAIL ADMINISTRATION (in Swedish).

REPORT OF THE NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING (in Swedish), with a covering letter and an appendix on environmental management in the construction sector.

REPORT OF THE SWEDISH ARMED FORCES (in Swedish).

REPORT OF THE SWEDISH ENERGY AGENCY (in Swedish).

REPORT OF THE SWEDISH BOARD OF FISHERIES (in Swedish), with an appendix.

REPORT OF THE SWEDISH CONSUMER AGENCY (in Swedish).

REPORT OF THE NATIONAL FOOD ADMINISTRATION (in Swedish), with an appendix.

REPORT OF THE SWEDISH CIVIL AVIATION AUTHORITY (in Swedish).

REPORT OF THE MEDICAL PRODUCTS AGENCY (in Swedish).

REPORT OF THE SWEDISH NATIONAL AGENCY FOR SCHOOL IMPROVEMENT (in Swedish).

REPORT OF THE SWEDISH AGENCY FOR ECONOMIC AND REGIONAL GROWTH (NUTEK) (in Swedish).

REPORT OF THE NATIONAL HERITAGE BOARD (in Swedish).

REPORT OF THE SWEDISH RESCUE SERVICES AGENCY (in Swedish).

REPORT OF THE SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY (SIDA) (in Swedish).

REPORT OF THE SWEDISH MARITIME ADMINISTRATION (in Swedish).

REPORT OF THE SWEDISH ROAD ADMINISTRATION (in Swedish), with more detailed documents on climate impact, clean air, reduced noise, water and materials, and landscape.

Background reports on the action strategies

STRATEGY FOR MORE EFFICIENT ENERGY USE AND TRANSPORT (EET) (in Swedish, with a summary in English). Report to the 2008 in-depth evaluation, with a covering letter. Swedish Environmental Protection Agency, ISBN 978-91-620-5777-0.

'IMPACT ASSESSMENTS OF POLICY INSTRUMENTS IN THE STRATEGY FOR MORE EFFICIENT ENERGY USE AND TRANSPORT (EET)' (in Swedish). Swedish Environmental Protection Agency, ISBN 978-91-620-5778-7.

STRATEGY FOR NON-TOXIC, RESOURCE-SAVING ENVIRONMENTAL LIFE CYCLES (GRK) (in Swedish, with a summary in English). Background report to the Environmental Objectives Council's in-depth evaluation of the environmental quality objectives. Swedish Environmental Protection Agency, ISBN 978-91-620-5798-5.

STRATEGY FOR THE MANAGEMENT OF LAND, WATER AND THE BUILT ENVIRONMENT (HUM) Work on this strategy is reported in the form of section 6.3 of the Environmental Objectives Council's report on the 2008 in-depth evaluation.

Reports prepared with funding from the Environmental Objectives Council

'ENVIRONMENTAL ECONOMIC INDICATORS IN THE SWEDISH STATE BUDGET 1995–2006' (in Swedish and English). Report from **Statistics Sweden** to the 2008 in-depth evaluation. MIR2007:2 (Swedish) and MIR2008:1 (English), ISSN 1654-6822, www.scb.se.

'HOW INTEGRATED ARE THE ENVIRONMENTAL QUALITY OBJECTIVES IN THE SWEDISH MANUFACTURING INDUSTRY?' (in Swedish). Interim report II to the Environmental Objectives Council from the **International Institute for Industrial Environ-**

mental Economics, Lund University. Full report to appear later in 2008.

'ECONOMIC VALUATIONS OF AIR- AND NOISE-RELATED HEALTH PROBLEMS' (in Swedish). A compilation of basic data for impact assessments, from the Swedish National Institute of Economic Research, commissioned by the National Board of Health and Welfare.

'ENVIRONMENTAL OBJECTIVES AND OTHER WISHES – A STUDY OF SYNERGIES AND CONFLICTS' (in Swedish). Background material for the Environmental Objectives Council's 2008 in-depth evaluation. **Swedish Environmental Protection Agency**, ISBN 91-620-5747-2.

'DO THE ENVIRONMENTAL COURTS TAKE THE ENVIRONMENTAL QUALITY OBJECTIVES INTO ACCOUNT?' (in Swedish). A study conducted by the **Geological Survey of Sweden** in 2006.

'LONGER-TERM SCENARIOS FOR THE ENVIRONMENTAL OBJECTIVES – PROPOSALS FOR WORK IN 2006' (in Swedish). Feasibility study by the **Royal Institute of Technology, Stockholm**, of methods of elaborating future scenarios linked to the environmental quality objectives and the action strategies. (Available from the Secretariat of the Environmental Objectives Council.)

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The Environmental Objectives Council

The Environmental Objectives Council

The following members and experts have been appointed until 31 December 2008:

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Anna Jonsson, Friends of the Earth Sweden

Mikael Karlsson, Swedish Society for Nature Conservation

Inger Strömdahl, Confederation of Swedish Enterprise

Peter Wenster, Swedish Association of Local Authorities and Regions

Note: The following former director-generals were also involved in the in-depth evaluation: **Kjell Asplund**, National Board of Health and Welfare, **Thomas Korsfeldt**, Swedish Energy Agency, and **Ines Uusmann**, National Board of Housing, Building and Planning, together with **Lisa Sennerby-Forsse**, current Rector of the Swedish University of Agricultural Sciences. On 1 July 2008 the Swedish Radiation Protection Authority was amalgamated with the Swedish Nuclear Power Inspectorate to form the Swedish Radiation Safety Authority.

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SWEDEN'S ENVIRONMENTAL OBJECTIVES: NO TIME TO LOSE

This is the Swedish Environmental Objectives Council's second comprehensive evaluation of the country's environmental quality objectives. Its principal aim is to serve as a basis for the Swedish Government's in-depth evaluation of efforts to achieve those objectives, an exercise that takes place every four years. This report also includes the Council's annual review of progress towards the objectives for 2008.

In the report, the Council presents its overall assessment of whether the environmental objectives will be met on time. Proposals for new, revised and unchanged interim targets are put forward, along with proposals to withdraw some of the existing ones. The Council also calls for changes to the wordings of a couple of the environmental quality objectives. Three action strategies are described, presenting several hundred proposals for policy instruments and measures that need to be introduced if these goals are to be attained. A brief account is given of the costs and benefits to society of implementing the objectives. In addition, the report describes the system of environmental objectives and the role of Swedish society as a whole in achieving them.

The present report is based mainly on background material from the government agencies and organizations represented on the Environmental Objectives Council. Both this report (in English and Swedish) and all the background documents (in Swedish, some with summaries in English) are available in PDF format on the Environmental Objectives Portal, www.miljomal.nu.

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