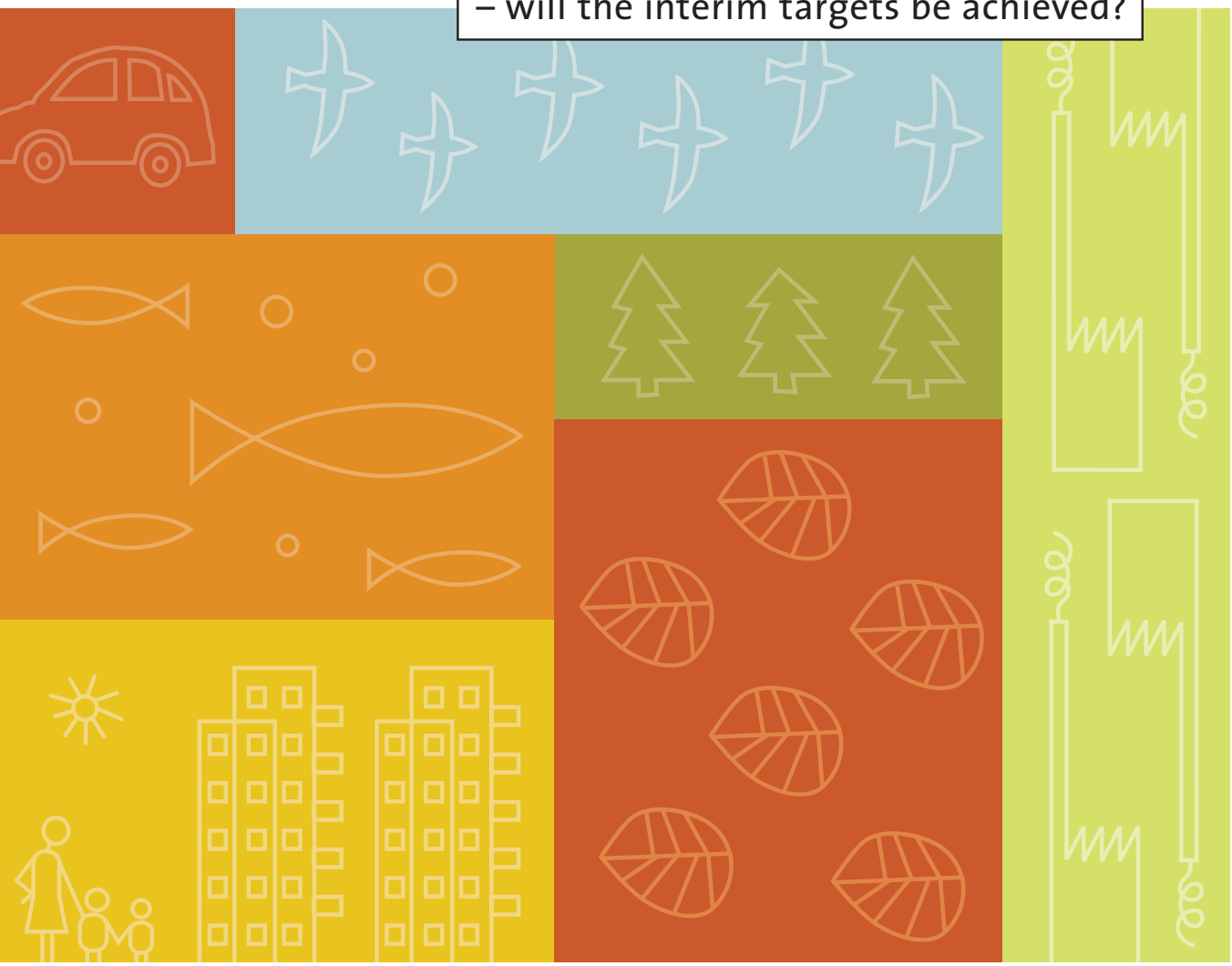
Sweden's environmental

objectives

– will the interim targets be achieved?



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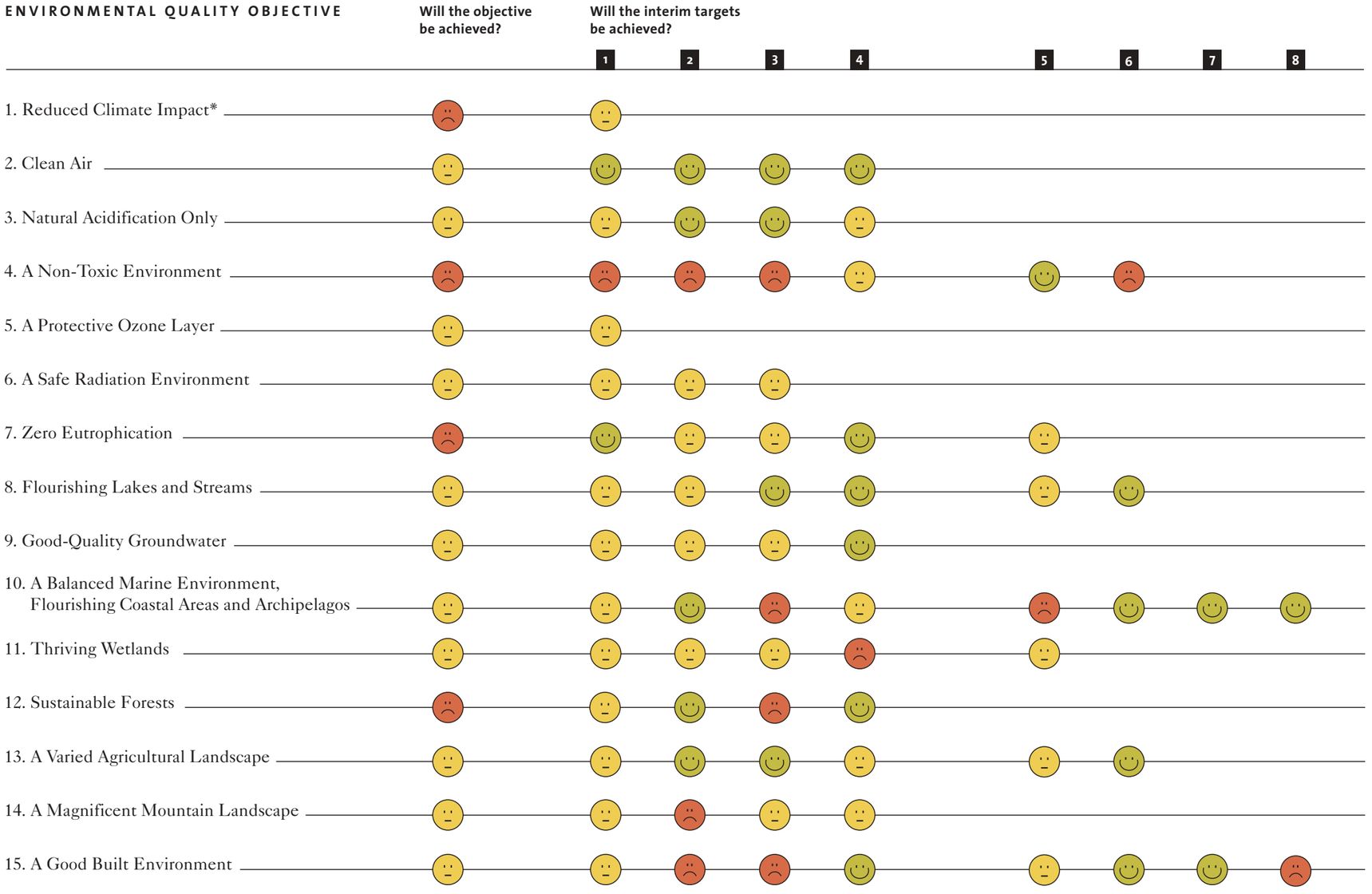
A progress report from the Swedish Environmental Objectives Council



* target year 2050

Progress towards the objectives

An environmental quality objective is more than simply the sum of the associated interim targets; many other factors and circumstances need to be taken into account in our efforts to implement it. This is easy to appreciate in the case of the objectives Reduced Climate Impact and A Protective Ozone Layer, which have just one interim target each.

For this reason, the symbol indicating the prospects of achieving an objective may be red, even though the assessments made regarding the interim targets are mostly favourable. A case in point is Sustainable Forests, for which two of the four interim targets are judged to be attainable within the defined time-frame, i.e. by 2010, and a third should be met if additional action is taken. But achieving the environmental quality objective by 2020 will nevertheless be very difficult. Why? Well, partly because more may need to be done to attain this objective than the targets indicate.

Another illustration of how implementing an environmental quality objective may depend on much more than our success in meeting the interim targets is Zero Eutrophication. In this case, two of the targets are expected to be met (indicated by a green face). The other three should also be achievable, provided that further measures are introduced than can currently be foreseen. And yet there is a considerable risk that the state described in this objective will not be brought about by 2020. Why? The answer is that a large proportion of the nutrients responsible for eutrophication come from other countries. In other words, Swedish action alone will not be enough to achieve the objective.

For further details, readers are referred to the Environmental Objectives Portal, miljomal.nu.

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Preface

In April 1999 the Swedish Parliament adopted fifteen national environmental quality objectives, describing what quality and state of the environment and the natural and cultural resources of Sweden are ecologically sustainable in the long term. To guide efforts to achieve these objectives, in spring 2001 the Government proposed interim targets for each of them. In a series of decisions in the course of 2001 and 2002, Parliament adopted a total of sixty-nine such targets, indicating the direction and timescale of the action to be taken. It also approved three strategies for implementing the objectives which highlight a need for cross-sectoral measures.

In this, its second annual report to the Government, the Environmental Objectives Council presents its evaluation of progress so far towards the interim targets.

The fold-out diagram on the inside front cover gives an outline assessment of the progress made, answering the questions: Will the environmental quality objectives be achieved by 2020 (or 2050 in the case of the climate objective), and will the interim targets be achieved within the time-frames laid down for each of them?

In a booklet of this size it is not possible to present all the factors and deliberations underlying the assessments arrived at. For further information, readers are referred to the Environmental Objectives Portal, miljomal.nu. There, the authorities responsible for each of the objectives describe in more detail (in Swedish) the grounds for the assessments made, together with the criteria by which they have been reached.

Readers should not be discouraged by the less cheerful yellow and red faces in the diagram. What they tell us is not that it is impossible to achieve the objectives and targets, but rather that more action needs to be taken. They are also there to remind us that the sooner additional, effective measures are introduced, the better it will be, since natural systems often take a long time to recover. And last but not least they underline the importance of continuing – and stepping up – our efforts to attain Sweden's fifteen environmental quality objectives.

Fundamentally, our concern is to ensure that the next generation – our children and grandchildren – and generations to come will be able to live their lives in a rich and healthy natural environment, underpinned by sustainable development.

Jan Bergqvist
Chairman, Environmental Objectives Council

Will the interim targets be achieved?

A progress report from the Swedish Environmental Objectives Council

In this year's report on progress towards Sweden's fifteen environmental quality objectives, the focus is on the sixty-nine interim targets, which indicate the direction of environmental efforts over the next few years and flesh out the fifteen objectives. Most of these targets are to be met by 2010, while the environmental quality objectives are intended to be achieved within one generation, i.e. by 2020, with the exception of Reduced Climate Impact, for which the target year is 2050.

All the objectives and many of the interim targets are currently assigned a red or a yellow face symbol, indicating that there is still much to be done. But these goals are by no means impossible to achieve. On the contrary, in many areas the efforts that have been made so far to realize them have produced results.

Participation, commitment and responsibility at every level

The most difficult objectives to achieve within the defined time-frames are Reduced Climate Impact, A Non-Toxic Environment, Zero Eutrophication and Sustainable Forests. To attain all the objectives, substantial effort needs to be invested at every level over many years, by government agencies, the private sector, local authorities, non-governmental organizations and individuals. Participation and commitment on the part of all concerned are essential if efforts to safeguard the environment are to succeed. Several of the objectives and targets also require action at the international level: climate change, for example, is a global problem for which Sweden must shoulder its share of the responsibility, but whose impact on the Swedish environment will ultimately depend on international cooperation. Reducing the human influence on climate is one of the biggest challenges we face when it comes to safeguarding the environment for future generations.

The Swedish Parliament has adopted three action strategies to guide efforts to implement the objectives. These strategies need to be developed, and tangible action plans need to be drawn up to create a better basis for attaining the environmental quality objectives and interim targets.

Good progress on many targets

Atmospheric concentrations of sulphur dioxide, nitrogen dioxide and ground-level ozone are falling, as are Sweden's emissions of sulphur, volatile organic compounds (VOCs) and ammonia. As a result, several interim targets relating to clean air, acidification and eutrophication can probably be met without further action beyond that already decided on or planned. However, attention needs to be paid to road traffic in the major urban regions, since there is a danger that street-level concentrations of nitrogen oxides and particulates could exceed recommended low-risk levels for a long time to come.

The EC's Water Framework Directive is currently being transposed into Swedish law, and the programmes of measures which it requires are expected to be established by 2009. Green face symbols have therefore been assigned to the interim targets relating to the directive under the objectives for eutrophication, lakes and streams, groundwater and the marine environment.

In forestry, the trend is now for more hard dead wood and larger areas of old forest and of mature forest with a significant deciduous element to be retained, and for larger areas to be regenerated with deciduous trees. The target for these variables under Sustainable Forests thus appears to be achievable.

Under the objective for the agricultural landscape there is an interim target concerning the management of culturally significant landscape features, such as old stone walls and avenues. Thanks to payments to landowners under the Environmental and Rural Development Programme, the prospects of meeting this target are good.

One of the targets relating to the built environment calls for the environmental impact of energy

use in residential and commercial buildings to be reduced. Here, too, good progress has been made. Many property owners have switched from fossil fuels to other energy sources for heating, and use of these fuels at district heating plants has also decreased. Our assessment is that there is every chance of attaining this target.

Others require further action

In the view of the Environmental Objectives Council, many of the interim targets can be achieved, but only if further decisions are taken to introduce new measures or change existing policy instruments. These targets are marked with a yellow face.

Additional action is for example required to ensure that emissions of greenhouse gases are reduced in line with the interim target relating to climate. In the transport sector, emissions of these gases are rising. Action in this sector could also help to achieve the target for nitrogen oxide emissions (under Natural Acidification Only and Zero Eutrophication).

When it comes to phasing out ozone-depleting substances, considerable progress has been made. However, to meet the interim target for emissions further decisions need to be taken on the use and handling of these substances, combined with an information campaign on existing and future bans. Additional efforts to ensure secure storage of nuclear waste are necessary to achieve the target for radioactive emissions under A Safe Radiation Environment.

Emissions of phosphorus to water have declined, but further reductions will be needed to meet the interim target under Zero Eutrophication. Measures to reduce discharges from single-household sewage systems, together with continuing efforts in agriculture, could help to achieve this target.

One of the interim targets relating to the built environment calls for land use and community planning to be based on programmes and strategies that take a range of health, environmental and cultural factors into account. Local authorities have a crucial part to play here.

To achieve the targets concerning restoration of rivers and streams and construction of forest roads (Flourishing Lakes and Streams and Thriving Wetlands), it is important to develop cooperation between the sectors concerned and to enhance public planning processes so that relevant interests are taken into account at an early stage. Environmentally sound land use planning makes it possible to consider the whole picture and to safeguard, develop and use natural and cultural assets in harmony with the wider development of society.

The interim targets for the protection of cultural or natural environments (under the forest and marine environment objectives, among others) require a combination of measures. These include increased resources for establishing and managing reserves. To date, county administrative boards have designated ten cultural heritage reserves. In mountain areas, combinations of payments to preserve cultural environments and support for the environments on which reindeer herding relies have produced good results, in the shape of well-preserved overall environments.

And some will be hard to meet

Interim targets marked with a red face are ones that could prove very difficult to achieve by the target date, even if additional action is taken. These include several under A Non-Toxic Environment. Regarding data on the properties of chemical substances, and health and environmental information on dangerous substances in products, Sweden must give a strong lead in the ongoing development of new EC chemicals rules, since these are areas that are subject to EU-wide legislation. As for the remediation of contaminated sites, it has taken a long time to develop the organization and procedures required, and it will be very difficult to achieve the rate of remediation needed to meet the target.

One of the interim targets for the marine environment states that, by 2008, catches of fish should not exceed recruitment. Reform of the EU's Common Fisheries Policy has created a framework for more sustainable management of fish resources, but decisions on catches show that the policy changes have yet to be implemented. It is therefore uncertain whether this target will be achieved by 2008.

THE FOLLOWING STRATEGIES ARE TO GUIDE EFFORTS TO ACHIEVE THE ENVIRONMENTAL QUALITY OBJECTIVES:

1. *A strategy for more efficient energy use and transport – in order to reduce emissions from the energy and transport sectors.*

2. *A strategy for non-toxic and resource-efficient cyclical systems, including an integrated product policy – in order to create energy- and material-efficient cyclical systems and reduce diffuse emissions of toxic pollutants.*

3. *A strategy for the management of land, water and the built environment – in order to meet the need for greater consideration for biological diversity, the cultural environment and human health, wise management of land and water, environmentally sound land use planning and a sustainable built environment.*

Local authorities have a key role to play in meeting the target for the protection of built environments of cultural heritage value, under A Good Built Environment. So far, however, most of them have failed to give priority to active protection measures. In many parts of the country, moreover, there are significant knowledge gaps regarding the overall status of such environments. Far-reaching cooperation and participation by local authorities is essential if this target is to be reached.

A recurring theme as far as the cultural heritage aspects of the objectives are concerned is the need to update and supplement existing knowledge in this area. In the case of the target calling for forest management practices that avoid damage to ancient monuments and other cultural remains (Sustainable Forests), it is essential to know where such remains are. At present, the majority of archaeological remains on forest land have still to be identified.

Some health risks reduced

For several known risk factors in the environment, a reversal of current trends can be expected. Concentrations of several air pollutants, such as sulphur dioxide and nitrogen dioxide, are for example developing in such a way that their adverse impacts on human health are no longer growing. Ill health resulting from these pollutants is therefore likely to become less common.

In the case of several interim targets with a bearing on health, further action is needed. This is true, for instance, of the targets concerning data on health characteristics and reduction of health risks under A Non-Toxic Environment.

Others remain

At the same time, it is disturbing to note that several of the interim targets linked to health seem to be difficult to attain. This is the case with the target for phasing out particularly dangerous substances (A Non-Toxic Environment), which is crucial in reducing exposure to substances that could damage human health.

It is also true of the target for noise under A Good Built Environment. Noise used to be regarded as a temporary nuisance. Now its health effects are better understood, and we know that persistent ill health may have its roots in the noise environment of everyday life. Reducing traffic noise is difficult, but the forthcoming EC Directive on environmental noise could be a positive force in tackling this problem.

The interim target relating to the indoor environment will also be very difficult to meet. The process of identifying and remediating homes with radon concentrations exceeding the target level is progressing far too slowly. Monitoring and remedial action are also urgently needed to deal with poor ventilation and other indoor environment problems, such as damp and mould.

Particles in ambient air are a major health problem. As long as concentrations of them are unacceptable from a health point of view, the Clean Air objective will not be achieved, despite good progress towards the interim targets.

The whole is greater than the sum of the parts

Why is further action judged to be necessary to attain the objective Clean Air, when our assessment is that all the interim targets can be met on the basis of decisions already taken? The reason is that these targets do not cover every aspect of the objective. For example, there is no interim target yet for particles in ambient air, and the problem of reducing particulate emissions from road traffic could in fact prove an obstacle to achieving this environmental quality objective. A target for particulates is to be proposed by the Swedish EPA in 2003.

The goal of A Non-Toxic Environment incorporates interim targets concerning preventive measures to protect the environment and human health. In addition, it includes targets relating to the state of the environment and impacts on health. Difficulties in implementing this environmental quality objective arise both from the measures required and from the state of the environ-

ment/level of health impacts to be achieved.

Two of the four interim targets for Sustainable Forests seem attainable within the defined timeframe, and a third can be met if further action is taken. Why, then, has the environmental quality objective been assigned a red symbol? The fact is that, even if most of the necessary measures are implemented by 2020, it will take time for the effects to make themselves felt across the majority of forest land, since a forest generation spans 70–120 years.

Regarding Zero Eutrophication, none of the five interim targets is marked red, and yet the objective as a whole is. One factor influencing our assessment here is that a large share of the pollutant load originates in other countries. In addition, large quantities of nutrients have accumulated in soils and in lake and marine sediments, from which phosphorus will be released for a very long time to come.

Many of the interim targets relating to the cultural environment are concerned with securing long-term protection. Another key factor in achieving the environmental quality objectives is careful use and management of environments and landscapes. Eventually, therefore, new targets will be needed to promote complementary approaches, alongside protection.

In certain cases, the pace of recovery in the environment may mean that it will take longer than one generation for an objective to be achieved. In the view of the Environmental Objectives Council, it is nevertheless important to ensure that all the necessary measures have at least been introduced by 2020.

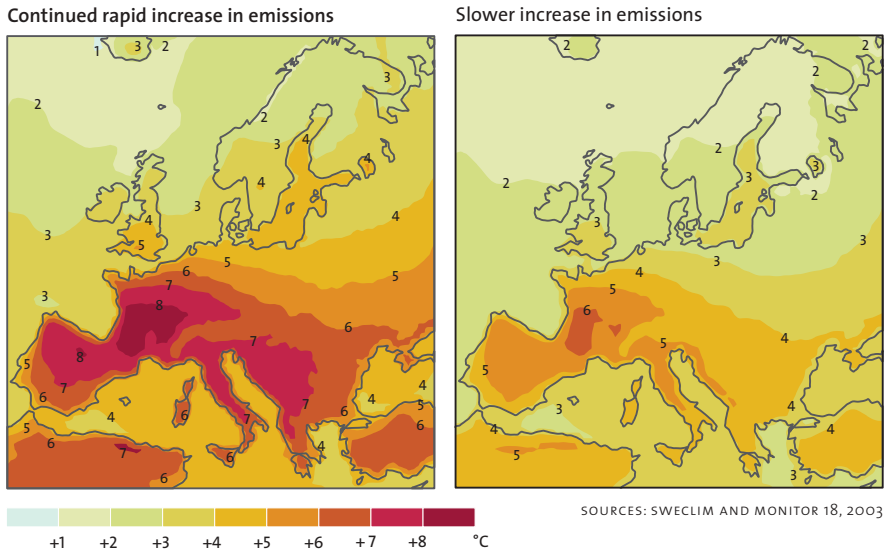
Do regional differences exist?

The basic conditions for achieving the environmental objectives vary from one part of Sweden to another. The Clean Air goal is most difficult to attain in the major cities, with their high densities of road traffic, but in smaller towns, where small wood-fired boilers are used to heat many homes, high air pollutant levels in winter may also stand in the way of achieving this objective. Acidification has had a severe impact on the south-west of the country, but there are also many acidified lakes across large areas of the north. In southern Sweden eutrophication is a major problem, whereas in northern areas nitrogen loadings from air pollution and agriculture are much lower. What is more, the Gulf of Bothnia is less sensitive to nitrogen inputs than other sea areas around Sweden's coasts.

At a national level, meadow and pasture land is better preserved and managed than ten years ago, but again regional differences exist. To attain the biodiversity targets for the agricultural landscape, farming must be maintained in all areas of the country. Favourable regional development is therefore needed, to prevent more farms being abandoned in parts of northern Sweden and the forest regions of the south.

Regional differences with regard to various environmental factors – which are reported in relation to some of the goals in this report – can sometimes be very considerable. However, it cannot be said that certain parts of the country are consistently better off or more seriously affected than others.

FIG. Ia and b Changes in summer temperatures in Europe up to 2100 under two emission scenarios



SOURCES: SWECLIM AND MONITOR 18, 2003

If global emissions of greenhouse gases continue to increase, southern Europe especially could face a sharp rise in mean summer temperatures over the next hundred years. Warming could be very significant even if emissions increase more slowly than they have done over the last half-century (right-hand map). In Spain, for example, daily maximum temperatures during the most intense heat waves could exceed 50 °C towards the end of the century.

1 Reduced Climate Impact

ENVIRONMENTAL QUALITY 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.

Will the objective be achieved?

The environmental quality objective for climate requires atmospheric concentrations of the six greenhouse gases listed in the Kyoto Protocol and defined by the Intergovernmental Panel on Climate Change (IPCC), calculated as carbon dioxide equivalents, to be stabilized below 550 ppm. Sweden should seek to ensure that global efforts are directed to attaining this objective. By 2050, total Swedish emissions should be below 4.5 tonnes of carbon dioxide equivalents per capita per year, with further reductions to follow. International cooperation and commitment on the part of all countries are crucial to the objective being achieved.

Current developments are both encouraging and discouraging. The global climate negotiations have progressed in recent years, as rules to implement the Kyoto Protocol have been drawn up. Many countries have ratified the protocol, but before it can take effect ratification by Russia is also necessary, and this is uncertain at present. The United States, meanwhile, has pulled out of the Kyoto process. Implementing Kyoto would be a small but important step towards a global solution of the climate change problem.

The longer-term development of international cooperation on climate is even harder to predict. Securing global agreement on the deep emission cuts needed to achieve a long-term climate goal, and making sure they are implemented, are major challenges. The latest conference of the parties to the Climate Change Convention was held in New Delhi in autumn 2002. There, delegates held an initial (but not very fruitful) discussion looking beyond the first commitment period, i.e. beyond 2012.

Sweden's long-term goal for 2050 entails a reduction of per capita emissions by almost 50% from current levels. To achieve it, and then reduce emissions still further, far-reaching changes will be necessary. However, several futures studies have shown that such a goal can be attained. Sweden's current level of emissions is below those of many other industrial nations. Some of the developing countries, which are not at present subject to emission commitments under the Kyoto Protocol, have a relatively high standard of living and relatively high emissions. In the long term these countries, too, will have to make commitments of some kind.

Will the interim target be achieved?

INTERIM TARGET 1, 2008–2012

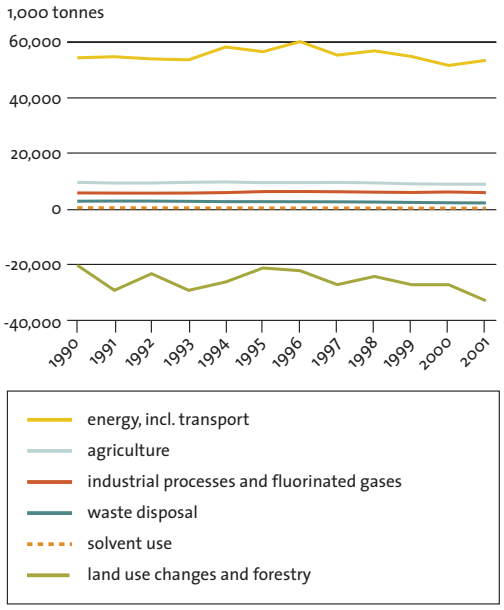
As an average for the period 2008–12, Swedish emissions of greenhouse gases will be at least 4% lower than in 1990. Emissions are to be calculated as carbon dioxide equivalents and are to include the six greenhouse gases listed in the Kyoto Protocol and defined by the IPCC. In assessing progress towards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

The most recent projection of greenhouse gas emissions, in Sweden's third national communication on climate change (2001), suggests that they will reach roughly their 1990 level in 2010 and subsequently rise. The report sees economic instruments, such as energy taxes and renewables certificates, as the key to cutting emissions. Policy instruments in the waste sector (chiefly bans on landfill disposal) and the motor

vehicle industry's undertaking to reduce fuel consumption in cars (the ACEA commitment) will also be important. In addition, changes to the Common Agricultural Policy of the EU are expected to have a beneficial effect on greenhouse gas emissions from Swedish agriculture. The reason why total emissions are nevertheless not predicted to fall is the expected increases in emissions from transport (above all, road freight) and industry.

According to the projection, then, additional measures will be needed to ensure that Sweden's emissions are reduced in line with the national interim target adopted by Parliament.

FIG. 1.1a Emissions and uptake of greenhouse gases, by sector

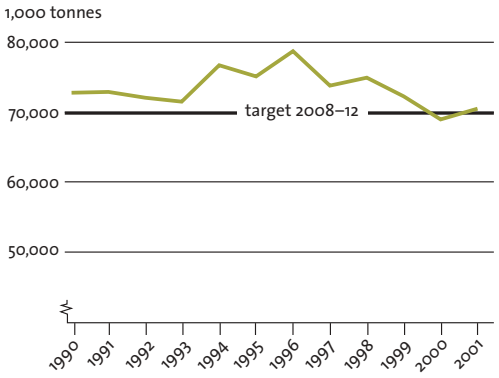


SOURCE: SWEDISH EPA

Around 80% of Sweden's greenhouse gas emissions are due to the burning of fossil fuels in industry, the transport sector and at power and district heating plants, with other sectors accounting for the remaining 20%.

Forests absorb carbon dioxide by incorporating it in biomass. This is referred to as a 'carbon sink'. In 2001 this uptake corresponded to just over 30% of emissions.

FIG. 1.1b Total emissions of greenhouse gases



SOURCE: SWEDISH EPA

The interim target of a reduction of greenhouse gas emissions of at least 4% from 1990 levels is to be achieved with no allowance made for carbon sinks or flexible mechanisms.

New statistics for 1990–2001 show that emissions of greenhouse gases in Sweden were 3% lower in 2001 than in 1990.

Energy sector emissions were over 7% lower in 2001 than in 1990. Emissions vary quite widely from year to year, however, depending on such factors as precipitation, temperature and industrial output. In both 2000 and 2001, for instance, a plentiful supply of hydroelectric power was available. The supply of nuclear-generated electricity was also good. What is more, 2000 was an unusually mild year.

Emissions from the transport sector have increased by 8% since 1990, with road traffic the dominant factor. Heavy goods vehicles account for much of the rise.

Emissions from the residential and services sector, on the other hand, show a steady downward trend, owing to a switch away from oil, above all to district heating, but also to electricity and biofuels. Apart from in this sector, the largest emission cuts have been achieved in agriculture and at landfill sites.

2 | Clean Air

ENVIRONMENTAL QUALITY OBJECTIVE

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

This objective is intended to be achieved within one generation.

Will the objective be achieved?

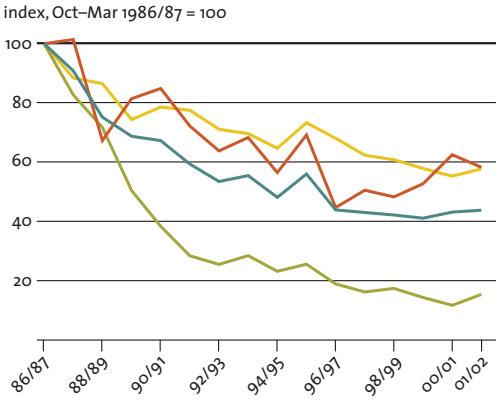
As far as the interim targets are concerned, there is cause for optimism. During the 1990s emissions of the air pollutants referred to in the targets fell appreciably: sulphur (SO_X) emissions were halved, while releases of volatile organic compounds (VOCs) and nitrogen oxides (NO_X) were reduced by 40% and 25%, respectively. This is reflected in lower concentrations in air, especially of sulphur dioxide and nitrogen dioxide. NO_X and VOC emissions are expected to fall by 30–35% between 2001 and 2010. Projections of concentrations are uncertain, but the interim targets for ozone and nitrogen dioxide are judged to be achievable with the measures planned.

Particulates, ozone and nitrogen oxides are examples of pollutants that cause a range of symptoms and illnesses. Particles and ozone in ambient air can be linked to premature death. In Stockholm, an estimated 200 deaths a year may be connected with particulates in air, in addition to an increase in cancer mortality due to other air pollutants. For the country as a whole, the figure is higher; it is estimated that, for the entire population, the increase in mortality shortens average life expectancy by several months.

In all, an estimated 100–1,000 cases of cancer occur in Sweden every year as a result of air pollution. In a statistical sample of the country's population, one in ten reported symptoms due primarily to vehicle emissions and wood burning. Old vehicles and combustion installations not equipped with best available technology account for the largest share of emissions. Outdoor air becomes indoor air, into which additional pollutants may be released. Here there is a link with the objective A Good Built Environment.

Apart from their health effects, air pollutants accelerate the degradation of metals, limestone, rubber and plastics, and damage culturally and

FIG. 2.1 Air quality index



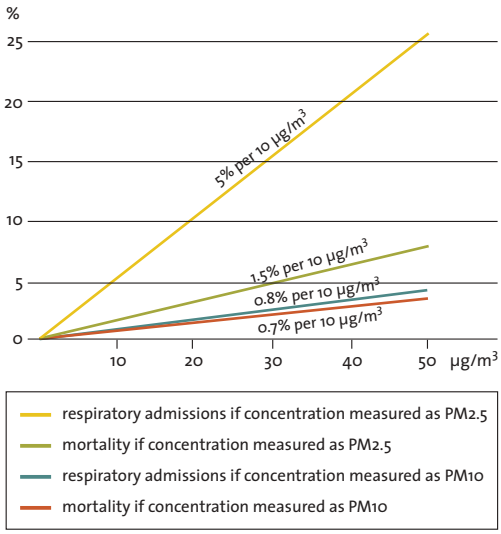
The index is based on concentrations of sulphur dioxide, nitrogen dioxide and soot during the period October–March in some 35 municipalities, weighted for the sizes of their populations.

Oct–Mar 1986/87: soot 11 µg/m^3, NO_2 31 µg/m^3, SO_2 17 µg/m^3

SOURCES: STATISTICS SWEDEN AND SWEDISH EPA

Concentrations of sulphur dioxide in ambient air are now low, and with the measures decided on and planned the interim target will be achieved. The downward trend for nitrogen dioxide is attributable to lower vehicle emissions, resulting from improved engine and abatement technologies. Estimates indicate that a very large number of people are still exposed to NO_2 levels exceeding the environmental quality standard – which is some 30% higher than the interim target. With the measures planned, though, this target could be met. The decrease in soot levels has slowed down, and further action to reduce particulate concentrations is needed.

FIG. 2.2 Relationships between hospital admissions for respiratory diseases/mortality and 24-hour mean concentrations of particulates



SOURCES: 'UTEBOKEN', BERTIL FORSBERG, GUNNAR BYLIN BASED ON WHO AIR QUALITY GUIDELINES 2000

The World Health Organization (WHO) has estimated the relationships between hospital admissions/mortality and particulate concentrations in ambient air. A clear link exists between these variables, especially in the case of PM2.5. For example, hospital admissions for respiratory diseases increase by 5% for every 10 µg/m³ increase in the PM2.5 concentration. It has not been possible to estimate a safe lower level, but the figures should not be extrapolated below 20 µg/m³ for PM10 or 10 µg/m³ for PM2.5.

historically significant buildings, statues and archaeological remains.

The principal forums for international efforts to improve air quality are the ECE Convention on Long-Range Transboundary Air Pollution and the EU's Clean Air For Europe programme. Work is also in progress on an EC directive to reduce emissions from major sources and to establish air quality objectives. In Sweden, EC daughter directives for air have been implemented as environmental quality standards with respect to sulphur dioxide, nitrogen dioxide, lead and particulates, adopted under the Environmental Code. A similar standard for benzene and carbon monoxide will also shortly be established.

At present, several air pollutants relevant to achieving the Clean Air objective are not covered by interim targets. In 2003 the Swedish EPA is to propose new targets for particulates (PM10, PM2.5), benzo[a]pyrene, 1,3-butadiene and formaldehyde, among other substances. The intention is that these targets will also be able to serve as a basis for future environmental quality standards. In the case of particulates, additional action is urgently required.

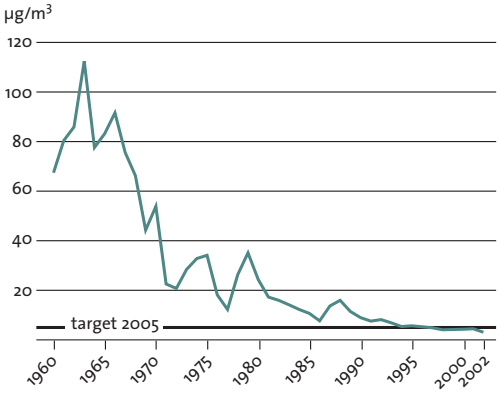
Will the interim targets be achieved?

INTERIM TARGET 1, 2005

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

As a result of action in Sweden and other countries and industrial restructuring in eastern

FIG. 2.3 Sulphur dioxide concentration in Göteborg



SOURCE: CITY OF GÖTEBORG

Since the 1960s the concentration of sulphur dioxide in ambient air has fallen sharply, thanks to action to reduce sulphur emissions and structural changes in Sweden and many other European countries.

Europe, concentrations of sulphur dioxide especially have been greatly reduced in recent decades. Today, the interim target level is exceeded in only a few places.

INTERIM TARGET 2, 2010

Levels of nitrogen dioxide of 20 µg/m³ as an annual mean and 100 µg/m³ as an hourly mean will have been achieved in most places by 2010.

More stringent vehicle emission standards have reduced nitrogen dioxide levels in urban air. Standards for heavy vehicles have also gradually been tightened up since the mid-1990s. However, the fall in concentrations has been slow, as traffic has increased over the same period. At present, urban background levels exceed the environmental quality standard in just a few of Sweden's larger municipalities.

Further action in the areas of transport, energy and mobile machinery will be decisive in reducing nitrogen oxide emissions. Local measures relating to transport which would help to meet the target are traffic planning, congestion charges and environmental zones. Even stricter emission standards for cars are to be introduced by 2010. The assessment is therefore that the interim target can be achieved in terms of urban background concentrations, but that it will still be exceeded on the streets of the major cities. Factors of particular relevance to the focus of action and planning include how easily streets can be ventilated and the proportion of diesel traffic.

INTERIM TARGET 3, 2010

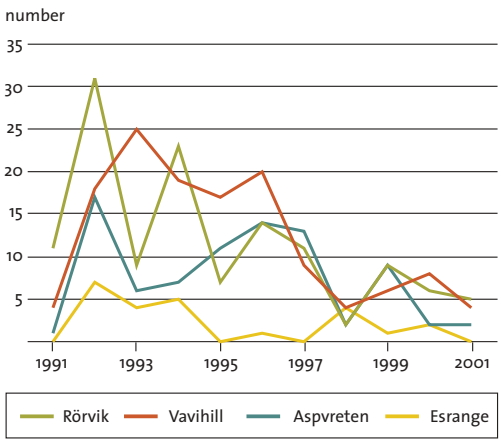
By 2010 concentrations of ground-level ozone will not exceed 120 µg/m³ as an 8-hour mean.

In Sweden, many air pollutants exhibit a north–south gradient. Long-range transport of ozone into the country chiefly occurs in the south, and can result in brief 'episodes' of very high concentrations. During the period April–September 2001, 8-hour running mean concentrations exceeded 120 µg/m³ on between 0 and 5 days, least often in northern Sweden and most frequently in the south.

The number of ozone episodes has fallen somewhat in recent years. This can be seen as a result of the action taken in the EU and Sweden to reduce emissions of VOCs and NO_x. However, the average level of ozone is still as high, and both background concentrations and mean concentrations in urban areas seem to be gradually rising. Although episodes of high concentrations have become less frequent, in the longer term (50–100 years) the background level could increase appreciably.

Ozone causes irritation of the respiratory tract and impairs lung function, especially during exertion, and is associated with increased mortality. It also has effects on vegetation. In

FIG. 2.4 Number of days with an 8-hour running mean ozone concentration exceeding 120 µg/m³



SOURCES: SWEDISH EPA AND IVL

The number of days on which ozone levels exceed 120 µg/m³ for entire eight-hour periods has fallen, especially in southern Sweden, as a result of measures to prevent ozone formation in Sweden and the EU.

the 1980s, production losses in Swedish agriculture attributable to ground-level ozone were estimated at around SEK 1 billion a year. More recent data from other sources suggest figures of around SEK 100 million in 1990 and SEK 53 million in 2010. Forest trees, too, are adversely affected by ozone.

A new EC Directive on ozone in ambient air will be incorporated into Swedish law in 2003. This interim target corresponds to the directive's target value for the protection of human health. The directive also lays down target values for vegetation. Sweden currently meets the directive's target values for 2010 with respect to vegetation, and should also be able to do so in 2020.

INTERIM TARGET 4, 2010

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

The fuels used in small boats, snowmobiles and mobile machinery contribute to emissions of VOCs, together with use of solvents. In recent years, measures to reduce emissions of benzene have resulted in a decrease in the earlier high mean October–March concentrations of benzene in urban air, but even now concentrations exceed the 2020 target for benzene, 1 $\mu g/m^3$ at urban background stations, and in 2010 they will still exceed that figure at street level. Concentrations of benzo[a]pyrene currently exceed the target for 2020 of 0.0001 $\mu g/m^3$ by a factor of 3–10 in many places. Street-level concentrations, however, are gradually falling.

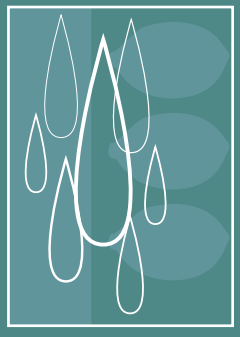
Adopted and forthcoming measures relating both to transport and to wood burning, solvents and industrial processes are expected to substantially reduce VOC emissions. Despite uncertainty about the true level of emissions, the interim target can probably be achieved. Further action is needed to meet the 2020 target for benzene.

3 Natural Acidification Only

ENVIRONMENTAL QUALITY OBJECTIVE

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 objective is intended to be achieved within one generation.



Will the objective be achieved?

Atmospheric deposition of sulphur fell by about 50% during the 1990s. Levels of nitrogen in rain and snow have declined over much of Sweden in recent years, but as precipitation has increased over the same period no clear trends in nitrogen deposition can be made out.

Critical loads for forest soils and for lakes are expected to be exceeded in an estimated 13% of the total area in 2010. The trend up to 2020 is difficult to assess, and even if deposition is below critical levels by then, recovery of soils and waters could take several decades.

At the national level, further steps should be taken to curb nitrogen oxide emissions, and action is also needed to reduce the acidifying effects of forestry. To enable Sweden's natural environment to recover, additional emission cuts need to be achieved across Europe, going beyond Gothenburg Protocol goals and the EC's National Emission Ceilings Directive.

Will the interim targets be achieved?

INTERIM TARGET 1, 2010

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.

Acidification primarily has adverse effects on the flora and fauna of lakes and streams, partly as a result of acidic, aluminium-contaminated water draining from forest land. The most recent nationwide survey of surface waters, in 2000, showed 10% of lakes larger than 4 ha to be acidified. Reliable estimates of the scale of acidification of running waters are not available at present.

TABLE 3.1 Acidification trends in 112 acid-sensitive lakes, reflected in percentages of lakes acidified according to *Environmental Quality Criteria – Lakes and Watercourses

Region, no. of lakes	1990–1995	1996–2001
SW Sweden (55)	90%	79%
C and E Sweden (34)	57%	55%
N Sweden (23)	6%	8%

* Note that the lakes included here do not constitute a representative sample and that the criteria do not distinguish naturally acidic from acidified lakes.

SOURCE: DEPT OF ENVIRONMENTAL ASSESSMENT, SLU

Recovery has been most marked in the areas of Sweden worst affected by acidification.

Lakes and streams began to recover from acidification as early as the 1980s, and the process accelerated in the 1990s. Despite this, it is uncertain whether the interim target will be met: studies in Västra Götaland, in the worst-affected part of the country, suggest that many surface waters will still be acidified in 2010.

A total of 7,500 Swedish lakes have been limed, representing some 90% of the acidified lake area. In 1999 a national liming plan for surface waters was adopted for the period 2000–9, and this now forms the basis for liming activities. The environmental quality criteria for lakes and watercourses are to be revised in the coming year. The number of lakes judged to be affected by acidification depends on the chemical criterion chosen. If the existing criterion is adapted to the international standard, a smaller number of lakes will be assigned to this category.

INTERIM TARGET 2, 2010

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 probably been achieved. Current data give no indication that acidification is continuing, suggesting rather a tendency towards a further improvement.

In addition to atmospheric deposition of sulphur and nitrogen, a contributory factor behind the acidification of soils and surface waters in forest areas is forestry itself. Data collected by the National Survey of Forest Soils and Vegetation show that, in the 1990s (1993–8) some 8% of the forest area had a mineral-soil pH of less than 4.4. On 20% of forest land, levels of exchangeable aluminium were high (over 10 mmol/kg dry matter), and in more than 25% of the area the effective base saturation was low (less than 10%). The most severely affected areas are concentrated in south-west Sweden.

The proportion of forest land with high or very high soil acidity, calculated according to *Environmental Quality Criteria – Forest Landscapes*, fell from some 24% in 1983–7 to 16% ten years later, in 1993–8. A broader analysis of changes in soil chemistry, however, does not point to as clear a positive trend, indicating rather that the situation is virtually unchanged.

TABLE 3.2 Percentage of forest land with high or very high soil acidity according to *Environmental Quality Criteria – Forest Landscapes*

	1983–1987		1993–1998	
	% of region	% of country	% of region	% of country
SW Sweden	46	11	30	6
E and C Sweden	20	5	13	3
N Sweden	15	8	12	7
Country as a whole		24		16

SOURCE: NATIONAL SURVEY OF FOREST SOILS AND VEGETATION, SLU

Recovery from acidification is currently taking place primarily in the areas where forest soils are most acidic.

The National Board of Forestry has issued recommendations on harvesting of felling debris and recycling of wood ash, and on modifications to whole-tree harvesting practices. To reduce leaching of nitrogen, streamside protection zones and retention of a tree layer in conjunction with final felling have been proposed. An increased proportion of deciduous forest (which is required to achieve one of the targets under Sustainable Forests) may also be beneficial with regard to acidification. The Government has yet to reach a decision on the Board's proposals from 2001, 'Measures to prevent soil acidification and to promote sustainable use of forest land'.

A number of measures within forestry to counteract further acidification in affected areas would facilitate the recovery of forest soils.

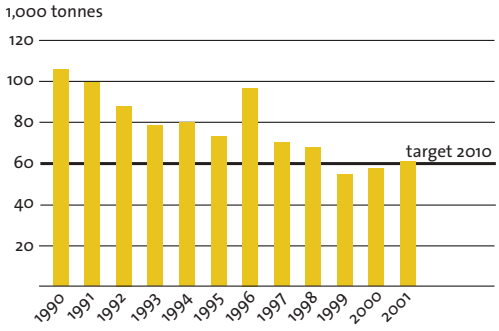
INTERIM TARGET 3, 2010

By 2010 emissions of sulphur dioxide to air in Sweden will have been reduced to 60,000 tonnes.

Swedish emissions of sulphur dioxide are primarily due to the burning of sulphur-bearing fuels such as coal and fuel oils. The pulp industry is another major source. In 2001 emissions of this pollutant totalled just over 60,000 tonnes (excluding international bunker fuel emissions). This interim target has thus basically already been met.

Since 1990 sulphur dioxide emissions have fallen from 106,000 tonnes, i.e. by 43%. This is the result of measures introduced in several different sectors: in the energy sector, the use of low-sulphur oils, together with flue gas desulphurization at large plants; in processing industries, integrated process measures; and in shipping, economic instruments such as environmentally differentiated harbour dues. A sulphur tax, introduced in 1991, is levied on the sulphur content of all fuels that are subject to the energy and carbon dioxide taxes.

FIG. 3.1 Swedish emissions of sulphur dioxide to air (excl. international bunker fuel emissions), 1990–2001



SOURCE: SWEDISH EPA

Since the interim target for sulphur emissions was adopted, the emission figures have been revised. This fact, combined with emission reductions, means that the target has in principle been achieved.

In 2001, heat and power plants, together with combustion in industry, accounted for some 60% of sulphur dioxide emissions.

Greater reliance on renewable energy and improvements in energy efficiency can help to achieve further emission cuts. Other actions that could lead to lower emissions include a green tax shift and measures in the area of climate policy.

INTERIM TARGET 4, 2010

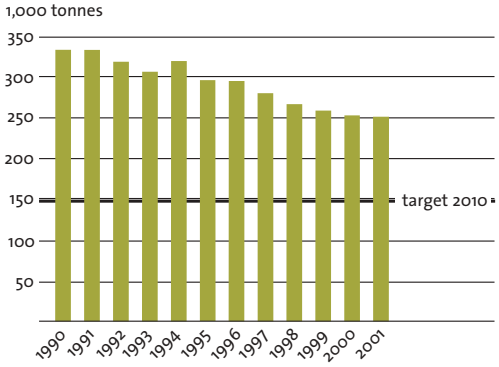
By 2010 emissions of nitrogen oxides to air in Sweden will have been reduced to 148,000 tonnes.

The majority of nitrogen oxide emissions originate from vehicles, primarily cars and trucks, but also from ships and mobile machinery.

Emissions fell from 334,000 tonnes in 1990 to 251,000 tonnes in 2001. This was achieved mainly by measures affecting road transport, in the shape of progressively more stringent emission standards for both cars and heavy vehicles. Environmentally differentiated shipping lane dues, emission standards for diesel-powered mobile machinery and the nitrogen oxides (NO_x) levy have also been of significance. The NO_x levy, introduced in 1992, is charged on nitrogen oxide emissions from stationary energy production plants, and is estimated to account for more than 50% of the emission reductions achieved at such installations.

With the decisions now taken, NO_x emissions are expected to fall to around 160,000 tonnes by 2010. The biggest decrease is predicted for road transport and diesel-powered mobile machinery, as a result of new, stricter emission standards. As part of its consideration of the Environmental Objectives Bill in 2001, Parliament adopted a strategy for more efficient energy use and transport. This strategy includes a continued green tax shift, a review of the NO_x levy, a strengthening of the system of environmentally differentiated shipping lane dues, and incentives to encourage the introduction of heavy vehicles and mobile machinery meeting future EU emission standards. Fully implemented, the strategy will further reduce nitrogen oxide emissions, enabling the interim target to be met.

FIG. 3.2 Emissions of nitrogen oxides, 1990–2001



SOURCE: SWEDISH EPA

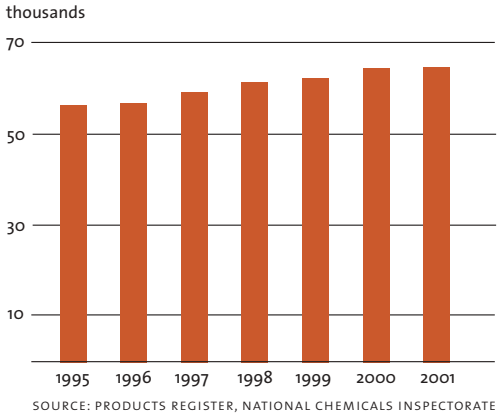
Swedish emissions of nitrogen oxides have been reduced by 25% since 1990. With the decisions now taken, emissions are projected to fall to around 160,000 tonnes by 2010. Provided that additional measures are introduced, the target should be met. One source of uncertainty, however, is the development of road traffic, with freight transport accounting for a particularly large share of emissions.

4 | A Non-Toxic Environment

Will the objective be achieved?

Legislation on chemicals is harmonized across the EU, which is therefore the focus of efforts to bring about rule changes that will help to implement this objective. The new rules being developed within the Union will improve the prospects of attaining the environmental quality objective and some of the interim targets – particularly with regard to deliberately manufactured chemical substances. The problem of dangerous substances in finished products, however, is difficult to solve. Many other question marks remain, e.g. regarding sources of and measures to tackle unintentionally produced substances. Diffuse releases of dangerous substances from products and buildings are judged to be very difficult to eliminate by 2020. Persistent substances (including those already phased out, such as PCBs) will still be present in the environment in 2020.

FIG. 4.1 Number of chemical products notified annually to Products Register



SOURCE: PRODUCTS REGISTER, NATIONAL CHEMICALS INSPECTORATE

The number of chemical products notified to the National Chemicals Inspectorate's Products Register has gradually increased over the years. This may be because a wider range of these products are now available in Sweden. Another explanation could be improved compliance with the notification regulations. The majority of chemical products used in Sweden are manufactured in other countries: in 2001, some 75% were imported. The total number of substances occurring in such products has increased. The developments described mean that we are learning more about what substances are present in chemical products, but not about the properties of the substances concerned.

Will the interim targets be achieved?

INTERIM TARGET 1, BEFORE 2010/2010/2020

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 as far as possible be available on the properties of all unintentionally produced and extracted chemical substances.

Far too little is currently known about the environmental and health characteristics of chemical substances. A survey within the EU showed that, in 1994–5, minimum data on these properties were only available for 14% of all high production volume chemicals within the programme for existing substances.

ENVIRONMENTAL QUALITY OBJECTIVE

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

This objective is intended to be achieved within one generation.

In a White Paper presented in 2001, the European Commission described what information new, harmonized EC legislation should require industry to produce concerning the health and environmental hazards of chemicals. It is a major step forward that the Commission is now developing a system to generate knowledge concerning individual substances, but attainment of this interim target will depend entirely on what information requirements are laid down in the forthcoming EC legislation. Experts from the member states regard the testing proposed in the White Paper as inadequate. Other interests are opposed to far-reaching data requirements being imposed by the legislation, either on animal welfare grounds or for commercial reasons. Sweden must seek to ensure that the information requirements introduced enable this interim target to be achieved. The Commission's legislative proposals are expected in the late summer of 2003.

Unintentionally produced substances will not be covered by the information requirements of the new legislation, however. The Swedish EPA plans to make an inventory of emission sources for certain substances of this kind and to identify necessary measures, and also to propose future environmental monitoring arrangements. Sufficient progress towards the goal concerning data on unintentionally produced substances will probably be difficult to achieve by 2020. Both proposed action and additional desirable measures will require a longer time-frame than the target allows.

As long as major gaps exist in our knowledge of chemical substances, information on dangerous substances in products, as called for in interim target 2, will also remain inadequate.

INTERIM TARGET 2, 2010

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

Finished products contain large numbers and quantities of chemical substances. At present, EC legislation on chemicals is not expected to meet the need for information systems for products other than chemical products.

To achieve the phase-out and risk reduction goals of interim targets 3 and 4, information needs to be available on any dangerous substances contained in products. Currently, there are rules on how environmental and health information relating to chemical products is to be passed down the supply chain. For other types of products voluntary systems exist, but no regulations. Until such time as efforts to influence EC legislation bear fruit, it is very important to develop voluntary systems for further groups of products. The information contained in safety data sheets for chemical products needs to be improved.

Sweden has given a lead in efforts to establish a Globally Harmonized System for the labelling of chemicals. The UN will probably recommend the introduction of such a system in national legislation no later than 2008.

Given the international nature of trade, an information system for hazardous substances in products should be introduced at the EU level – and preferably at a global level. Certain other countries have begun to show an interest in this. Much remains to be done, though, to get more countries on board and to develop a basic, practical design for such a system.

Even with additional action at the national level, this target will be difficult to meet within the stated time-frame.

INTERIM TARGET 3, 2003/2005/2007/2010/2015

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

- *carcinogenic, mutagenic and reprotoxic substances, by 2007, if the products are intended*

to be used in such a way that they will enter natural cycles;

- *new organic substances that are persistent and bioaccumulating, as soon as possible, but no later than 2005;*
- *other organic substances that are very persistent and very bioaccumulative, by 2010;*
- *other organic substances that are persistent and bioaccumulative, by 2015;*
- *mercury by 2003, 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.

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.

Success in achieving this target will very much depend on how particularly dangerous substances are regulated within the EU. Our assessment is that the target deadlines will not be met. The new EC chemicals legislation is expected to mean that approval for specific uses will be required before substances that are particularly dangerous can be sold. This will apply to both new and existing substances. The EC rules and the interim target may prove to diverge in terms of their level of ambition, implementation, and definitions of particularly dangerous substances. Substances that are carcinogenic, mutagenic and/or toxic for reproduction (CMR substances) will be regarded as particularly dangerous, but lead, cadmium and mercury will not receive special attention.

Sweden has called for persistent and bioaccumulating (PB) substances to be classed as dangerous, and probably the most potent of these (vPvB substances) will be included.

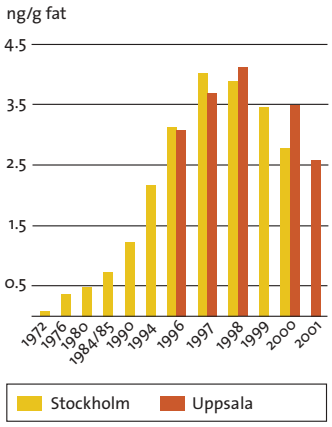
As part of the EU's risk reduction efforts for individual substances, rules have been introduced for example on tributyl tin in hull paints, arsenic in timber preservatives, certain brominated flame retardants, short-chain chloroparaffins and azo dyes. A Council Directive has been adopted banning the use of heavy metals and certain flame retardants in electronic products from 2006.

The use of mercury has declined over the years, but the aim of phasing it out in Sweden by 2003 will not be achieved. Current uses include batteries and dental amalgams. At the international level, more needs to be done to reduce emissions of mercury. The target for cadmium can be met, but emissions from fossil fuel burning must be reduced, and other measures are also required. Since 2002 the use of lead shot on wetlands has been banned. In many counties (e.g. Halland, Uppsala and Västra Götaland), special efforts are being made to reduce levels of mercury, cadmium and lead in sewage sludge.

On environmental grounds, the Swedish Parliament decided in 2002 to lower the tax on alkylate petrol, which can reduce emissions of polyaromatic hydrocarbons from two-stroke engines by 80–90%.

The EU member states have agreed on stricter criteria for biocidal products. Efforts are under way to extend the substitution principle to plant protection products, a change that has been vigorously pursued by Sweden. The EU Chemicals Strategy, however, does not cover pesticides. In the assessment process for plant protection products, active substances with CMR and PB characteristics have already been accepted in the EU, contrary to the Swedish interim target. This may result in certain substances previously banned in Sweden once again being permitted.

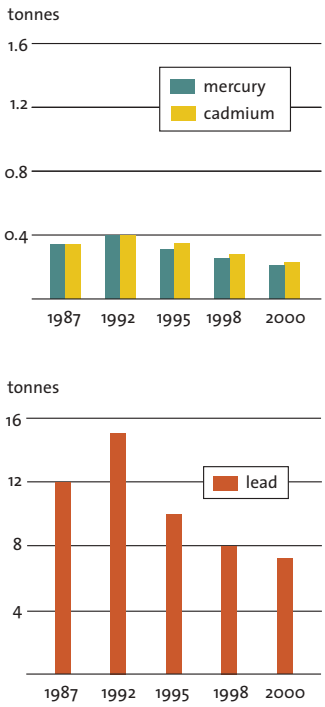
FIG. 4.2 Brominated flame retardants in breast milk



SOURCE: NATIONAL FOOD ADMINISTRATION

Concentrations of PBDEs (polybrominated diphenyl ethers) in breast milk from mothers in Stockholm and Uppsala seem to be falling somewhat, after an earlier rise. Aggregate concentrations of several different PBDEs, a group of brominated substances used as flame retardants, were measured in the studies reported here. The trend for PBDEs is not representative of all groups of chemicals, and other substances may exhibit a different pattern. The publicity surrounding brominated flame retardants may have helped to reduce their use in some product categories, leading to lower exposure in some sections of the population. An EU-wide ban on the use of penta- and octabromodiphenyl ether will take effect on 15 August 2004.

FIG. 4.3a and b Quantities of mercury, cadmium and lead in sewage sludge



SOURCES: SWEDISH EPA AND STATISTICS SWEDEN

The diagrams above show total annual amounts of mercury, cadmium and lead in sludge from Swedish municipal sewage treatment plants. The concentrations of heavy metals and other substances found in sewage sludge limit its use in agriculture. The quantities occurring reflect a certain level of dispersion of heavy metals in urban areas and point to a continuing need to phase out mercury, cadmium and lead. In 1998, average concentrations were below the statutory limits. However, levels vary between individual treatment plants, and at several plants the limits were exceeded.

If it is to be possible to achieve the target at a later stage, Sweden must be very active in the ongoing development of new rules on chemicals within the EU and under international conventions. This is important with regard both to general chemicals and pesticides and to unintentionally formed substances, contaminants and metabolites.

INTERIM TARGET 4, 2010

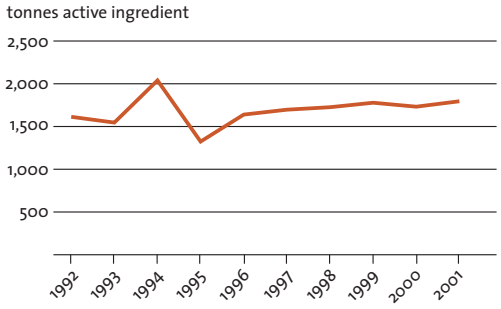
Health and environmental risks associated with the manufacture and use of chemical substances will be reduced continuously up to 2010, as measured by indicators and ratios to be established by the competent authorities. Over the same period, the occurrence and use of chemical substances which impede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

Indicators to monitor health and environmental risks need to be developed.

Risk reduction is an ongoing part of the EU's programmes for new and existing substances. As part of the programme for existing substances, Sweden's National Chemicals Inspectorate has for example assessed the risks associated with diethylhexyl phthalate (DEHP), a plasticizer used in PVC plastics. It has also drawn up risk management proposals which identify a range of necessary short- and long-term measures. Together with other government agencies, the Inspectorate has engaged in a dialogue on dangerous substances with companies in several sectors. Within the EU, guidelines are being developed on environmental risk evaluation of medicinal products.

Statutory producer responsibility for cars and electrical products has reduced the occurrence and use of chemical substances that impede recycling. In addition, voluntary undertakings have been made, e.g. by the construction industry, which has developed environmental declarations of building products, and by tyre produc-

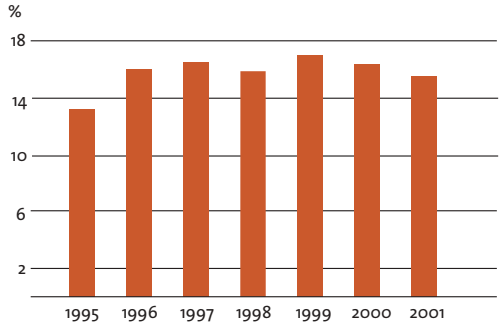
FIG. 4.4 Quantity of pesticide active ingredients sold for use in agriculture, forestry and horticulture in Sweden, 1992–2001



SOURCE: PRODUCTS REGISTER, NATIONAL CHEMICALS INSPECTORATE

Sales of pesticides for use in agriculture, forestry and horticulture have risen somewhat since the mid-1990s. The areas being treated are increasing, absolutely and relative to the total areas cultivated/forested. The risk reduction envisaged in the earlier Swedish action programme has not been achieved. The increase in pesticide use can be put down to three factors: the EU's Common Agricultural Policy (CAP), Sweden's implementation of it, and cuts in resources for risk reduction activities.

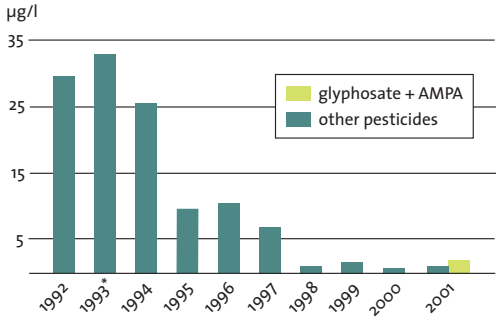
FIG. 4.5 Percentage of consumer-available chemical products containing known allergenic substances



SOURCE: PRODUCTS REGISTER, NATIONAL CHEMICALS INSPECTORATE

In 2001 known allergenic substances occurred in 2,181 chemical products available to consumers (15.5% of the total), according to the National Chemicals Inspectorate's Products Register. The percentage of chemical products containing such substances has remained at the same level in recent years, working on the basis of allergenic substances known in 2001. New findings and reclassifications may increase the proportion, with retroactive effect.

FIG. 4.6 Residues of chemical pesticides in River Vemmenhögsån, 1992–2001



* Data for May–June only; other years, for May–September

SOURCE: DIVISION FOR WATER QUALITY MANAGEMENT, SLU

Voluntary initiatives in the farming sector are becoming increasingly important. Several county administrative boards (e.g. Blekinge, Halland, Skåne, Uppsala and Västra Götaland) have made reduced pesticide levels in the aquatic environment a priority in their efforts to implement the environmental objectives.

The good example presented in the diagram, which shows a decrease in pesticide residue concentrations in the Vemmenhögsån in southern Skåne, illustrates how, with advisory support, farmers can reduce leaching by systematic efforts to achieve safer handling of pesticides.

The measurements made cover most of the pesticides used in the area, some of their metabolites, and a number of substances that are no longer used. Glyphosate and its metabolite AMPA were not measured prior to 2001.

ers, who have started to make tyres without carcinogenic high aromatic oils.

To meet this target, continued efforts are needed within the EU and under international conventions, but also at the national level. Companies must consciously seek to put in place broad-based risk management procedures. Their responsibilities should be more clearly spelt out in the new rules being drawn up within the EU.

INTERIM TARGET 5, 2010

By 2010 guideline values will be established by the competent authorities for at least 100 selected chemical substances not covered by interim target 3. These values will indicate the maximum concentrations to be permitted in the environment or to which humans may be exposed. The aim is that the guideline values will in the long term be adopted as environmental quality standards.

The Chemicals Inspectorate has developed methods for defining guideline values for the aquatic environment, and has determined such values for some 70 substances. The Swedish EPA has proposed around 40 of these guideline values as limit values for surface water quality.

INTERIM TARGET 6, 2005

By 2005 contaminated sites will have been identified and remediation will have begun at a minimum of 100 of the sites given highest priority with regard to the risks to human health and the environment. In addition, remediation will have been completed at a minimum of 50 of the sites at which such work has begun.

It will be difficult to achieve this target in its entirety within the time-frame defined. All contaminated sites will have been identified by the end of 2005, but the other goals – that remediation should have begun with government grants at a minimum of 100 of the highest-priority sites, and been completed at at least 50 of them – will not be achieved before the end of 2005.

The Swedish EPA estimates that there are some 38,000 contaminated sites in Sweden. In all, 29,000 have been identified. It has taken a long time to develop the organization and procedures required. Now, though, the investigation of contaminated sites is under way. Inventories and risk classification of identified sites are in progress in all counties. Remediation has begun at almost 30 sites, and by 2005 25–30 of the highest-priority sites are expected to have been restored.

5 A Protective Ozone Layer

ENVIRONMENTAL QUALITY OBJECTIVE

The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.

Will the objective be achieved?

The adverse impact of ozone-depleting substances on the ozone layer has abated, owing to the fact that concentrations of these substances in the atmosphere have begun to decline as a result of action in Sweden and other countries. Nonetheless, further measures are needed to maintain the momentum in the international phase-out of ozone depleters and to end the use of these substances in Sweden.

The latest assessment by international scientists is that, in 2020 at the earliest, it will be possible to see a recovery of the ozone layer above Europe; by 2050 at the earliest, it could be restored. This is assuming that all the parties comply with the Montreal Protocol and the amendments to it.

Will the interim target be achieved?

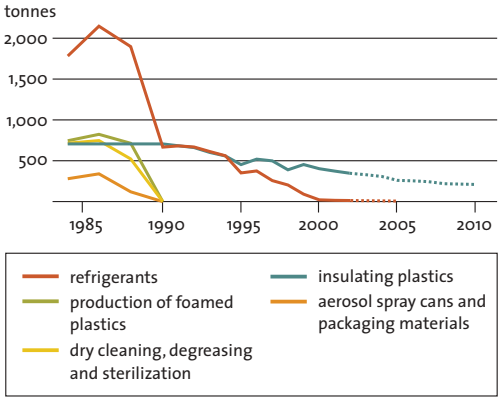
INTERIM TARGET 1, 2010

By 2010 the great majority of emissions of ozone-depleting substances will have ceased.

If current rules are adhered to, there is a good chance of moving closer to the target. However, to actually achieve it, further decisions need to be taken on the use and handling of ozone-depleting substances. There is also some risk of non-compliance with the existing rules, possibly owing to insufficient awareness of them in different sectors of society.

Today, emissions of ozone depleters mainly occur from products in which they are used as refrigerants or in insulating materials. By 2010, the use of old refrigerators, refrigerated displays and refrigeration plants will probably have largely ceased; by then, they are expected to have reached the end of their technical lifetime and to have been replaced.

FIG. 5.1 Swedish emissions of CFCs from different sources, 1984–2001, with projections for 2002–2010



SOURCE: SWEDISH EPA

Emissions of ozone-depleting substances have fallen sharply since the late 1980s. The principal source of future emissions will be insulating plastics of various types. The scale and effect on the ozone layer of national emissions of HCFCs are marginal compared with emissions of CFCs.

In 1986, total Swedish emissions of ozone depleters were around 4,800 tonnes. By 2001, the figure had dropped to less than 400 tonnes. (No data for 1985, 1987 or 1989.)

The largest quantities of CFCs (chlorofluorocarbons) and HCFCs (hydrochlorofluorocarbons) are to be found in insulating materials in buildings, in the ground and round pipes. These products have a long lifetime. The point in time at which they are replaced with ozone-friendlier alternatives will depend on the extent to which old buildings and other structures are altered or demolished.

To meet the target, the Swedish EPA has among other things proposed that HCFC refrigerants should be phased out by 2010. Another proposal is to make it illegal to transfer ownership of old refrigerators containing CFCs, in order to tackle the black market and illegal exports. In addition, a targeted information campaign on existing and future bans has been proposed.

6 A Safe Radiation Environment

Will the objective be achieved?

To attain this environmental quality objective, we need a better overall picture of known and as yet unknown sources of radiation and their effects on people and the environment. This can be achieved through environmental monitoring, research into the health effects of radiation, and studies of how people's behaviour and attitudes affect their exposure to radiation. Continued preventive efforts in the area of emergency preparedness, inside and outside Sweden's borders, are also important. A key challenge is to build a permanent repository for spent nuclear fuel and other radioactive waste.

Traditionally, radiological protection has focused on protecting humans. At the international level, there are now moves to broaden its scope to include animals and plants, which will probably lead to recommendations to ensure protection of the environment. To be able to live up to such recommendations, Sweden needs a national environmental monitoring programme for radioactive substances, as well as a research capability in radioecology and radiobiology.

If the number of new skin cancer cases due to UV radiation is to fall, long-term measures must be introduced without delay. Thanks to increased funding in 2002, several public agencies are now better placed to help reduce the future incidence of skin cancers.

The development of third-generation mobile telephone systems has raised questions and concern among members of the public and politicians about the possible risks of radio waves from base station antennas and handsets. So far, research has not revealed any detrimental impacts on health. However, several international research projects are in progress to study whether long-term use of mobile phones could cause cancer or have other adverse health effects.

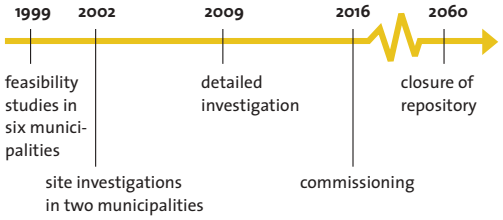
Will the interim targets be achieved?

INTERIM TARGET 1, 2010

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.

This target requires a range of measures to limit and monitor radioactive emissions from all types of activities. The national environmental monitoring programme for radioactive substances that is being developed has an import-

FIG. 6.1 SKB's timetable for planning and construction of a permanent repository for spent nuclear fuel

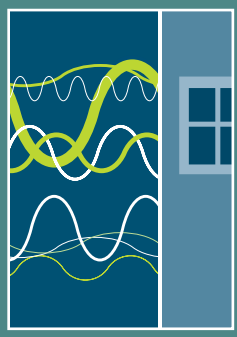


SOURCE: SKB

Studies are currently under way in two municipalities, among other things to assess the suitability of geological formations there. At the detailed investigation stage, SKB will begin building the repository. Following closure, the first 1,000 years will be the most important period in terms of the repository's ability to protect the environment.

ENVIRONMENTAL QUALITY OBJECTIVE

Human health and biological diversity must be protected against the harmful effects of radiation in the external environment.



ant part to play. One of the major challenges facing our generation is the safe disposal of spent nuclear fuel and other radioactive waste. In 2002, Svensk Kärnbränslehantering AB (SKB) began site investigations for a permanent repository in Oskarshamn and Östhammar. This issue is one that demands a great deal in terms of specific contributions by a number of different agencies and organizations. These include developing standards for the final disposal system, scrutinizing SKB's activities and conducting consultations. In addition, there is a need for research and other studies.

The pressure for action by the authorities on the nuclear waste issue will remain high until the Government has given the go-ahead for a permanent repository to be built. All the parties concerned must be given the financial means to scrutinize proposals and participate in consultations. At this stage it is important that funding, e.g. from the Swedish Nuclear Waste Fund, is made available to government agencies. Otherwise, there is a great risk that scrutiny will be less effective and that inadequate support will be given to local authorities on this issue.

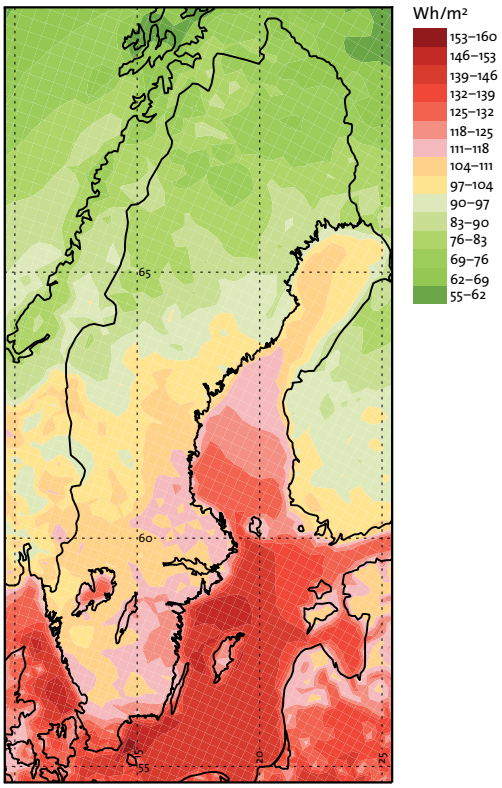
The assessment of the Swedish Radiation Protection Authority (SSI) is that work in this area is currently moving in the right direction. The target can be achieved on time, provided that adequate resources are allocated to research, environmental monitoring and preparations for a permanent repository.

INTERIM TARGET 2, 2020

By 2020 the annual incidence of skin cancer caused by the sun will not be greater than it was in 2000.

Both the total dose of UV radiation and the frequency of severe sunburn in childhood are considered of significance in the development of skin cancer. Over the last 10 years, the increase in skin cancer incidence has been less marked than before, but it is still too early to say whether this represents a trend break. In 2000, 1,616 new cases of the serious form malignant melanoma and 2,934 new cases of squamous cell carcinoma were discovered. It takes about 20 years for skin cancer to develop following an excessive dose of UV radiation. It is therefore important that young people especially heed advice on the risks of sunbathing.

FIG. 6.2 Modelled annual dose of UV radiation in 2002



SOURCE: SMHI

This map shows the wide regional variations in UV dose that arise from differences in latitude, weather conditions and thickness of the ozone layer. Over seas and large lakes the sky is often cloudless, resulting in higher UV radiation. The annual dose of UV radiation is expressed in watt-hours per square metre, Wh/m². The map is preliminary.

In consultation with other agencies, SSI has prepared a long-term strategy to reduce the incidence of skin cancer, including information campaigns, measures to protect young children, improved controls on sunbed parlours, environmental monitoring and research.

Together with the Swedish Meteorological and Hydrological Institute (SMHI), SSI has developed a model for estimating UV exposure. The data derived from it can be combined with statistics on holidays to sunny destinations and numbers of sunbed salons, allowing the total population dose to be estimated and related to cancer incidence in each region.

Progress is being made towards this target, but its achievement will require continuing efforts to pursue the necessary measures in the longer term.

INTERIM TARGET 3

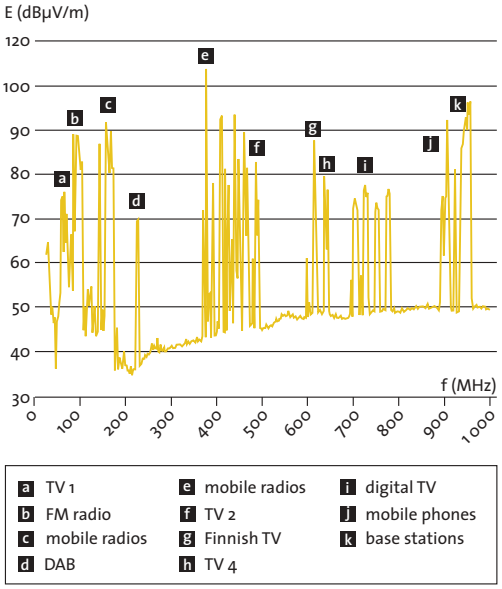
Risks associated with electromagnetic fields will be studied on an ongoing basis and necessary action will be taken as any such risks are identified.

Developments in areas such as telecommunications, IT, transport and security systems mean that electromagnetic fields are occurring increasingly widely in our environment. A necessary response to this is research to improve our understanding of the possible effects of such fields on human health. A national research programme on the biological effects of electromagnetic fields should be established.

A review of the research undertaken so far offers no clear evidence of a heightened risk of cancer from mobile phone use. The World Health Organization (WHO) is currently carrying out a study in 13 countries on long-term use of mobile phones.

Nor is there considered to be any definite proof of an increased cancer risk from exposure to power transmission lines. However, the WHO's cancer research agency, the IARC, has classed low-frequency magnetic fields as 'possibly carcinogenic'.

FIG. 6.3 Electric field strength from different types of radio transmitters in Stockholm, in frequency range 30–1,000 MHz



Note: Electric field strength, E, is expressed as a logarithmic measure on a decibel scale.

SOURCE: SSI

We are exposed to electromagnetic fields both indoors and outdoors. As a rule, the general public's exposure to such fields is more than a hundred to a thousand times lower than the limit values that apply in Sweden and the rest of Europe.

An international scientific council has been set up to assist SSI in assessing health risks from exposure to electromagnetic fields. On the basis of EU recommendations from 1999, SSI has issued guidelines to reduce public exposure to such fields. This calls for increased monitoring and supervision efforts to ensure that recommended values are not exceeded.

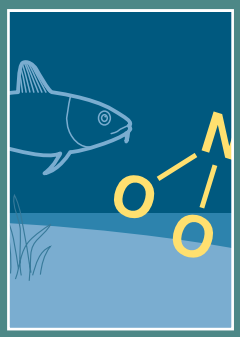
To attain this target, more needs to be done in the areas of research, environmental monitoring, supervision and information.

7 Zero Eutrophication

ENVIRONMENTAL QUALITY OBJECTIVE

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.

This objective is intended to be achieved within one generation.



Will the objective be achieved?

The environmental state described in this objective will be difficult to bring about by 2020, partly because the timescale of recovery of natural systems is so long. It will be particularly difficult to achieve the objective in southern Sweden, where the highest nutrient loadings, and hence the greatest environmental effects, have been and still are observed. In addition, open coastal waters of the Baltic are significantly affected by eutrophication of open sea areas.

The trend for Swedish emissions of nitrogen oxides and ammonia to air is encouraging, but nutrient emissions to water are not as clearly in decline. Vigorous action, both national and international, needs to be taken without delay if the objective is to be attained. The programmes of measures that are to be established by 2009 under the EC's Water Framework Directive will promote progress towards the objective, as all the member states have to comply with the directive's requirements.

Preliminary projections of the future climate of Sweden suggest an increase in precipitation. This could make it even more difficult to achieve this objective, since it would increase diffuse losses of nutrients from soils.

Will the interim targets be achieved?

INTERIM TARGET 1, 2009

By 2009 programmes of measures as provided for in the EC Water Framework Directive will be established, specifying how good ecological status is to be achieved in lakes and streams and in coastal waters.

This target will be met, as EC legislation requires Sweden to prepare programmes of measures to achieve good ecological status in its lakes, streams and coastal waters. The Committee on the Environmental Code has proposed a legislative framework to give effect to this, and the Committee on Swedish Water Administration has recommended the creation of five water districts, administered by as many water authorities, whose task it will be to ensure that the programmes are drawn up.

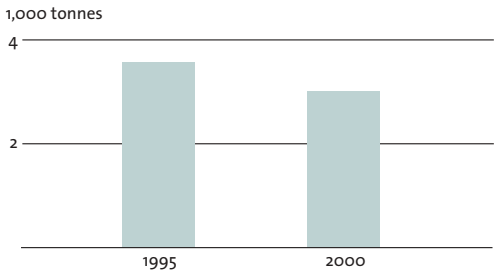
INTERIM TARGET 2, 2010

By 2010 Swedish waterborne anthropogenic emissions of phosphorus compounds into lakes, streams and coastal waters will have decreased continuously from 1995 levels.

Model results indicate that emissions of phosphorus compounds fell by 15% between 1995 and 2000. Agriculture is credited with the largest decrease, of 19%, although this figure is uncertain, partly due to a lack of data on the effects of measures introduced in that sector. Phosphorus discharges from sewage treatment plants and factories have also declined. In the case of sewage works, the reduction between 1995 and 2000 was about 10% for Sweden as a whole, while emissions from the forest products industry fell by a good 15% over the same period. It is difficult to assess whether this interim target will be met, however, owing to incomplete emission statistics for certain sources, and also because it is unclear what is meant by 'decreased continuously'. The Swedish EPA has been asked to define the target more precisely by 2004.

In agriculture, the use of phosphorus-based fertilizers has declined since the 1970s. In the

FIG. 7.1 Emissions of phosphorus to water in 1995 and 2000



SOURCE: SWEDISH EPA

Phosphorus emissions fell by 15% between 1995 and 2000. Provided that additional action is taken, they should continue to decline.

1990s new rules were introduced requiring a green plant cover on a certain proportion of arable land in southern Sweden, and agri-environment payments have been introduced for protection zones along river banks. The combined effect of these measures should be to reduce leaching of phosphorus from the soil.

Eutrophication could be further alleviated if livestock herds were reduced or redistributed geographically. However, this could conflict with biological and cultural heritage goals relating to pastures, an open farmed landscape, small-scale habitats and culturally significant landscape features. Single-household sewage systems are a significant nutrient source, and require additional action if the target is to be attained.

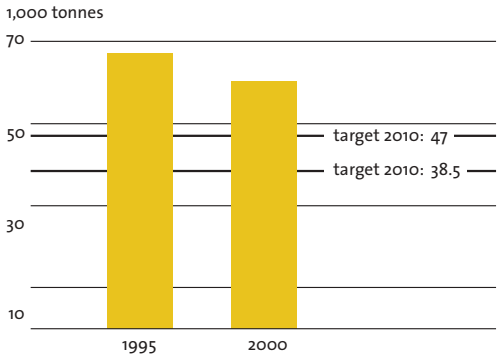
INTERIM TARGET 3, 2010

By 2010 Swedish waterborne anthropogenic emissions of nitrogen into sea areas south of the Åland Sea will have been reduced by at least 30% compared with 1995 levels, to 38,500 tonnes.

New model calculations of nitrogen emissions to water in 1995 show that they were considerably higher that year than previously estimated, and the earlier figure of 55,000 tonnes has been revised to 67,000 tonnes. Waterborne anthropogenic emissions of nitrogen in 2000, flow-normalized to the period 1985–99, have been estimated at 60,000 tonnes. This means that, according to the new calculations, they have fallen by 11% since 1995.

In recent years the problems of eutrophication observed in coastal and open sea areas around southern and central Sweden have given rise to stricter standards for nitrogen removal at large sewage treatment plants on the west coast and on the east coast as far north as the Stockholm archipelago. These standards also apply to certain major inland plants. Almost three-quarters of the municipal wastewater discharged along the Swedish coast in 2000 had been subjected to nitrogen removal treatment. That year, the average removal efficiency at all permit-holding treatment plants exceeded 50% for the first time.

FIG. 7.2 Emissions of nitrogen to water in 1995 and 2000



SOURCE: SWEDISH EPA

The period 1995–2000 saw a marked reduction of point-source emissions. As yet, though, there has been no clear decrease in diffuse emissions from agriculture. New model results have led to a revision of the earlier emission figure for 1995, from 55,000 to 67,000 tonnes. The interim target calls for emissions to be reduced by at least 30% compared with 1995, to 38,500 tonnes. A 30% reduction from the revised 1995 figure, however, would entail a target level of 47,000 tonnes.

Municipal sewage works cut their nitrogen discharges to the sea by some 6,300 tonnes between 1995 and 2000, and other point-source emissions also fell. The forest products industry accounts for an estimated 90% of industrial emissions. Estimates suggest that, if production remains unchanged and best available technology is used, this sector could halve its emissions by 2010 compared with 1995 levels. However, since production is expected to rise, the decrease in emissions will probably be smaller.

Leaching from farmland seems to have remained largely unchanged during the second half of the 1990s, judging from model results. In 1999 the Swedish Board of Agriculture proposed an action programme on nutrient losses in farming, which is expected to reduce nitrogen leaching by around 8,000 tonnes by 2010, from 1995 levels. As part of an action programme called 'Getting a Grip on Nutrients', a major advisory effort is currently under way. The aim is to provide the information and tools farmers need to reduce nitrogen and phosphorus losses in a cost-effective manner. An agri-environment scheme to curb losses of nitrogen, within the Environmental and Rural Development Programme (ERDP), involves the growing of catch crops and delayed tillage. From the start of this scheme in 2001, take-up was above target, and it is expected to reduce nitrogen leaching by some 1,600 tonnes a year.

One means of reducing nutrient inputs to water from farmland is to establish wetlands. Partly for this purpose, 6,000 ha of wetlands are to be recreated or restored under the ERDP over the period 2000–6. Up to 2002, the area covered by the wetlands and ponds scheme was some 2,200 ha, which is estimated to have cut nitrogen inputs by 300–400 tonnes a year. The Board of Agriculture has been asked by the Government to draw up guidelines on how and where wetlands should be established to be most effective as nutrient sinks. A shift from autumn to spring spreading of animal manure is also expected to help reduce nitrogen losses. All in all, the assessment is that losses from agriculture will decline at at least the rate stated in the action programme proposed by the Board.

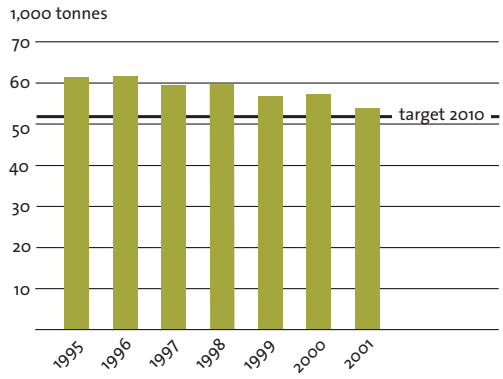
Point-source emissions to water have fallen steadily since 1995. Measures to reduce leaching from farmland have been implemented at the pace laid down in the Board of Agriculture's action programme. How far this has affected inputs to sea areas is difficult to assess at present, owing to uncertainties in the models used. If emissions and leaching – and thus inputs to the sea – continue to decrease according to plan, it should be possible to meet the interim target.

INTERIM TARGET 4, 2010

By 2010 emissions of ammonia in Sweden will have been reduced by at least 15% compared with 1995 levels, to 51,700 tonnes.

In all, some 54,000 tonnes of ammonia are estimated to have been released into the atmosphere from Swedish sources in 2001, of which agriculture accounted for about 85%. Compared with 1995, this was a reduction of almost 13%.

FIG. 7.3 Emissions of ammonia, 1995–2001



SOURCE: SWEDISH EPA

Ammonia emissions have fallen by almost 13% since 1995. The prospects of achieving the interim target by 2010 seem good.

Up to 2001, ammonia emissions from agriculture had declined by 7% (around 3,500 tonnes) from 1999 levels and by 17% compared with 1995. The decrease in anthropogenic emissions between 1999 and 2001 is attributable entirely to the farming sector. Broadly speaking, half the reduction is due to improved handling of manure, the rest to reduced numbers of pigs and cattle.

During the 1990s the Board of Agriculture drew up several action programmes to reduce ammonia losses; in 1999, for example, it proposed a programme for 2000–10. A succession of regulations to curb losses associated with storage and spreading of animal manure have been introduced since 1995. As part of the programme 'Getting a Grip on Nutrients', and in other contexts, advisory services are also offered with a view to reducing ammonia emissions. Investment support has been introduced for certain types of spreading equipment that minimize losses of ammonia.

An ammonia source of growing importance is road transport, as certain amounts of the compound form in catalytic converters. Between 1999 and 2001, emissions of ammonia from non-agricultural sources, such as industry and transport, rose by some 10%.

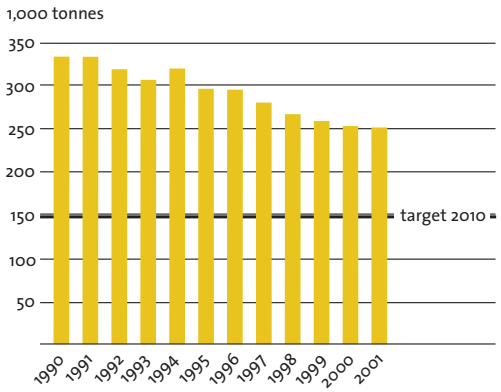
INTERIM TARGET 5, 2010

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

The majority of nitrogen oxide emissions originate from vehicles, primarily cars and trucks, but also from ships and mobile machinery.

Emissions fell from 334,000 tonnes in 1990 to 251,000 tonnes in 2001. This was achieved mainly by measures affecting road transport, in the shape of progressively more stringent emission standards for both cars and heavy vehicles. Environmentally differentiated shipping lane dues, emission standards for diesel-powered mobile machinery and the nitrogen oxides (NO_x) levy have also been of significance. The

FIG. 7.4 Emissions of nitrogen oxides, 1990–2001



SOURCE: SWEDISH EPA

Swedish emissions of nitrogen oxides have been reduced by 25% since 1990. With the decisions now taken, emissions are projected to fall to around 160,000 tonnes by 2010. Provided that additional measures are introduced, the target should be met. One source of uncertainty, however, is the development of road traffic, with freight transport accounting for a particularly large share of emissions

NO_x levy, introduced in 1992, is charged on nitrogen oxide emissions from stationary energy production plants, and is estimated to account for more than 50% of the emission reductions achieved at such installations.

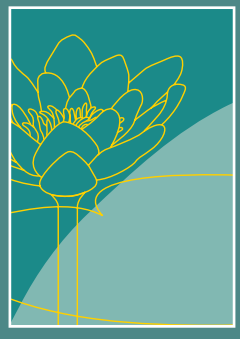
With the decisions now taken, NO_x emissions are expected to fall to around 160,000 tonnes by 2010. The biggest decrease is predicted for road transport and diesel-powered mobile machinery, as a result of new, stricter emission standards. As part of its consideration of the Environmental Objectives Bill in 2001, Parliament adopted a strategy for more efficient energy use and transport. This strategy includes a continued green tax shift, a review of the NO_x levy, a strengthening of the system of environmentally differentiated shipping lane dues, and incentives to encourage the introduction of heavy vehicles and mobile machinery meeting future EU emission standards. Fully implemented, the strategy will further reduce nitrogen oxide emissions, enabling the interim target to be met.

8 Flourishing Lakes and Streams

ENVIRONMENTAL QUALITY OBJECTIVE

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 objective is intended to be achieved within one generation.



Will the objective be achieved?

There is a growing awareness today of the importance of physical environments for the conservation of freshwater biodiversity. One factor crucial to achieving this objective is that agriculture, forestry and other primary sectors live up to their stated aim of taking care not to harm natural and cultural environments associated with lakes and streams. In parallel with this, efforts to provide long-term protection for areas with valuable natural assets associated with surface waters need to be stepped up.

Rivers and streams are a resource in terms of biodiversity, fisheries, recreation, cultural heritage and hydroelectric power. Projects to restore them have to take account of these different interests. Because of the legal and practical complexities involved, however, such projects may cost more and take longer to complete than expected. The action programmes for protection and restoration will shed light on these issues. Only then will it be possible to assess the prospects of achieving this environmental quality objective.

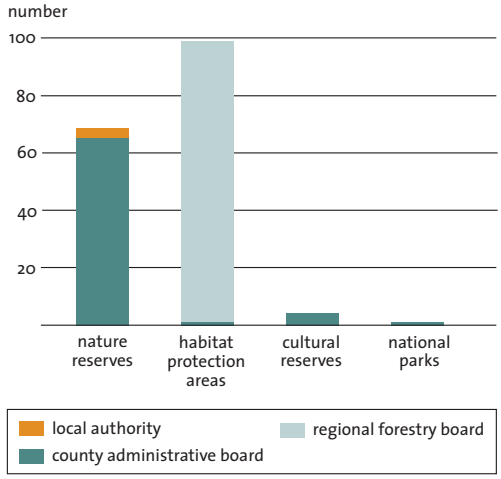
Will the interim targets be achieved?

INTERIM TARGET 1, 2005/2010

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.

The Swedish EPA has proposed guidelines for the conservation of valuable natural environments in and around lakes and streams, and over the past year these have been discussed with county administrative boards and regional forestry boards. The Agency has also called for changes to the habitat protection rules, proposing that waterfalls, rapids and natural outflows from lakes should enjoy general protection.

FIG. 8.1 Sites protected by different authorities for the express purpose of preserving freshwater environments



SOURCE: NATURE CONSERVATION REGISTER, SWEDISH EPA

Of the site safeguard options available, county administrative boards most frequently use nature reserve designation and forestry boards habitat protection areas to preserve freshwater environments. Nature reserves are generally larger in extent than habitat protection areas. Since 1987, local authorities have been able to create nature reserves; the Swedish EPA is proposing that they should also be able to establish habitat protection areas. Alongside site safeguard, ways of preserving aquatic environments include nature conservation agreements, planning and environmentally careful practices. (Lakes and streams are often included in protected areas, without being specifically mentioned in the statement of purpose.)

In 2002, 14 new sites containing one or other of the freshwater habitat types were proposed for inclusion in the European Natura 2000 network, which already incorporates some 750 such areas. Draft guidance on conservation measures for these habitat types has been prepared, and county administrative boards have begun to draw up conservation plans for the sites. As the Habitats Directive is now incorporated into Sweden's Environmental Code, these areas enjoy relatively far-reaching protection. Steps are currently being taken to safeguard the sites and establish preventive measures. In addition, 28 waters that are to be protected under the Ordinance on Environmental Quality Standards for Fish and Shellfish Waters have been designated.

By acquiring land and/or hydroelectric rights, the authorities have secured long-term protection for parts of several rivers, including the Moån in Norrbotten and the Mörrumsån in Blekinge. At present, 70 of Sweden's roughly 2,500 nature reserves have freshwater conservation as one of their aims, and many more include lakes and streams – although they often lack specific regulations for their protection.

Six out of Sweden's 21 counties draw attention to lakes and/or rivers in their cultural environment profiles. Of the country's 10 cultural heritage reserves, a number are associated with fresh waters, among them Rörträsk in Västerbotten. For the country as a whole, the National Heritage Board has identified 93 culturally significant rivers as being of particular conservation value. Long-term measures to preserve and protect their cultural assets will be set out in the action programme that is to be drawn up in accordance with this interim target. Work is under way on a description of cultural heritage features and contexts relevant to identifying significant cultural environments associated with lakes and running waters.

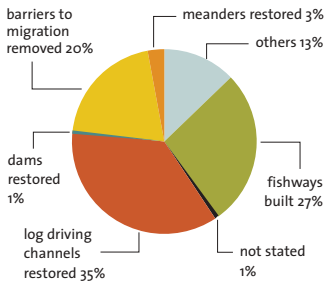
Only when action programmes to protect natural and cultural environments of particularly high conservation value are established will it be possible to assess the feasibility of achieving this target.

INTERIM TARGET 2, 2005/2010

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.

The process of identifying natural environments of particularly high conservation value is under way. Many watercourses containing valuable natural and cultural environments need to be restored, although the scale of action required cannot be quantified on the basis of existing knowledge. Central government funding for river and stream restoration is limited, and consists above all of the National Board of Fisheries' fishery conservation grants, the Swedish EPA's liming grants and the National Heritage Board's cultural environment grants. In the case of fisheries conservation, priority is given to interventions with enduring effects, e.g. projects to promote natural reproduction or give long-term protection to particularly valuable species and populations. Biological restoration of limed waters involves supplementing liming with measures to re-establish animal species once found there. Restoration measures include habitat management, building of fishways, removal of barriers to migration and restocking of species. Up to now, cultural environment grants have mainly been awarded for the conservation and maintenance of buildings. Through the Local Investment Programmes (LIP), many municipalities, working alongside local companies and organizations, have received help with investments that enhance the ecological sustainability of aquatic environments. In the case of the Vindelälven and Piteälven rivers, LIP support has enabled

FIG. 8.2 Breakdown of measures involved in 106 river and stream restoration projects, 1997–2002



SOURCE: NATIONAL HERITAGE BOARD

Restoration projects have been carried out with either fisheries conservation (42%), nature conservation (37%) and/or recreation/tourism (21%) as their main objective. Barriers to migration usually consist of dams/weirs or culverts, but may also include log driving remains or eel traps, possibly giving rise to a conflict of interests with cultural heritage conservation.

restoration and monitoring efforts to be coordinated across several local authorities.

When watercourses are to be restored, conflicts of interest may arise between nature, fisheries and cultural heritage conservation. Such problems can often be resolved if addressed at an early stage. A brief questionnaire survey on river restoration projects, to which 12 county administrative boards responded, showed that cultural aspects had been taken into account in around half the cases. However, none of the projects covered by the survey had been initiated with cultural heritage conservation as their main aim, although a few did include measures to rehabilitate installations of cultural significance.

Only when action programmes to restore Swedish rivers and streams of high conservation value have been prepared will it be possible to assess the prospects of achieving this target.

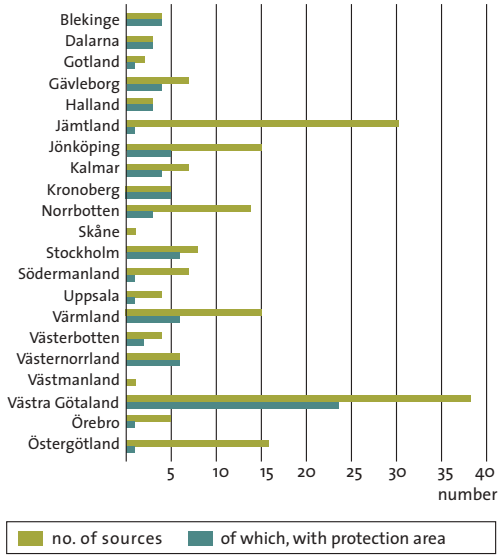
INTERIM TARGET 3, 2009

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.

Of Sweden's 195 municipal surface water sources, 81 (42%) have water protection areas, established under either the Environmental Code or local authority regulations. Private water supplies are based chiefly on groundwater; there are probably no large private surface sources of drinking water.

In line with the EC Water Framework Directive, a register is being prepared of areas requiring special protection, including bodies of water used for the abstraction of drinking water and providing more than 10 m³ a day or serving more than 50 people. Registered water sources are to be given the necessary protection, for example by means of safeguard zones.

FIG. 8.3 Number of public surface water sources with protection areas in 2000, by county



SOURCE: NATIONAL FOOD ADMINISTRATION AND SWEDISH EPA, GOVERNMENT-COMMISSIONED STUDY 2000

Of the 195 surface water sources represented in the diagram, 114 – or 58% – still lack protection under the Environmental Code or local authority regulations.

Even if this interim target is met, it is not certain that water sources will be protected in practice, since the target does not indicate how large protection areas should be or what safeguards they should entail. To ensure that protection is effective, it needs to be provided for in land use planning, and in sensitive areas water supply interests should be given priority.

The introduction of the Water Framework Directive will make the necessary tools available. It is assumed that Sweden will meet the directive's requirements.

INTERIM TARGET 4, 2005

By 2005 releases of aquatic animals and plants will be undertaken in ways which do not adversely affect biological diversity.

Fish are released into fresh waters in order to conserve threatened species and stocks or improve fisheries. The National Board of Fisheries' policy is that such releases should as far as possible be avoided. Before any fish are released, the possibility of achieving the desired result by restoration measures, for example, must be investigated, and the dispersal risk and impacts on genetic and biological diversity must be assessed. The policy stresses that local stocks should be used for all releases.

A Board of Fisheries sample survey of releases of brown trout in Dalarna county from 1992 to 2001 indicates that little attention was paid during that period to the origins of the trout used. However, these releases occurred before the Board's policy took effect, and it is too early to assess compliance with that policy. It is assumed that in future more careful account will be taken of the origins of fish released.

FIG. 8.4 Breakdown of all releases of brown trout in Dalarna county, by stock used, 1992–2001

Local stocks: trout stocks from river system where release occurs.

Specified stocks: trout stocks from other parts of Sweden.

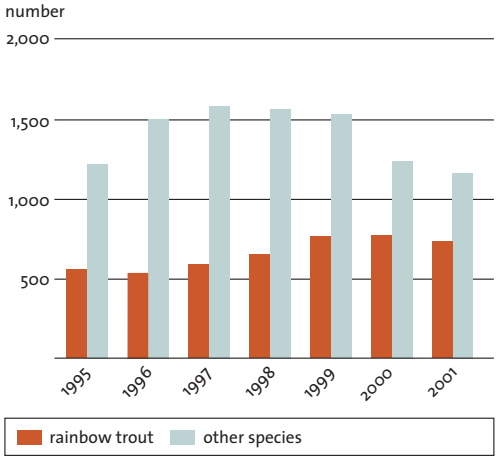
Foreign: here, trout from Lake Konnevesi in Finland.

Unspecified: trout stocks not specified in permits.

SOURCE: NATIONAL BOARD OF FISHERIES

In many cases, permits for releases have failed to take account of the origins of the fish to be used. A large proportion of releases involve fish of remote origin; only a small proportion are based on local stocks.

FIG. 8.5 Releases of rainbow trout in relation to releases of other fish species in Sweden as a whole, 1995–2001



SOURCE: NATIONAL BOARD OF FISHERIES

Rainbow trout are often stocked for put-and-take fishing, whereas other species are released into natural waters. The statistics indicate that county administrative boards, in line with the Board of Fisheries' policy, have become more restrictive when it comes to releases into natural waters.

It is illegal to release or farm species that are not native to Sweden, with the exception of rainbow trout, American speckled and lake trout (brook and lake char), signal crayfish and the hybrid splake, which already occur in the country. These non-native species are stocked to improve fisheries, but the Board of Fisheries' policy calls for restraint in releasing them into natural waters.

Provided that the Board's policy is followed and illegal releases are combated by means of information and supervision, this interim target should be met.

INTERIM TARGET 5, 2005

By 2005 action programmes will have been prepared and introduced for threatened species and fish stocks that are in need of targeted measures.

Action programmes are currently being drawn up or implemented for around 20 threatened species associated with lakes and streams. According to the Environmental Objectives Bill, up to another ten threatened species are in need of measures that justify action programmes. A review of procedures for developing action programmes for species and habitat types is in progress. It is not known at present how many species inhabiting and associated with fresh waters require targeted measures.

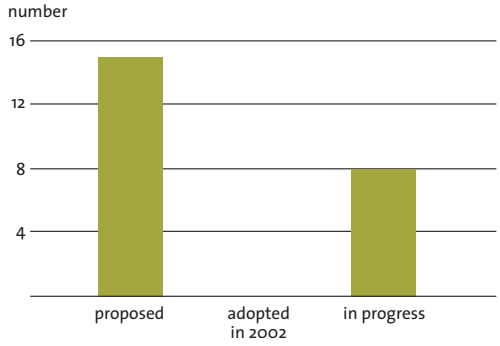
To facilitate implementation of the EC's Habitats Directive, guidance documents have been prepared for the conservation of the 103 plant and animal species covered by Annex II of the Directive. At least 20 of these species are associated with lakes and streams, including 15 on the Red List of Swedish Species.

Several action programmes are now being implemented, involving both action in the field and research and development. Among other things, monitoring methods for the wels (*Silurus glanis*) are being developed. Research on the genetic diversity of the native noble crayfish has revealed that most populations are genetically distinct, underlining the importance of using local, river-specific stocks in reintroduction, restoration and restocking programmes.

The effects of measures introduced should be monitored as part of the action programme concerned.

Before the new procedures for developing action programmes are implemented, or the number of programmes required for the threatened species of lakes and streams is known, it is difficult to assess whether this target will be met.

FIG. 8.6 Action programmes for threatened species and fish stocks in and in the vicinity of lakes and streams



SOURCE: SWEDISH EPA

To date, eight action programmes for threatened species/habitats have been adopted and 15 have been placed on a priority list. During 2003, the overall need for programmes for species and habitats in and around lakes and streams will be quantified.

INTERIM TARGET 6, 2009

By 2009 a programme of measures as provided for in the EC Water Framework Directive will be established, specifying how good surface water status is to be achieved.

At the end of 2002, three official studies relating to the EC Water Framework Directive were completed:

- The Committee on the Environmental Code presented proposals on how parts of the directive should be transposed into Swedish legislation.
- The Committee on Swedish Water Administration proposed an organizational framework for implementing the directive.
- The Swedish EPA presented some of the technical and scientific data which the water authorities will need to discharge their duties.

In addition, the EU member states and the European Commission, as part of the Common Implementation Strategy, have drawn up a number of guidance documents to assist in implementing the directive.

9 Good-Quality Groundwater

Will the objective be achieved?

This environmental quality objective aims to ensure a supply of water of good quality and sufficient quantity to meet the needs of society as a whole. At the same time, the quality and quantity of groundwater should be such as to help ensure viable habitats for the flora and fauna of ecosystems that depend on it. Existing and future sources of groundwater for use as drinking water are large aquifers in the form of eskers and, in the south of Sweden, sedimentary rock formations. To achieve the objective, these aquifers must be protected from any development that restricts their use as drinking water sources.

The most important mechanism for attaining the drinking water goal is the establishment of protection areas for bodies of groundwater from which drinking water is or is planned to be abstracted. This measure can also be used to safeguard geological formations for future water supplies. Compensation claims by landowners, however, will affect whether sufficiently strong protection can be put in place.

Where conflicts arise, drinking water often has to take second place to other interests. This environmental quality objective and a sustainable supply of drinking water conflict with many other goals of society, e.g. regarding infrastructure, use of natural gravel, mineral extraction, food production and in certain cases nature conservation. The objectives for groundwater set out in the EC Water Framework Directive, and above all the programmes of measures which it requires, strengthen the status of groundwater, both as a source of drinking water and in ecological terms. However, the directive as such does not create a basis for stronger protection of groundwater sources of importance for water abstraction than is provided by the Environmental Code. A power to protect groundwater at at least the 'national interest' level should be introduced into the Code.

If groundwater is to contribute to viable habitats for flora and fauna in lakes and watercourses, some of the interim targets relating to eutrophication, acidification and a non-toxic environment also need to be achieved. It should be noted, moreover, that measures to improve groundwater quality or prevent its deterioration sometimes take decades to have an effect.

Will the interim targets be achieved?

INTERIM TARGET 1, 2010

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.

By protecting geological formations under the Environmental Code, it is possible to ensure that they can in future be used to augment groundwater. At present, no such long-term protection is in place. Artificial recharge of groundwater is already necessary to meet the drinking water needs of major towns.

The Geological Survey of Sweden (SGU) is currently identifying geological formations that can be considered of importance in meeting water supply needs in a national/regional perspective. It will also be proposing a list of formations requiring long-term protection – some of them as formations of national interest. At present there is no power to protect a formation on the ground that it is of 'national interest for the purposes of water supply'. As a result, where land use conflicts arise, other societal or nature conservation interests often prevail. The

ENVIRONMENTAL QUALITY OBJECTIVE

Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.

This objective is intended to be achieved within one generation.

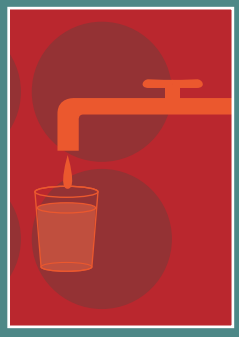
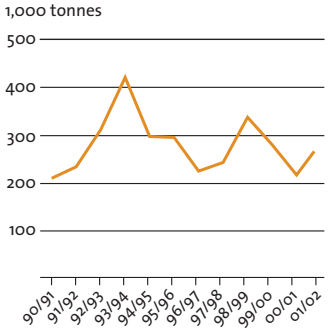


FIG. 9.1 Use of salt on state road network



SOURCE: NATIONAL ROAD ADMINISTRATION

Primarily to ensure that roads remain passable, but also for safety reasons, salt (NaCl) is used as a de-icing agent at temperatures around 0 °C. The amounts applied vary according to the weather. In the winter of 2001/02, 265,000 tonnes of salt were used on state roads in Sweden, almost 20% more than the previous winter. The increase was mainly due to a greater frequency of icy conditions and snowfall. This can be seen from a comparison with the National Road Administration's salt index. For winter 2001/02, no data are available on the quantities of salt used on local authority roads; in previous years, they showed a gradual rise.

Committee on the Environmental Code should examine without delay the possibility of statutory provision for protecting geological formations of national interest for drinking water purposes.

INTERIM TARGET 2, 2010

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.

Large fluctuations in the water table cause landslides and debris avalanches in the river valleys of northern Sweden and subsidence problems in the major urban regions. They also affect drinking water quality. No fewer than seven coastal counties report problems of salt-water intrusion. Especially in coastal areas with large concentrations of second homes, withdrawals of fresh groundwater may exceed the rate of recharge, jeopardizing the long-term supply of water.

For this target to be achieved, local authorities need more relevant hydrogeological and geological data. It will then be possible to plan new developments in such a way as to meet long-term water supply and sewage treatment requirements. The EC Water Framework Directive is a powerful instrument in this context, in that it does not permit development that will result in salt-water intrusion.

INTERIM TARGET 3, 2010

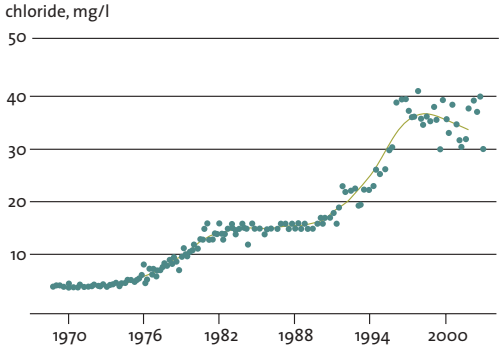
By 2010 all bodies of water used for the abstraction of water intended for human consumption, and providing more than 10 m³ a day as an average or serving more than 50 persons, will meet the Swedish standards for good-quality drinking water with respect to anthropogenic pollution.

Data that can be used to track progress towards this target are not yet available. Tools for processing relevant data are being developed, and data collection is under way.

The most important step towards achieving the target is to introduce the possibility of protection on hydrogeological grounds for groundwaters used for water abstraction, but still lacking protection. In addition, the safeguards in place in many existing water protection areas are inadequate and need to be reviewed. The Swedish EPA's revised guidelines and handbook on protection areas, due out in June, may be of assistance to county administrative boards and local authorities in this regard. A large number of municipalities have already begun to review the protection given to their public drinking water sources. Many county administrative boards' regional environmental objectives for groundwater include the establishment of protection areas.

If land use in a protection area is significantly impeded, the owner may seek compensation, which is one reason why local authorities have refrained from providing adequate protection for water sources. In 1995 the Groundwater

FIG. 9.2 Effects of road salt on groundwater



SOURCE: SWEDISH ENVIRONMENTAL MONITORING PROGRAMME

Salting of roads in winter has raised chloride levels in groundwater. This can cause corrosion of water pipes. Apart from the fact that metals may as a result find their way into drinking water, there is a risk of damage to domestic appliances and water supply installations. Households with private wells close to roads face the biggest problems, but large groundwater reservoirs supplying urban populations (or which may do so in future) are also affected.

Committee argued that it was possible to introduce more far-reaching restrictions than are normally imposed in protection areas, without becoming liable to pay compensation. A few judgments of the Superior Environmental Court from 2002 confirm this view.

If the quality of raw water is improved, it may be possible to reduce the quantities of chemicals needed to produce drinking water.

For this interim target to be met, means of controlling contamination risks in water protection areas must exist. The most significant problems affecting well water are:

- nitrates in southern counties with high agricultural intensity,
- pesticides in Skåne, Uppsala, Västmanland and Gotland counties,
- rising chloride levels near roads that are salted in winter, in southern and central regions and along the northern Swedish coast.

In the south, groundwater is also severely affected by acidification. This causes corrosion of water pipes, which can raise heavy metal levels in drinking water. Atmospheric deposition of sulphate fell by some 60% in the 1990s. Despite this, only a very slight improvement can be discerned in terms of groundwater acidification, owing to the very slow rate at which groundwater recovers.

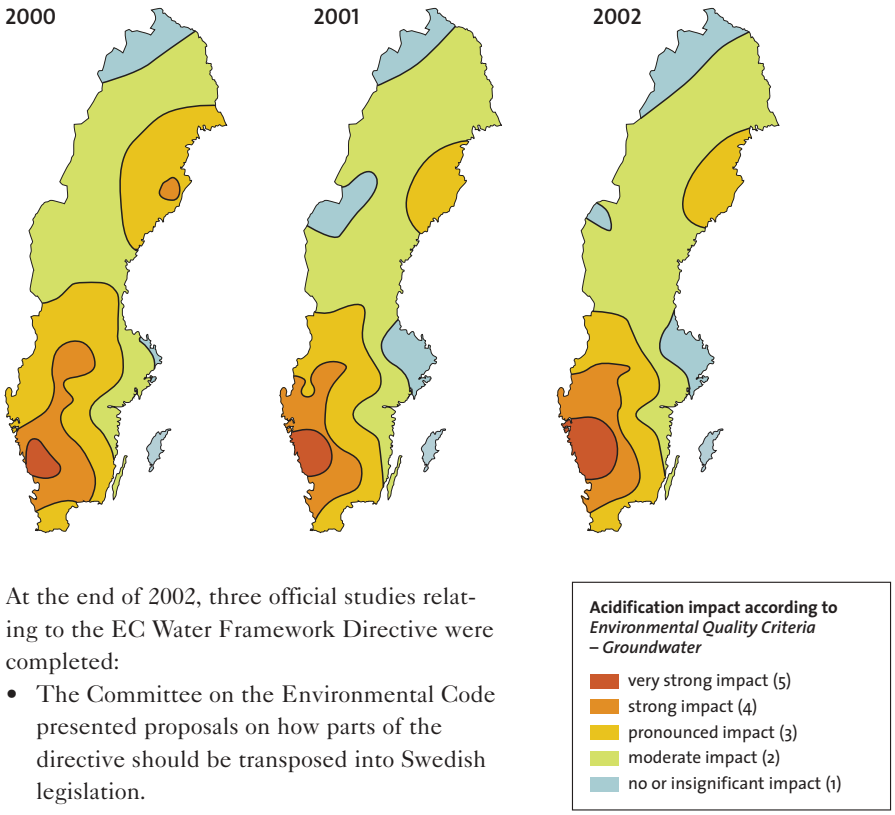
The long timescale of groundwater recovery means that people in south-west Sweden who obtain their drinking water from shallow aquifers may have to live with raised levels of metals in their water for several decades as a result of pipe corrosion.

Acidification is dealt with at greater length under Natural Acidification Only.

INTERIM TARGET 4, 2009

By 2009 programmes of measures as provided for in the EC Water Framework Directive will be established, specifying how good groundwater status is to be achieved.

FIG. 9.3 Acidification of shallow groundwater



SOURCES: SWEDISH ENVIRONMENTAL MONITORING PROGRAMME AND SGU

Long runs of data reveal a marginal decrease in the impact of acidification on shallow groundwater. In the last three years, acidification seems to have abated somewhat in northern and eastern Sweden, whereas in the south-west the area strongly or very strongly affected has if anything increased.

At the end of 2002, three official studies relating to the EC Water Framework Directive were completed:

- The Committee on the Environmental Code presented proposals on how parts of the directive should be transposed into Swedish legislation.
- The Committee on Swedish Water Administration proposed an organizational framework for implementing the directive.
- The Swedish EPA presented some of the technical and scientific data which the water authorities will need to discharge their duties.

In addition, the EU member states and the European Commission, as part of the Common Implementation Strategy, have drawn up a number of guidance documents to assist in implementing the directive.

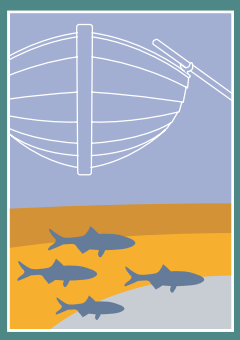
The programmes of measures called for in the Water Framework Directive are to be designed in such a way as to achieve 'good groundwater status' by 2015. Under the directive, member states are required to draw up such programmes, and this interim target will thus be achieved.

10 A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos

ENVIRONMENTAL QUALITY OBJECTIVE

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 objective is intended to be achieved within one generation.



Will the objective be achieved?

In 2002 the Government set up a Marine Environment Commission to propose new measures to attain this environmental quality objective. The Commission is to report by 30 June 2003.

In December 2002, EU fisheries ministers decided on a reform of the Common Fisheries Policy, creating a new basis for meeting the interim targets for fisheries under this objective. The decision was not entirely in line with Sweden's aims, but does nevertheless lay a foundation for a sustainable fisheries policy.

Efforts to preserve environments of high conservation value are progressing, and in several coastal counties conditions for establishing new marine nature reserves have become more favourable. A strategy to preserve the cultural heritage and agricultural landscapes of coastal and archipelago areas is being developed, using an approach that cuts across several of the environmental objectives.

Some steps have been taken to tackle the bycatch problem and make fisheries more sustainable, but further action is needed. The process of establishing action programmes for threatened species needs to be accelerated. Attainment of this environmental quality objective is dependent on the objectives Zero Eutrophication and A Non-Toxic Environment being achieved. The goals for the agricultural landscape, the built environment, forests, wetlands, and lakes and streams are also relevant in this context.

Will the interim targets be achieved?

INTERIM TARGET 1, 2005/2010

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 will be protected as reserves, and the competent authorities will have decided which other areas in the marine environment are in need of long-term protection.

A substantial body of knowledge exists regarding the land-based natural assets of Sweden's coastal and archipelago areas, but when it comes to the marine environment, and especially offshore waters, very few data are available. During 2003 surveys of some of the marine habitat types listed in the EC Habitats Directive will be completed. Inventories of shallow sea areas will also begin during the year.

The process of implementing the EC's Habitats and Birds Directives involves the selection of natural habitat types and species of particular conservation value. Twenty-three of the habitat types defined are marine or marine-related. Together with freshwater and terrestrial habitats, they make up the European Natura 2000 network. Sweden's list now includes 372 sites containing marine habitat types. One of these is Hoburg Bank, located partly within Sweden's economic zone to the south of

Gotland. This area is of considerable biological interest, with large wintering populations of long-tailed duck and other birds. Hoburg Bank has been designated by Sweden for inclusion in the Helsinki Convention network of protected areas. In 2002 the Swedish EPA proposed changes to existing habitat protection rules to facilitate the safeguarding of freshwater, marine and brackish-water habitats. In that context, it called for general protection for entirely or partly enclosed shallow inlets, river mouths and *Lophelia prolifera* reefs. The Agency has also recommended changes to the provisions on shore protection.

To give an impetus to efforts to safeguard and manage marine protected areas in all the coastal counties of Sweden, a seminar was held in 2002 by the Swedish EPA and the National Board of Fisheries. In several counties, the process of establishing marine nature reserves is now under way. In all, there are now eight large nature reserves of this type. The earlier slow progress in creating such reserves was partly due to local opposition.

On the cultural heritage side, existing knowledge is limited – with certain regional exceptions – and needs to be updated in order to be able to determine where long-term protection is required. There are currently about 140 areas of national interest which incorporate coastal and archipelago environments, but the areas selected need to be reviewed.

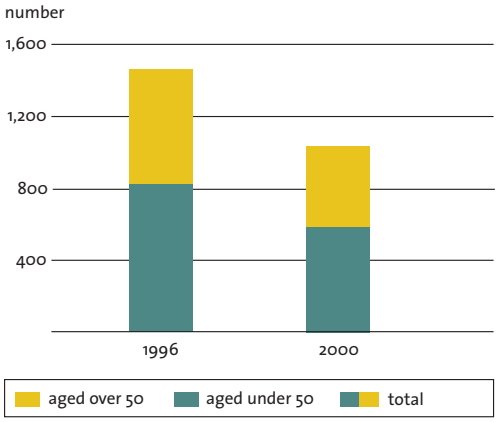
The National Heritage Board, in collaboration with the Swedish Maritime Administration, has drawn up a conservation plan for Swedish lighthouses and lighthouse sites. In 2002, 25 lighthouses were designated as national cultural heritage sites.

INTERIM TARGET 2, 2005

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.

The National Heritage Board has begun to develop this strategy, and a number of clear tendencies can be made out. The cultural heritage of coastal and archipelago areas is an essential part of what makes such areas attractive, as well as a resource for regional development. In the traditional sectors of fishing, shipping and agriculture, major structural changes have taken place, radically affecting the basic conditions for preserving and developing the cultural heritage of coasts and archipelagos. When farming is abandoned or restructured, there is a danger of much of the traditional open landscape becoming overgrown with scrub. The character of this special environment may also be changed if redundant farm buildings are demolished or converted to new uses. In some areas, development pressures are considerable, inflating land and property prices and forcing out permanent residents who can no longer afford to live there. Many coastal communities are now completely dominated by second homes.

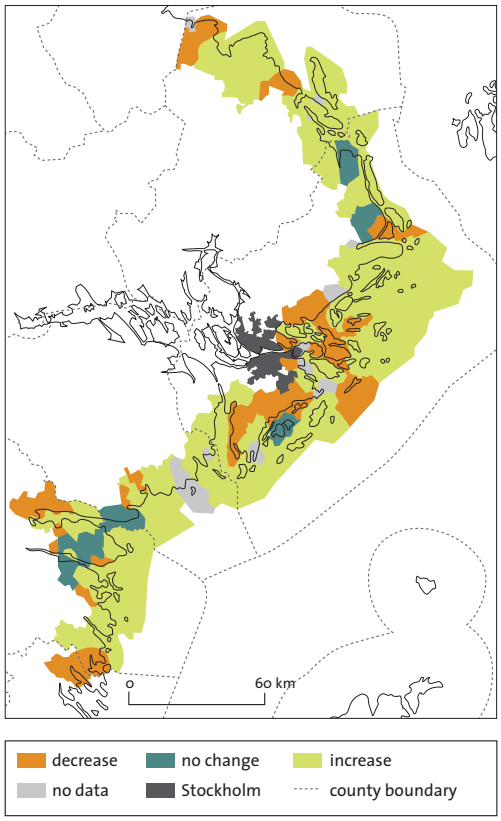
FIG. 10.1 Number of licensed fishermen and women on the Västra Götaland coast in 1996 and 2000



SOURCE: STATISTICS SWEDEN

Clearly, the decline in the number of commercial fishermen and women is not only due to retirements among members of an ageing profession.

FIG. 10.2 Changes in area of pasture land along the coast of eastern central Sweden, 1995–2001



SOURCE: SWEDISH BOARD OF AGRICULTURE

As a result of withdrawal of land from production and restructuring of agriculture, pasture land is in danger of becoming overgrown. Agri-environment schemes have created a new basis for preserving pastures, and since Sweden joined the EU the area of grazing land has increased. This map shows changes in the pasture area between 1995 and 2001 in 91 parishes with coastal and/or archipelago areas. In 53% of these parishes, the area of pasture increased by more than 5%. It decreased in 24% of them, above all close to large villages and towns. In 9% of the parishes the area was unchanged (i.e. it changed by less than 5%). For 14% of the parishes, no data are available.

If the number of licensed commercial fishermen and women continues to fall, boats and operations linked to fisheries could disappear from former fishing harbours, and the associated installations and buildings could be lost or turned into homes. Inshore fishing is thus essential in keeping Sweden's coastal archipelagos alive. Older vessels of cultural historical interest, especially fishing boats, represent a threatened cultural heritage. Certain fishing methods could affect the marine archaeological heritage. In 2003 efforts will be made to promote greater understanding of the need to conserve older elements of the floating cultural heritage.

INTERIM TARGET 3, 2005

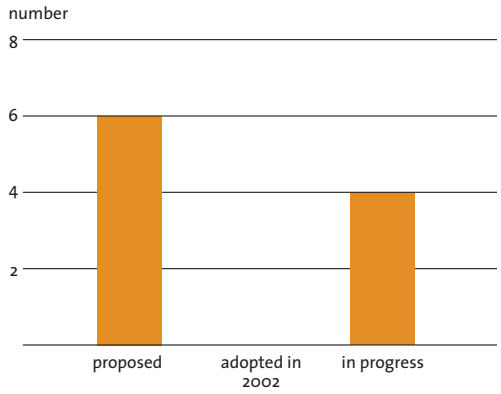
By 2005 action programmes will have been prepared and introduced for threatened marine species and fish stocks that are in need of targeted measures.

Action programmes are intended for threatened or near-threatened species in cases where current site protection efforts alone are insufficient to ensure the species' survival in Sweden. The Swedish Species Information Centre considers 17 marine Red List species to be in need of measures that justify action programmes. Programmes are now under way for four species found in coastal or marine environments.

In 2002 the National Board of Fisheries and the Swedish EPA proposed an action programme for the harbour porpoise, including measures to reduce bycatch of this species. During 2002, within ASCOBANS (the small cetaceans agreement adopted under the Bonn Convention), Sweden actively sought to establish a recovery plan for the porpoise in the Baltic Sea.

Implementation of the national action programme for wild salmon is continuing in the framework of the agreed international plan for Baltic salmon.

FIG. 10.3 Action programmes for threatened species and fish stocks



SOURCE: SWEDISH EPA

Action programmes currently exist for four species found in coastal or marine environments, namely wild salmon, pool frog, green toad and natterjack toad. A further six species have been assigned to a priority list.

The Board of Fisheries is currently working on a project to describe the biodiversity of the fish fauna of Sweden's marine ecosystems. The aim is to identify reference values for natural biodiversity in coastal and marine areas, as well as to provide an overview of the present state of biodiversity and hence of the threats to fish species and populations.

A review of procedures for developing action programmes for species and habitat types is in progress. The programmes now being prepared and implemented cover the species given priority by the authorities before the environmental quality objective was adopted. The total number of species in marine environments requiring targeted measures has yet to be clarified.

For the interim target to be met by 2005, the new procedures for developing action programmes must be put in place and efforts to establish a national Red List of threatened marine species must be intensified.

INTERIM TARGET 4, 2010

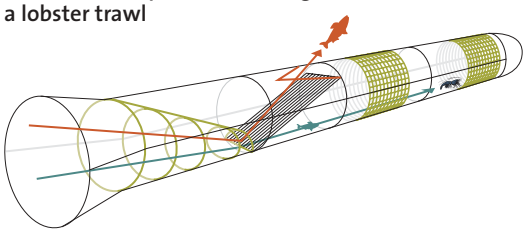
By 2010 total annual bycatches of marine mammals will not exceed 1% of each population. Bycatches of sea birds and undesired fish species will have been reduced to levels that have no adverse effect on the populations concerned.

Bycatches of fish in Norway lobster trawls are often substantial. Since stocks of several demersal fish species are at historically low levels, it is essential to develop lobster trawls that are selective for target species and size, i.e. which catch lobsters of the right size and exclude fish. In 2002, therefore, efforts to develop a method for excluding fish from lobster trawls were stepped up.

Very good results have been achieved in trials using an exclusion grid similar to that employed in shrimp trawling. Virtually all large fish were diverted from the trawl. Discard of smaller fish was reduced by more than half compared with present levels.

Off the west coast of Sweden, the largest bycatch of common (harbour) seals is associated with fyke nets used to catch eels. As part of a project called 'Seals and Fisheries', these nets have been modified to prevent seals from entering them and drowning. The proposed action programme for the porpoise (see interim target 3) includes several measures to reduce the bycatch of that species.

FIG. 10.4 Principle for excluding fish from a lobster trawl

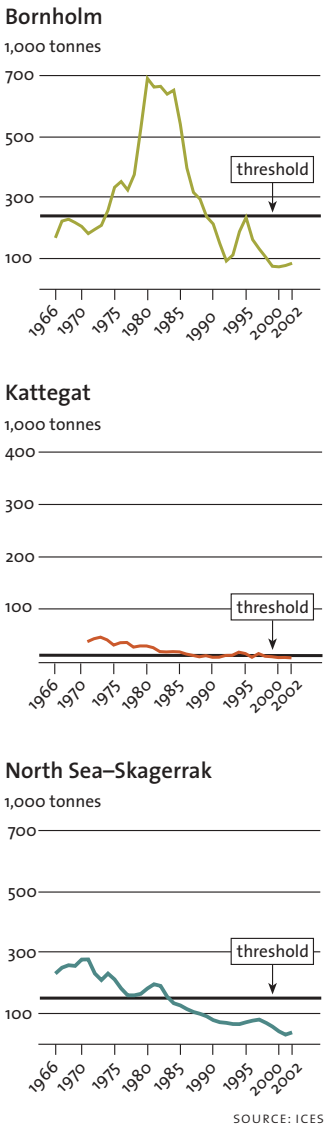


With this type of lobster trawl, bycatch of demersal fish is appreciably reduced.

Incoming individuals are guided down towards the bottom of the trawl via a tunnel, to a rigid grid, which deflects large fish upwards and out through the top of the trawl. Smaller fish and lobsters pass through the grid into the cod end. The square-mesh panels of the cod end (the green areas towards the front of the trawl) then permit even better selection by allowing small fish and undersized lobsters to escape.

SOURCE: NATIONAL BOARD OF FISHERIES

FIG. 10.5a–c Development of spawning biomass of cod in Baltic Sea (eastern stock), Kattegat and North Sea (incl. Skagerrak)



SOURCE: ICES

If the spawning biomass ends up below the threshold, the population is considered to be below biologically safe limits and is in danger of collapsing.

INTERIM TARGET 5, 2008

By 2008 catches of fish, including bycatches of juveniles, will not exceed recruitment, enabling fish stocks to survive and, where necessary, recover.

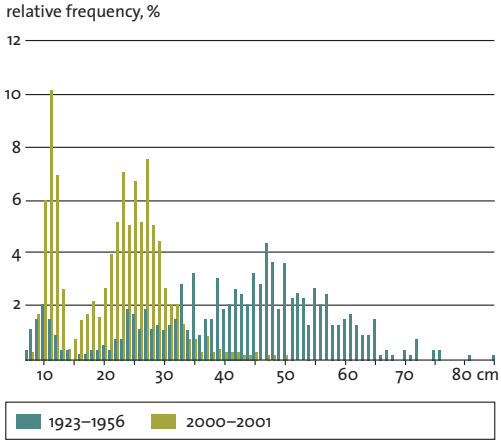
The International Council for the Exploration of the Sea (ICES) is an independent scientific body that provides scientifically based advice on fishing and environmental issues to international organizations and national governments. The positions it adopts are founded on data gathered by the member countries. If sustainable, ecosystem-based fisheries for different species are to be achieved, it is essential to allow decisions on catches and conservation measures to be guided by ICES' advice. Up to now, insufficient account has been taken in fisheries management of species other than fish of commercial interest. It is therefore important to clarify what 'ecosystem-based fisheries management' means in practice.

The major marine fish stocks of Europe are managed on the basis of negotiations, either directly between the EU and Norway, as in the case of the North Sea, or within fisheries commissions, such as the IBSFC for the Baltic Sea. In the case of cod fisheries – whose management was much discussed in 2002 – ICES' advice for the Kattegat, Skagerrak and North Sea was not followed when catch quotas were set. As for the Baltic, the final advice of ICES left relatively large scope for interpretation. This resulted in a much higher catch of cod than the complete moratorium advocated by Sweden.

In 2002 the EU's Fisheries Council agreed on a reform of the Common Fisheries Policy. New Council Regulations were adopted on the conservation and sustainable exploitation of fisheries resources, scrapping of fishing vessels and structural assistance.

To bring about long-term improvements in spawning conditions for cod off the west coast,

FIG. 10.6 Relative (percentage) size distribution of cod caught in sample trawls in Gullmarsfjorden from 1923 to 1956 (means for period) and in 2000



SOURCE: NATIONAL BOARD OF FISHERIES

Adult, sexually mature cod have now more or less disappeared from Gullmarsfjorden on the west coast of Sweden. Apart from reducing the potential fishery, the loss of large predatory fish could radically change the structure and functioning of the area's ecosystems.

the Board of Fisheries is carrying out surveys and studies of spawning grounds. In 2002 two closure areas were established in Laholm and Skälderviken Bays in the counties of Halland and Skåne, prohibiting fishing from January to March inclusive, i.e. the period when cod congregate in their spawning areas. This step was taken in response to the sharp decline of cod stocks in the Kattegat and Skagerrak.

To protect salmon and brown trout in the Skagerrak and Kattegat, new closure areas have been established around the mouths of 15 rivers previously lacking protection for these species. At five river mouths, moreover, existing closed areas were extended somewhat in 2002, and on another 12 stretches of coast they have been linked between river mouths. The new and extended closure areas established in the last 20 years have greatly improved the status of

several salmonid populations. They are especially important on the west coast, as many of the rivers with spawning and nursery grounds are small, making their populations vulnerable. Establishing closure areas is a very important fishery conservation measure, and also benefits many other fish species.

INTERIM TARGET 6, 2010

By 2010 noise and other disturbance from boat traffic will be negligible in particularly sensitive and designated archipelago and coastal areas.

Establishing areas with limited or no motorboat traffic, combined with special lanes for recreational craft, is an important measure in achieving this target. It is also important to monitor the effects of action taken to reduce noise disturbance. It will be the responsibility of county administrative boards, in consultation with local authorities, to propose areas for designation as particularly sensitive archipelago areas, in which noise from boat traffic is to be reduced.

At present there are no designated sensitive coastal and archipelago areas with negligible levels of noise, partly owing to a lack of criteria for identifying such areas. A joint group involving a number of authorities has proposed a survey method to map out the characteristics of different areas in terms of noise and freedom from it. The group's report describes the impacts which noise has on, among other things, recreation in natural, cultural and recreational areas.

INTERIM TARGET 7, 2010

By 2010 discharges of oil and chemicals from ships will be minimized and reduced to a negligible level by stricter legislation and increased monitoring.

A government inquiry on discharges of oil proposed a range of measures to enable more effective action to be taken against illegal discharges at sea. These included a total ban on oil discharges, a new administrative fine, and jurisdiction extending throughout the economic zone. In December 2001 Parliament approved a bill based on the inquiry's findings. More powerful instruments to prevent discharges of oil are therefore now in place.

In 2002 a review began of existing Swedish arrangements to combat oil pollution damage at sea, the aim being to lay a foundation for work in this area over the next 10–15 years. The Rescue Services Agency, the Coast Guard, the Maritime Administration, the Swedish EPA, the Association of Local Authorities and IVL Swedish Environmental Research Institute Ltd. are participating in the review, the findings of which will be published in spring 2003.

INTERIM TARGET 8, 2009

By 2009 programmes of measures as provided for in the EC Water Framework Directive will be established, specifying how good surface water status can be achieved.

At the end of 2002, three official studies relating to the EC Water Framework Directive were completed:

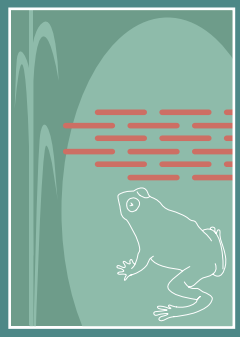
- The Committee on the Environmental Code presented proposals on how parts of the directive should be transposed into Swedish legislation.
- The Committee on Swedish Water Administration proposed an organizational framework for implementing the directive.
- The Swedish EPA presented some of the technical and scientific data which the water authorities will need to discharge their duties.

In addition, the EU member states and the European Commission, as part of the Common Implementation Strategy, have drawn up a number of guidance documents to assist in implementing the directive.

11 Thriving Wetlands

ENVIRONMENTAL QUALITY OBJECTIVE

The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.



Will the objective be achieved?

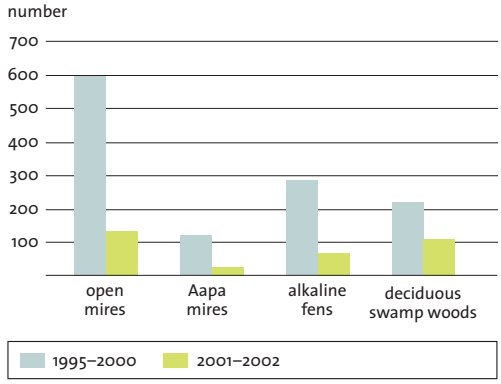
During the 1990s, several legislative changes promoting the long-term conservation of wetlands were introduced. Work in this area is in progress at both the national and the international level, e.g. under the 1971 Ramsar Convention (for the protection and conservation of wetlands) and through the Natura 2000 network and EU agri-environment schemes.

Proposals have recently been submitted to the Government that would extend habitat protection to include certain environments associated with water, some of them involving wetlands. Other proposals envisage an extended ban on drainage and the possibility of a general duty of consultation in connection with the building of forest roads.

Under the Environmental and Rural Development Programme (ERDP), payments can be made to support the re-creation of wetlands. The aims are to trap nutrients from farmland and promote biodiversity. At the same time, care is to be taken when creating wetlands to avoid any adverse impacts on the cultural heritage interest of the area. Since the Environmental Code came into effect in 1999, it has been possible to protect valuable human-influenced landscapes as cultural heritage reserves, and several such reserves include wetlands with significant cultural assets.

It is difficult at present to assess the effects of existing measures and instruments. The Swedish Board of Agriculture has been asked to develop quality criteria for wetlands in farming areas. Despite the good progress made, it is uncertain whether this objective will be attained.

FIG. 11.1 Number of Natura 2000 sites in Sweden hosting certain wetland types*



* Wetland types 7110 and 7140, 7310, 7230, and 9080 in the EC classification

SOURCE: NATURA 2000 DATABASE, SWEDISH EPA

Several of the sites which the Government has decided are to be included in the European Natura 2000 network contain wetlands of different types, e.g. open mires, Aapa mires, alkaline fens and deciduous swamp woods. In all, some 15 of the wetland types included in the EC classification are to be found in Sweden.

Will the interim targets be achieved?

INTERIM TARGET 1, 2005

A national strategy for the protection and management of wetlands and wet woodlands will be drawn up by 2005.

The process of developing a national strategy – which will involve several authorities – will begin in autumn 2003. The aim is to assemble the data needed to assess funding requirements, allocate responsibilities and establish arrangements for cooperation. The relevant environmental quality objectives and international undertakings will be taken into account. The strategy will cover such issues as protec-

tion, restoration and creation of wetlands, management requirements for different habitat types, information and local support.

On the initiative of WWF-Sweden, non-governmental organizations will be preparing a policy and strategy of their own for Swedish wetlands, partly with a view to promoting larger-scale restoration of wetlands. This NGO project could form part of the basis for the national strategy.

With additional effort, this target should be achieved.

INTERIM TARGET 2, 2010

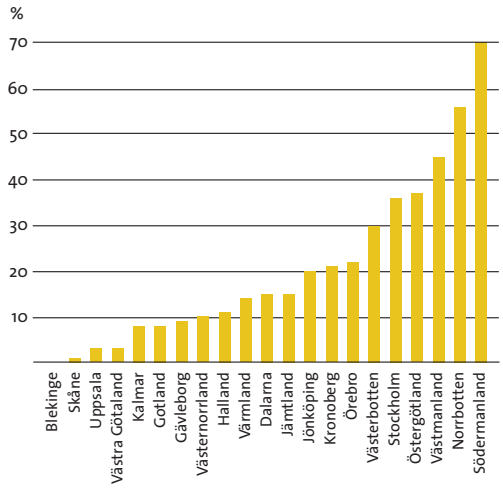
By 2010 long-term protection will be provided for all the wetland areas listed in the Mire Protection Plan for Sweden.

The Mire Protection Plan covers 503 sites with a combined area of 892,000 ha. When it was adopted in 1994, 150 sites were fully or partly protected, and the area protected amounted to 62% of the total area included in the plan. By the end of 2002, the number had risen to 214, corresponding to 69% of the total area. Over the period 1995–2002, the rate of protection of new sites has been around 7,500 ha/year. Over half the Mire Protection Plan sites are included in the Natura 2000 network, either fully or to a large extent, while a third of them are not included at all. This means that much remains to be done to meet this interim target.

In 2002 six new nature reserves with a total area of some 13,000 ha were created in Jämtland, Dalarna and Västernorrland counties, with the largest number and area in Jämtland. In addition, acquisitions and compensation payments secured another 4,500 ha of land covered by the Mire Protection Plan. This gives some idea of the potential for designating new reserves in the years ahead. At the present rate, it will not be possible to achieve the target on schedule.

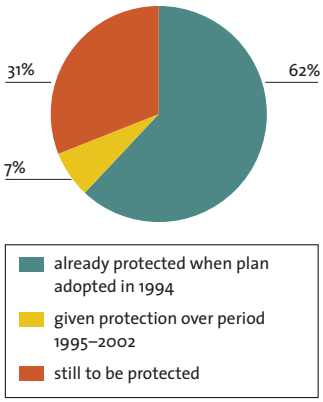
The main reason for the slow progress in implementing the plan is a lack of resources at the authorities that make decisions on site safeguard, i.e. county administrative boards and local authorities. The resources that are available are targeted primarily on safeguarding forest environments, which are judged to be at greater risk. The estimate of increased funding needs over the next few years, set out in the Environmental Objectives Bill, seems well founded.

FIG. 11.2a Progress by individual counties (in percentage terms) towards protecting Mire Protection Plan areas that were unprotected in 1994



SOURCE: SWEDISH EPA

FIG. 11.2b Protection status of area included in Mire Protection Plan, December 2002



SOURCE: SWEDISH EPA

INTERIM TARGET 3, 2004

By 2004 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 in other respects.

At present, 'notice of consultation' is required under the Environmental Code for activities and measures that could alter the natural environment. Normally virtually all forest road projects are considered to be in that category, but it is up to the developer to assess whether notice of consultation is required. The Forestry Administra-

tion estimates that it handles consultations for the vast majority of new plans for forest roads. In 2002, consultations under the Environmental Code took place for 752 such projects. Nevertheless, a number of forest roads have been built across wetlands without prior consultation.

A conceivable way of reducing the impacts of forest road building on wetlands is to ensure that more such projects are made the subject of consultation. This could be achieved by introducing a general duty to notify the regional forestry board when such a road is to be built. Before that is done, however, the National Board of Forestry wishes to clarify how many forest roads are built across wetlands, and a study of this is currently under way. In addition, the effects of current consultations should be examined more closely. No inventories of valuable cultural environments have been carried out, and current knowledge about how such environments have been affected is therefore inadequate.

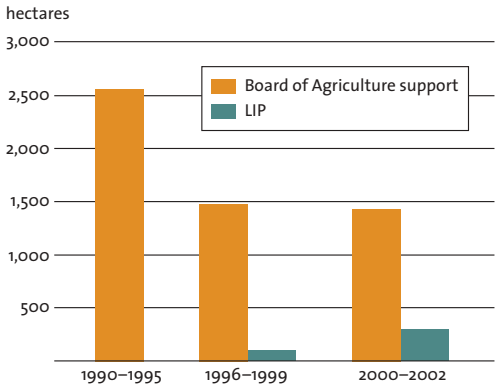
It is difficult at present to assess whether or not the interim target will be achieved. No data are available on the extent to which new forest roads are affecting wetlands. Nor have the effects of consultations in 2002 been analysed as a basis for assessing whether the impacts of such projects on wetlands have been reduced. With a general notification requirement, the statistics could be improved, and this would also make it easier to assess the prospects of attaining the target.

INTERIM TARGET 4, 2010

At least 12,000 hectares of wetlands and ponds will be established or restored on agricultural land by 2010.

Wetlands are established with the support of a number of different bodies. For several years, the Swedish Board of Agriculture, in collaboration with county administrative boards, has made payments to landowners wishing to create wetlands on farmland. Today, such payments are made under the ERDP.

FIG. 11.3 Wetlands established on agricultural land, 1990–2002



SOURCE: SWEDISH BOARD OF AGRICULTURE

The diagram shows the areas of wetlands/ponds established on farmland in the framework of Board of Agriculture support schemes and Local Investment Programmes (areas funded by other bodies are not included). Between 1990 and 1995 support was given in the form of wetland creation and NYLA grants. The figures for 2000–2 also include restored wet meadows and pastures. At the present rate, the interim target is not expected to be achieved.

The National Heritage Board has carried out on-site inspections of 55 artificially created wetlands in two counties. Only in exceptional cases had the wetlands resulted in a good cultural environment. Most of them consisted of excavated ponds with a relatively large water surface, but only a small area of adjoining wet ground. This highlights the need to establish wetlands of high quality in terms of both the natural and the cultural environment.

In the framework of the Local Investment Programmes, some 300 ha of wetlands were created in agricultural areas over the period 2000–2. Some 40 wetlands were restored/created to safeguard biodiversity, and an equal number to treat surface runoff or municipal wastewater. All the funding allocated has now been used.

Wetlands are also created with funding from other bodies. The Swedish Wetlands Fund, for example, provided support for some 600 ha of farmland wetlands in 2000–2, and the WWF funded projects covering around 200 ha over the same period. In addition, small areas of wetland are established through private initiatives, under action programmes for threatened amphibians, and in some cases with local authority support. In the period up to 2010, moreover, several major restoration projects are planned which should be able to be included in the final total.

The baseline year for this target was 2000. If it is to be achieved, therefore, some 1,200 ha of wetlands need to be established or restored every year. Estimates put the area of wetlands created or restored over the period 2000–2 at no more than 800 ha a year. At the present rate, no more than 9,000 ha of wetlands will have been created by the end of 2010. The pace thus needs to increase appreciably if the interim target is to be met.

INTERIM TARGET 5, 2005

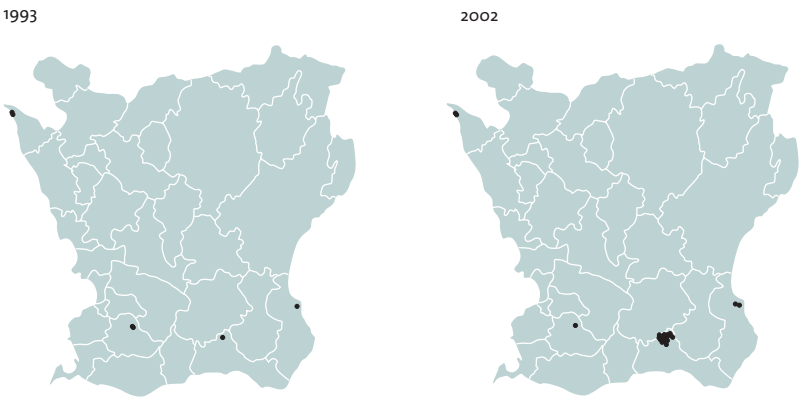
By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

Between three and nineteen species associated with wetlands may be in need of special action programmes. Around ten programmes are in progress or under development. A review of procedures for developing action programmes is currently under way.

Roughly 270 species in Sweden that are dependent on wetlands are threatened. Of these, 24 are covered by the EC Habitats Directive and thus stand to benefit from the county administrative boards' activities relating to Natura 2000 sites. Special guidance documents are to be prepared to enable these species to be maintained at a favourable conservation status. This work is proceeding in parallel with the special action programmes.

The action programme for the fire-bellied toad has recently been evaluated. The last observation in Skåne before the species disappeared was around 1960. As only one of the species' 21 earlier known localities has retained the character it had in the 1950s, a large number of suitable ponds have been restored or created. Since 1982 the Swedish EPA and the WWF have supported a breeding and release programme for the species. As part of the action programme, over 2,800 young toads were released between 1998 and 2002. In addition, a major information campaign has been mounted, aimed at landowners and others. The evaluation shows that the population has increased appreciably in recent years.

FIG. 11.4 Distribution of fire-bellied toad (*Bombina bombina*)



SOURCES: SKÅNE COUNTY ADMINISTRATIVE BOARD, BORIS BERGLUND, CLAES ANDRÉN

In recent years, the population of the fire-bellied toad has developed very favourably in the species' core area. Its numbers in Skåne are judged to have increased from around 500 in 2000 to some 1,600 in 2002. Over the same period, the number of spawning waters has risen from 38 to 60.

12 Sustainable Forests

ENVIRONMENTAL QUALITY OBJECTIVE

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 objective is intended to be achieved within one generation.

Will the objective be achieved?

The environmental quality objective will probably not be achieved by 2020, even though most of the interim targets should be met.

As far as biodiversity is concerned, this is mainly due to the long timescale of biological processes in forests. A marked enhancement of biological diversity will probably not become apparent until after 2020, despite appreciable improvements for several of the factors on which it depends (dead wood, large trees, deciduous trees in coniferous forests, and old forests). One reason for this is that the trend has for so long been towards a more uniform forest landscape.

Although many species will eventually benefit from the measures now being implemented, others will no doubt require other types of action, presumably increasingly specialized.

The value of forests and forest land for biological production and biodiversity is currently threatened by air pollution and by locally high removals of biomass. It is uncertain whether pollution will be reduced to a sufficient degree by 2020. Especially in the south-west, nitrogen deposition in particular remains high. Harvesting of large amounts of biomass must be offset by such measures as recycling of wood ash if productivity is to be maintained.

Initiatives have been launched to develop and highlight the social values of forests, including urban woodlands. These initiatives should produce good results.

Will the interim targets be achieved?

INTERIM TARGET 1, 2010

A further 900,000 hectares of forest land of high conservation value will be excluded from forest production by the year 2010.

Of the total area of productive forest land that is to be excluded from production, 320,000 ha are to consist of nature reserves and 30,000 ha of habitat protection areas, while 50,000 ha are to be covered by nature conservation agreements. Forest owners are expected to set aside at least another 500,000 ha on a voluntary basis, resulting in an area of at least 730,000 ha with voluntary protection by 2010.

With existing funding, the targets for habitat protection areas and nature conservation agreements will not be met.

From 1999 to 2002 inclusive, some 86,000 ha were safeguarded by nature reserve designation, of which just under 50,000 ha consisted of productive forest land. In other words, only around 15% of the target area was achieved in the first third of the target period, mainly owing to insufficient allocations for the creation of reserves. As well as adequate funding, a key factor in meeting the nature reserve target is a general strengthening of county administrative boards' organizational resources for reserve designation and an increase in the number of decisions. Creating nature reserves is a labour-intensive process, requiring the close involvement of local communities.

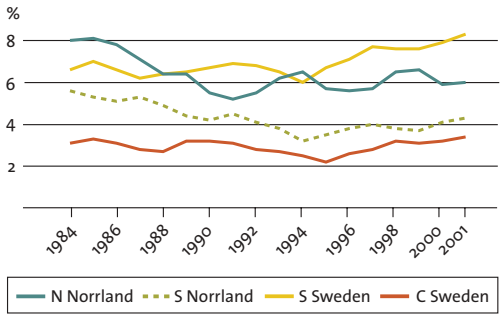
As regards voluntary undertakings, the situation looks relatively promising. As early as 2000, some 800,000 ha of forest land had been set aside voluntarily. However, the permanence and quality of many of these undertakings is uncertain, making any assessment of progress towards the target equally uncertain. Further monitoring is necessary.

INTERIM TARGET 2, 2010

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.*

FIG. 12.1 Proportion of mature forest with a large deciduous element outside formally protected areas



SOURCE: SWEDISH NATIONAL FOREST INVENTORY, SLU

Since the mid-1990s, the earlier downward trend for mature forest with a large deciduous element has given way to a suggestion of an increase, although the increase measured to date is not statistically significant. According to 'Forest impacts analyses – 1999', forest of this type is expected to have expanded by some 10% by 2010, assuming that forestry practices remain unchanged.

'Forest with a large deciduous element' includes a wide range of forest ecosystems. For many species, the qualitative aspects of particular deciduous habitats are more important than the total area. Many of these ecosystems are currently threatened. The significance of deciduous forests for biodiversity is undisputed. The most species-rich forest type in Sweden is deciduous forest made up of warmth-demanding species (e.g. oak, beech). Mature deciduous trees in coniferous forests can also contribute significantly to biodiversity.

Mature forest with a large deciduous element is defined as forest containing at least 25% deciduous (broadleaved) trees and which is at least 80 years old in northern Sweden or 60 years old in the south.

Success in attaining these goals will depend mainly on how forests are managed: what stands are felled, and to what extent dead trees are retained. The target for dead wood should be achieved without far-reaching additional action. If current trends continue, the target for old forests will also very probably be met. As for mature forest with a large deciduous element, the situation is uncertain. Here, targeted advice to forest owners may be needed. The area regenerated with deciduous forest is expected to increase.

At present, the principal means by which the state can promote this interim target are advice and education aimed at forest owners. The regional forestry boards have run advisory schemes addressing several of the issues involved.

INTERIM TARGET 3, 2010

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.

At present, forestry operations cause damage to too many ancient monuments and cultural remains, one of the basic reasons being that most such remains on forest land have yet to be identified. In many parts of Sweden, inventories of ancient and cultural remains are under way, chiefly as part of the 'Forests and History' project. It is important to extend these surveys to cover the entire country. However, this will not be achieved in time to meet the target, even if digital mapping techniques and more effective, targeted advice from regional forestry boards can appreciably improve the situation.

INTERIM TARGET 4, 2005

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

The programmes required cover a few dozen forest species. This target is expected to be met.

FIG. 12.2 Regions where volume of hard dead wood increased significantly from 1998 to 2001

SOURCES: NATIONAL FOREST INVENTORY, SLU AND NATIONAL BOARD OF FORESTRY

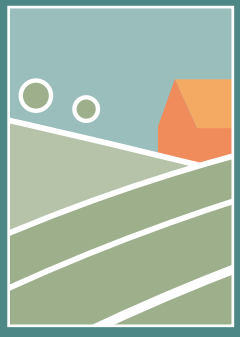
The amount of dead wood in a forest is an important factor for biodiversity. The quantity of hard dead wood in Swedish forests, which was very low for most of the 20th century, is now steadily rising – more rapidly in the south than in the north. The increase is statistically significant for all regions except northern Norrland. The main reason for the increase is that forest owners are now deliberately retaining dead trees in forests and no longer felling them to the same extent as before. For the country as a whole, the volume of hard dead wood rose by 9–30% between 1998 and 2001. The prospects of achieving an increase of 40% by 2010 are judged to be very good.

13 | A Varied Agricultural Landscape

ENVIRONMENTAL QUALITY OBJECTIVE

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.

This objective is intended to be achieved within one generation.



Will the objective be achieved?

A range of measures and instruments promoting the biodiversity and cultural heritage of the farmed landscape exist, primarily within the Environmental and Rural Development Programme (ERDP). The prospects of achieving these aspects of the objective are good. Relevant interim targets are also to be found under the objectives for wetlands and the marine and coastal environment.

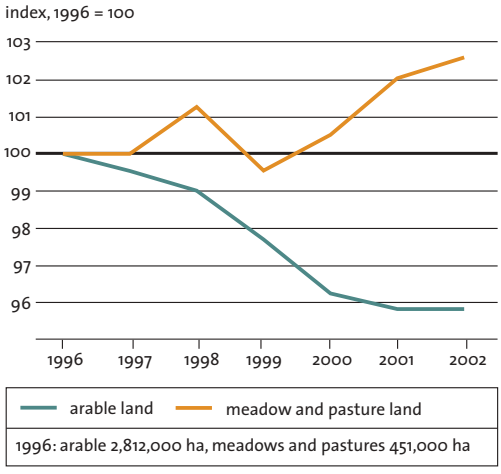
As regards the long-term conservation of valuable features of farmland and, at a regional level, the preservation of meadow and pasture land and of buildings and built environments, it is less clear whether the objective will be attained: at the regional level, success will depend on developments in other policy areas. Above all, the problem of abandoned farms in sparsely populated regions is of significance. Measures outside the sphere of agricultural policy may be necessary, chiefly in the area of regional policy.

Concerning the condition and long-term productivity of arable land, existing measures in the agricultural sector are judged to be sufficient. Interim targets of relevance here also exist under Zero Eutrophication and A Non-Toxic Environment.

If good results are to be achieved, all concerned must have a clear understanding of what action needs to be taken. Information to farmers is being provided through educational and advisory programmes within the ERDP. Campaigns aimed at the general public are also planned.

The prospects of achieving this environmental quality objective will depend on any future changes in the Common Agricultural Policy (CAP) of the EU.

FIG. 13.1 Relative changes in total areas of meadow and pasture land and of arable land, 1996–2002



SOURCES: STATISTICS SWEDEN AND SWEDISH BOARD OF AGRICULTURE

Continued agricultural production is fundamental to achieving this objective in the long term. During the 1990s the area of pasture land increased, while that of arable land decreased – most noticeably in the north of the country. In the last few years the arable area has remained fairly stable.

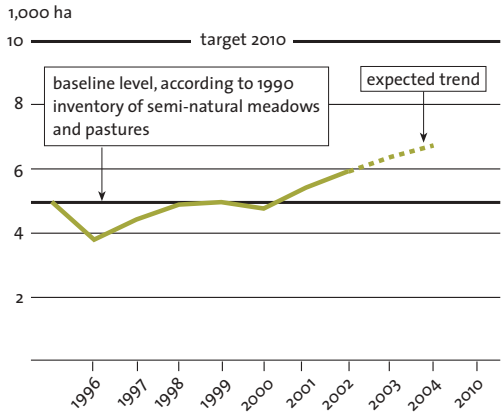
Will the interim targets be achieved?

INTERIM TARGET 1, 2010

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.

Since 2000, the CAP has benefited diversity, e.g. through livestock aid and agri-environment payments under the ERDP. Numbers of grazing

FIG. 13.2 Area covered by agri-environment scheme to preserve meadows



SOURCE: SWEDISH BOARD OF AGRICULTURE

Agri-environmental support is essential in ensuring that the country's meadows are managed and also that meadow land is restored, allowing the total area to increase. The areas restored with agri-environmental support up to 1999 and project support from 2001 on will gradually be included in the meadow management scheme. This is reflected in the expected trend for 2003–4.*

* Estimated in study of environmental effects of CAP, Swedish Board of Agriculture.

livestock have increased, and farmers have received payments for restoration and management measures. Future reforms of the CAP, however, could have quite different effects.

This interim target is also dependent on other factors, including social and demographic ones. Isolation, long distances to schools and shops, and a lack of alternative employment for other family members may make it unattractive to remain in farming. In such circumstances, payment levels for management of meadows and pastures under the ERDP will carry less weight.

With existing measures, the area of meadow and pasture land will largely be maintained. Over the country as a whole, the area is increasing, but regional differences may be noted: in Norrbotten county and the forest districts of Västra Götaland, for example, it is decreasing.

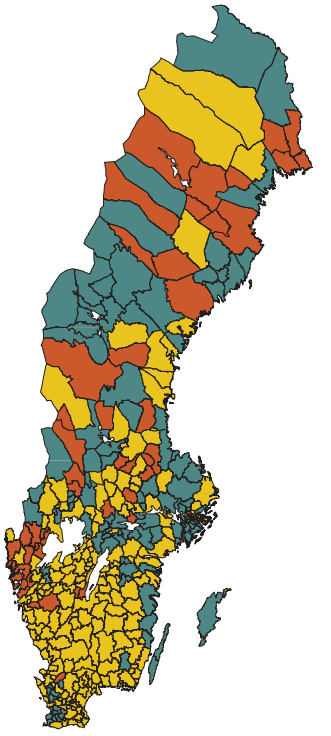
Agri-environment payments provide a basis for preserving the value of meadow and pasture land, in terms of both flora and fauna and culturally significant landscape features and environments. However, it is not clear whether the payment rules always secure the long-term conservation of these assets. To assess whether further action is required, it needs to be clarified what features are of value in this context and what regional differences exist.

To obtain a practical measure of the biological value of meadows and pastures, a species index project has been launched. So far, a pilot study has been made of the suitability of different groups of organisms in this regard. An inventory of meadow and pasture land is in progress, and after one season some 16,000 sites have been described. This inventory will lay a good foundation for qualitative monitoring of both biological assets and cultural remains.

The area of traditionally managed meadow land is increasing in line with the target. For outlying pastures of the most endangered types, the situation is less clear. Measures to safeguard them primarily exist within the ERDP, although some of these pastures are also protected areas under the Environmental Code. The area of pasture covered by agri-environment payments in northern Sweden has increased. Regional differences exist, though, and in Norrbotten county the area has clearly decreased. In addition, further checks should be made to ensure that the areas supported by such payments include the most valuable types of land.

Agri-environment statistics show a marked rise in the number of grazing livestock on shielings (summer upland pastures). The total number of such pastures is also rising, but not as much as livestock numbers, and in certain regions shielings have ended up outside the agri-environment scheme. The total area of forest pastures covered by the scheme has declined since 2000, although once again there are large regional variations. In Kalmar county,

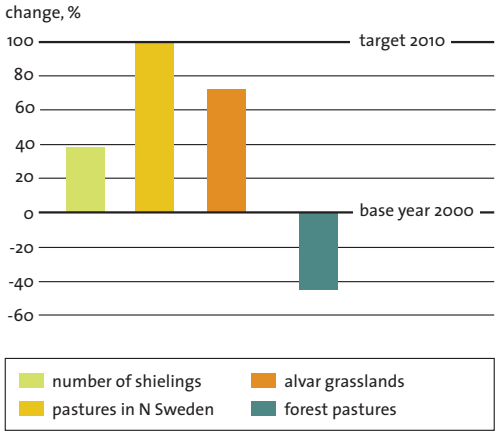
FIG. 13.3 Change in total area of meadow and pasture land 2000–2002, by municipality



SOURCE: SWEDISH BOARD OF AGRICULTURE

The area of meadow and pasture land is fairly stable in most local authority areas. The changes in municipalities in the mountain region and the county of Stockholm are misleading, as the areas of pasture there are so small. Norrbotten county and the forest areas of Västra Götaland are examples of areas where the decreases should be studied more closely.

FIG. 13.4 Managed pasture land of the most endangered types, 2002



SOURCE: SWEDISH BOARD OF AGRICULTURE

Overall, progress is being made towards the target, but the unfavourable trend for forest pastures needs to be studied more closely. The same is true of managed pasture land in Norrbotten county, where the trend is not as favourable as in the other counties of northern Sweden.

for example, the area has increased appreciably, while in Gotland it has shown a marked decline. For heather heathland, no data of use in tracking progress are yet available, although relevant data will be provided by the inventory of meadows and pastures.

INTERIM TARGET 2, 2005

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.

Species associated with farmland are disappearing. This negative trend must be reversed, and here small-scale habitats have a part to play. A study of the value of small-scale habitats of different types and with different management regimes is in progress.

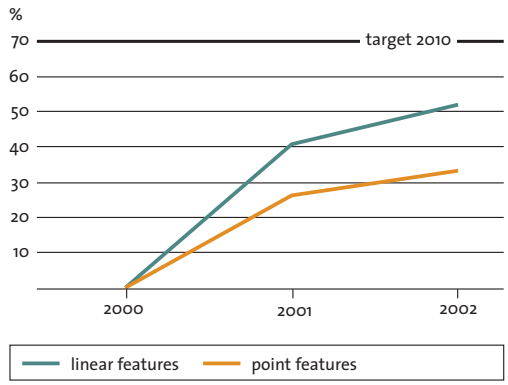
Culturally significant landscape features make up a large share of small-scale habitats. The number of such features covered by agri-environment schemes is rising, reducing the risk of these habitats disappearing. Furthermore, the majority of small habitats are safeguarded by the habitat protection area provisions and rules of consideration of the Environmental Code and may not be removed. Our assessment is therefore that the current number of small-scale habitats will be preserved, and the target met.

INTERIM TARGET 3, 2010

The number and extent of culturally significant landscape features that are managed will increase by about 70% by 2010.

This target relates to landscape features associated with arable land and means that the length of linear features managed must increase to 80,000 km and the number of point features to 620,000 by the target date. At present, some

FIG. 13.5 Change in number or extent of culturally significant landscape features covered by agri-environment schemes



SOURCE: SWEDISH BOARD OF AGRICULTURE

Agri-environmental support under the Environmental and Rural Development Programme is important in achieving the interim target concerning management of culturally significant landscape features. The data relate to undertakings, i.e. decisions on payments have not yet been taken.

71,500 km of linear features and 486,000 point features are being managed with agri-environment payments under the ERDP.

The pace of the increase is satisfactory for the country as a whole, but large differences exist between regions. In some areas, an increase of more than 70% is needed. It is therefore important to determine to what extent there are culturally significant landscape features that are not receiving ERDP support, and to evaluate regional progress towards the target.

Culturally significant landscape features on meadow and pasture land are covered by interim target 1.

INTERIM TARGET 4, 2010

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.

The Programme for Cultivated Diversity (POM) is Sweden's programme for plant genetic resources. It is run by bodies involved in the conservation and use of cultivated diversity, including various authorities, open-air museums and NGOs. A strategy has been drawn up for a nationwide inventory of cultivated plants in Sweden that have not previously been surveyed. A full-scale inventory will begin in 2003. In 2002 a partial inventory was started with a view to tracking down surviving seed-propagated cultivated plants.

A country study of Swedish livestock breeds has been drawn up, and a programme for the conservation and sustainable use of these breeds is being developed. The programme will among other things specify which breeds are included and what 'long-term conservation' entails in this context. The interim target is considered achievable for most breeds. For some, however, it may be difficult to attain with existing breeding programmes and numbers of individuals. The main measures and instruments available are to be found within the ERDP. Payments are made to support breed societies' information activities and to encourage the keeping of cattle, sheep, goats and pigs of the most endangered breeds, including Bohus Polled cattle, Gute sheep, Jämtland goats and Linderöd pigs.

INTERIM TARGET 5, 2006

By 2006 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

A great many species of the farmed landscape are in need of targeted measures. The number of action programmes required will depend on how many of these species can be included in joint programmes. It is therefore uncertain whether this target will be met within the stated time-frame. A review of procedures for developing action programmes for species and habitat types is currently in progress.

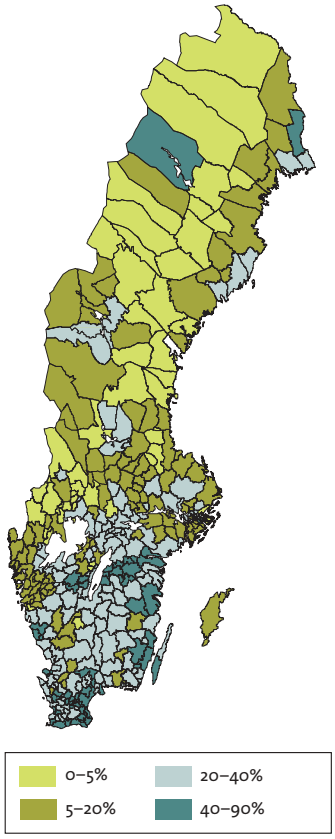
INTERIM TARGET 6, 2005

By 2005 a programme will have been prepared for the conservation of farm buildings of cultural heritage value.

Buildings are of significance for the character and regional distinctiveness of the landscape. The most threatened buildings of agricultural regions are farm buildings other than dwellings. To conserve them, a variety of instruments and measures are needed. In 2003, a pilot support scheme for the restoration of small redundant farm buildings will be launched. ERDP payments for redundant buildings on or near arable land provide only for very limited maintenance.

A programme is now being developed, and to this end discussion seminars and regional meetings are being held with representatives of the cultural heritage and agricultural sectors.

FIG. 13.6 Percentage of total arable area covered in 2001 by agri-environment schemes to preserve natural and cultural assets, by municipality



SOURCE: SWEDISH BOARD OF AGRICULTURE

There is much to suggest that the number of culturally significant landscape features managed needs to increase by more than 70% in areas with low take-up of support under the Environmental and Rural Development Programme. First, however, it needs to be established what features are being managed outside the area covered by the programme.

14 A Magnificent Mountain Landscape

ENVIRONMENTAL QUALITY OBJECTIVE

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.

This objective is intended to be achieved within one generation.

Will the objective be achieved?

This environmental quality objective can be achieved if the relevant sectors and society as a whole show the consideration which the interim targets require. The need for action programmes for threatened species is greater than previously estimated. Pressure to develop wind power in mountain regions could adversely affect the natural and cultural assets of such regions and make it more difficult to increase the area free from disturbance, unless development is preceded by careful land use planning. At the same time, wind power will benefit mountain ecosystems that are dependent on the environmental quality objectives relating to acidification, eutrophication and climate change being met.

The overall assessment is that this objective can be attained within one generation. Several measures have already been introduced, but further action needs to be decided on and implemented. The objective presupposes the survival of reindeer herding, in order to maintain a landscape characterized by grazing. At the same time, herding must continue to be pursued and developed along environmentally sustainable lines.

Will the interim targets be achieved?

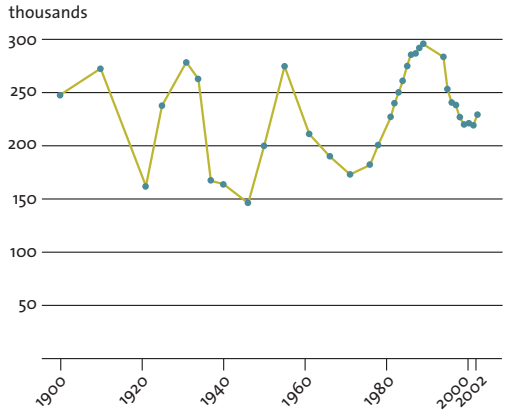
INTERIM TARGET 1, 2010

By 2010 damage to soil and vegetation caused by human activities will be negligible.

The Swedish Board of Agriculture has been entrusted with developing a survey method for reindeer pasture areas, with assistance from the Sami Parliament, the Swedish University of Agricultural Sciences (SLU) and the Swedish EPA, and this work must be completed. As part of the Swedish Environmental Monitoring Programme, a method for a 'National Inventory of the Landscape in Sweden' (NILS) is being developed. This will include mountain areas, and data collection will begin in 2003.

As yet, then, no data are available on the state of the mountain environment. The risk of damage can only be assessed indirectly, on the basis of numbers of all-terrain vehicles and reindeer. In addition, an appraisal needs to be made of the impacts of infrastructure and settlements on soil and vegetation.

FIG. 14.1 Reindeer numbers, 1900–2001



SOURCE: SWEDISH BOARD OF AGRICULTURE

Reindeer are counted in winter, after the autumn slaughter and before calving. At this time of year, they graze mainly on lichens. Fluctuations in reindeer numbers reflect the varying abundance and accessibility of lichens, chiefly in forest areas outside the mountain region.

The increase in the number of all-terrain vehicles has been insignificant in recent years. Reindeer numbers have risen by 5%, with almost the whole of the increase occurring in Norrbotten.

Our assessment is that this target can be achieved within the time-frame, provided that the relevant measures are implemented. This presupposes that current work on new methods is completed and that inventories begin soon enough to allow sufficient data to be collected and progress towards the target to be verified.

INTERIM TARGET 2, 2010/2015

Noise in mountain areas from motor vehicles driven off-road and from aircraft will be reduced to meet the following requirements:

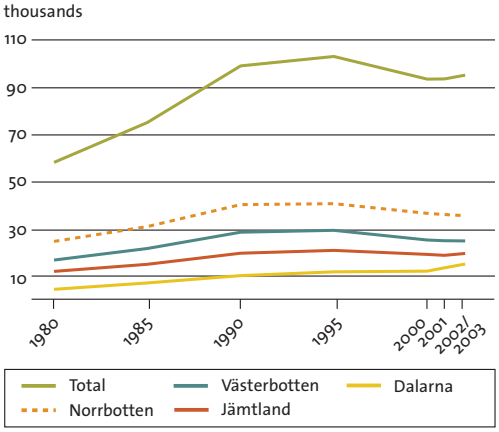
- *by 2015 at least 60% of light all-terrain vehicles will meet stringent noise standards (below 73 dBA);*
- *by 2010 the noise from aircraft will be negligible both in class A regulated areas under the Off-Road Driving Ordinance (1978:594) and in at least 90% of the national park area.*

The Swedish EPA is preparing proposals for an environmental classification system for snowmobiles, with a view to promoting quieter vehicles and thus reducing noise levels in mountain areas. Environmental standards for vehicles must also be pursued at the EU level and on a voluntary basis within the industry. In addition, the EPA has evaluated local and regional regulation of off-road vehicle use in mountain terrain. Only four of the fifteen local authorities concerned had made use of their powers to regulate off-road driving in mountain areas. It also emerged that county administrative boards had had difficulty taking sufficient account of national goals and interests when reaching decisions on snowmobile routes and exemptions permitting off-road driving.

Only a small number of light all-terrain vehicles in Sweden's mountain counties meet stringent noise standards. If the target for noise from these vehicles is to be met, existing vehicles must be replaced with new ones complying with these standards. It is not possible at present to assess whether this part of the interim target will be achieved. A number of policy instruments will be needed, e.g. economic instruments to encourage people to switch to quieter vehicles.

The Civil Aviation Administration, together with the Swedish EPA and the county administrative boards of the mountain counties, has begun a review of restrictions on overflight and landing in sensitive mountain areas. The aim is to reduce noise in such areas. It is too early to judge whether the target for aircraft noise will be met.

FIG. 14.2 Light all-terrain vehicles in use in mountain counties of Sweden, 1980–2002

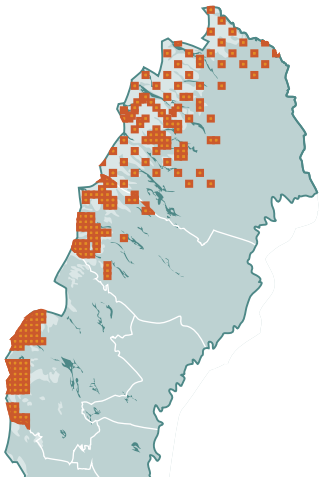


Note: Light all-terrain vehicle = all-terrain motor vehicle with a maximum ready-for-use weight of 400 kg. In practice, refers to quad bikes, three-wheelers and, above all, snowmobiles.

SOURCE: STATISTICS SWEDEN

The main legal users of off-road vehicles on snow-free ground in mountain areas are reindeer herders, along with the defence forces and telephone and energy companies. Driving on ground unprotected by snow damages soil and vegetation, and may also harm archaeological remains. Other adverse effects, on snow-covered as well as bare ground, are noise and exhaust emissions, which make the mountain environment less attractive for outdoor recreation. Snowmobiles may, however, be important for certain aspects of tourism.

FIG. 14.3 Areas where surveys of archaeological remains have been performed



SOURCE: NATIONAL HERITAGE BOARD

To provide a clearer picture of the archaeological remains of mountain areas, the National Heritage Board carried out surveys in the areas marked over the period 1995–2002.

INTERIM TARGET 3, 2010

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.

Very large areas of land in Sweden's mountain regions are protected. Protection of the environment below the surfaces of lakes and streams, on the other hand, is limited, as is our knowledge of the representative and significant cultural assets of these regions. Protection of freshwater environments in general falls within the scope of Flourishing Lakes and Streams, while significant natural and cultural assets associated with upland agriculture are covered by A Varied Agricultural Landscape.

The assessment is that this interim target can be achieved, provided that additional measures are decided on and implemented. Large areas containing significant assets in terms of both cultural heritage and nature conservation are already protected. However, the representativeness of the sites and features safeguarded needs to be evaluated and additional funding requirements for management and restoration assessed. Furthermore, supplementary data on the cultural environments, ancient remains and settlements of mountain areas are required.

Agri-environment payments under the ERDP for the preservation of valuable natural and cultural environments in reindeer-herding areas have been increased in order to improve the prospects of meeting this target.

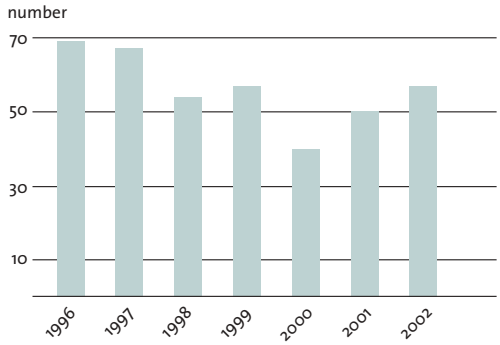
INTERIM TARGET 4, 2005

By 2005 action programmes will have been prepared and introduced for threatened species that are in need of targeted measures.

Two action programmes of specific relevance to the mountain landscape are in progress, for the Arctic fox and the wolverine. Another three are closely associated with mountain areas, for the wolf, brown bear and lynx. All five, in other words, are devoted to large mammals. In addition, programmes are being prepared for gyrfalcon and golden eagle, and for lakes which in their natural state do not support fish. Programmes will probably also be needed for flora, rich fens, and fish populations, primarily Arctic char. A review of procedures for developing action programmes for species and habitat types is currently under way.

Provided that adequate resources are made available, it should be possible to achieve this target.

FIG. 14.4 Number of wolverine litters found in reindeer herding region, 1996–2002



SOURCES: NORRBOTTEN, VÄSTERBOTTEN, JÄMTLAND AND DALARNA COUNTY ADMINISTRATIVE BOARDS

The Predatory Animals Bill passed by the Swedish Parliament in 2001 sets an interim national target for the wolverine of 90 litters per year in the country as a whole. Outside the counties covered by the diagram, one wolverine litter has also been observed in three of the last four years in the forest area on the boundary between Gävleborg and Västernorrland. The wolverine population can be seen as reflecting the balance between reindeer herding and the protection of mountain wildlife.

The range and size of the wolverine population is determined by the annual surveys of predatory animals conducted by the county administrative boards of mountain counties. The survey results form the basis for the compensation payments for predatory animal populations that are made to reindeer husbandry districts under a new system introduced in 1996.

15 A Good Built Environment

Will the objective be achieved?

This is a complex objective incorporating eight interim targets. Other dimensions than those described in the targets also need to be taken into account. Security, accessibility and participation, for example, are important in shaping people's perceptions of their built environment. Some of the targets will be difficult to attain by the dates stipulated, and there is therefore considerable uncertainty as to whether this environmental quality objective can be achieved within one generation.

There are large gaps in the data required to monitor progress. Methods and statistics need to be developed if it is to be possible to assess performance in relation to this objective. Local authorities and county administrative boards have an important part to play. Increased resources or reordered priorities at the local and regional levels are essential if the objective is to be attained.

Will the interim targets be achieved?

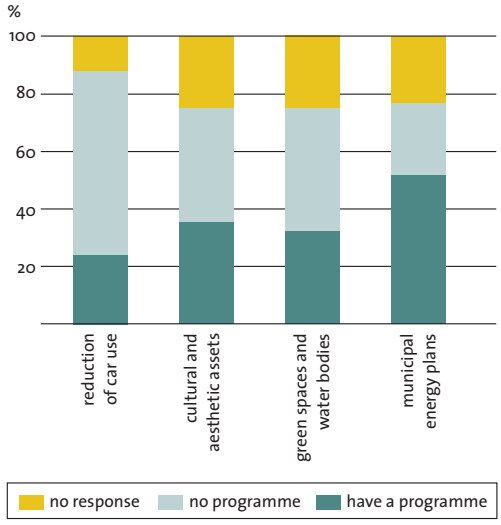
INTERIM TARGET 1, 2010

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 car use and improve the scope for environmentally sound and resource-efficient transport;*
- *preserving and enhancing cultural and aesthetic assets;*
- *preserving and enhancing green spaces and water bodies in urban and suburban areas and ensuring that the proportion of hard surfaces does not increase;*
- *promoting more efficient energy use, use of renewable energy resources and development of production plants for district heating, solar energy, biofuels and wind power.*

For most municipalities and regions, attractiveness and competitiveness are key aims. Several of the factors referred to in this target make an area more attractive, and they may therefore carry great weight when different interests need

FIG. 15.1 Percentages of local authorities with programmes specifically addressing environmental issues covered by interim target 1



SOURCES: SURVEYS BY NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING AND SWEDISH ENERGY AGENCY, 2002

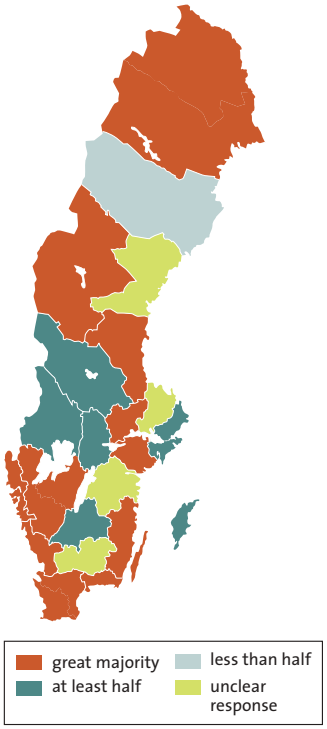
Many local authorities have already drawn up programmes or strategies dealing with the environmental issues covered by interim target 1. It should be noted that basic conditions vary from one municipality to another. Some authorities, for example, have a limited need of special programmes for suburban green spaces and water bodies. In several cases, inadequate resources and know-how are significant obstacles.

ENVIRONMENTAL QUALITY OBJECTIVE

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.

This objective is intended to be achieved within one generation.

FIG. 15.2 Proportion of areas of national cultural heritage interest not covered by area regulations imposing more extensive permit requirements or by a detailed development plan



SOURCE: NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING SURVEY OF COUNTY ADMINISTRATIVE BOARDS, 2002

The majority of areas of national interest for the purposes of conserving the cultural environment lack basic protection.

to be balanced in land use planning. But often different goals will conflict.

In most counties, this interim target is being or has been regionalized, i.e. translated into terms that reflect conditions at the county level. Few municipal authorities, though, have formulated local goals based on the target.

Achieving this target will require the active involvement of regional and local agencies and bodies, and hence the expertise and resources of counties and municipalities.

The interim target is also relevant to planning and decision-making processes outside local government, such as the government transport agencies' infrastructure planning and strategic planning in industry and the construction sector. New methods need to be developed to track progress towards the target. Monitoring of private-sector decision making is particularly difficult.

Serious obstacles to achieving this target include inadequate resources and know-how. Smaller local authorities with limited resources will need extra support from the state if the target is to be met.

INTERIM TARGET 2, 2010

By 2010 built environments of cultural heritage value will be identified and a programme will be in place for the protection of their cultural assets. In addition, long-term protection will be provided for at least 25% of valuable built environments.

Areas of national interest in cultural heritage terms have been identified for a long time, and are intended to include the built environments of greatest value from a national point of view. A large proportion of them consist of built environments in small villages and rural areas.

For such areas to be considered to enjoy long-term protection, they need to be covered by detailed development plans or area regulations that include adequate rules for their protection and care. Neither of these alternatives in itself constitutes protection, but they do give the authorities a chance to act and react. If valuable areas are not covered by plans, then their buildings can be demolished or altered externally without a permit. In practice, therefore, they are completely unprotected.

A survey of county administrative boards in autumn 2002 showed that the great majority of built environments of cultural heritage value lack the most basic of safeguards. The responses also revealed inadequate awareness of the extent to which areas of national cultural heritage interest enjoy protection. This must be remedied if it is to be possible to monitor progress towards the target.

To achieve the target, steps must be taken to ensure that local authorities take greater account of cultural heritage assets in their planning. With the existing emphasis on development-oriented planning, this interim target will not be met.

INTERIM TARGET 3, 2010

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 is among the forms of environmental disturbance whose effects are most widely felt in Sweden. Over 2 million people are exposed to traffic noise exceeding guide values in the open air near their homes. The problem is concentrated in the major towns: more than half of those who experienced excessive traffic noise outdoors in the vicinity of their homes in 1998 lived in the counties containing Sweden's three largest cities. The same year, the number of people exposed inside their homes to road traffic noise exceeding guide values was estimated at 840,000. Apart from traffic noise, many people are also exposed to noise at work and in connection with leisure activities.

Noise can have effects on health. It may for example disrupt sleep, interfere with speech intelligibility, or cause learning difficulties. Such types of disturbance can severely impair

TABLE 15.1 Forecast of total volume of domestic passenger transport in billions of passenger-kilometres, 1997–2010

Mode of transport	1997	2010	Change, %
Car	93.1	119.7	29%
Rail	7.0	8.8	26%
Air	3.8	4.7	23%
Bus	13.9	15.0	8%
On foot/bicycle	6.0	5.6	-6%
Total	124	154	24%

SOURCE: SIKA REPORT 2002:1

Car use is expected to continue to increase, as is heavy road traffic. The share of freight carried by road is predicted to rise from 40% to 46% between 1997 and 2010. This will create a greater problem of noise disturbance and make it more difficult to achieve the interim target.

quality of life, possibly giving rise to both social and psychological problems. Some studies also point to a risk of cardiovascular conditions.

Current knowledge about noise levels on municipal roads and streets, which account for the majority of urban traffic, is inadequate. Some local authorities and county administrative boards are developing noise survey methods and planning remedial action, but in most areas and regions there is no basis for assessing whether the number of people exposed to noise is rising or falling. At the central level, too, there are shortcomings in monitoring: the transport agencies make estimates for their respective modes of transport, but methods to aggregate the noise from these different sources are not available.

Measures to reduce levels of traffic noise in homes have been introduced by the transport agencies among others. For an initial phase, up to 2007, the focus will be on the worst-affected homes. Windows and external walls will be improved, and noise bunds and screens built along roads. These measures are primarily designed to reduce indoor noise levels. Outdoor noise is much more difficult to tackle.

Despite the action taken, traffic noise is judged to have increased since 1998. The reasons for this include urban development, which is generating more traffic; an increase in heavy vehicle traffic; and a combination of wider tyres and noisy road surfaces.

Traffic is expected to continue to increase, with car traffic likely to grow by 29% between 1997 and 2010. To reduce the associated noise, further action is needed. In view of the current negative trend, this target is unlikely to be met.

INTERIM TARGET 4, 2010

By 2010 extraction of natural gravel in the country will not exceed 12 million tonnes per year and reused materials will represent at least 15% of the aggregates used.

The amount of natural gravel extracted and the proportion of reused materials are interrelated, but the goals with respect to each are not mutually dependent. The two aspects of the interim target are affected by different actors and driving forces, and are differently regulated in legislation.

In the case of natural gravel, the target will probably be met. This is indicated by the fact that the use of gravel, as a proportion of all aggregates, has declined since 1987. This trend can be maintained and the target achieved by:

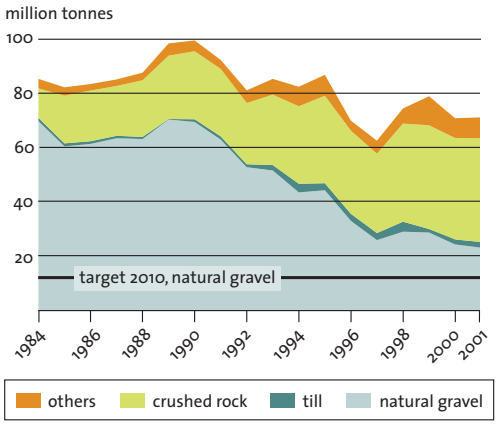
- planning aggregate supplies in such a way as to limit the use of gravel to applications for which other alternatives are excluded on technical or economic grounds;
- consistent licensing of pits;
- disseminating information about how crushed rock can be used for various applications.

Two other factors support this assessment:

- the tax on natural gravel was increased on 1 January 2003;
- vigorous action to protect natural gravel resources will result from implementation of the objective Good-Quality Groundwater and the EC Water Framework Directive.

Total demand for aggregates roughly mirrors the level of construction investment in Sweden. Since 1987, the proportion of natural gravel has fallen continuously, in favour of crushed rock. Data on 'other' materials are incomplete.

FIG. 15.3 Quantities of aggregates supplied, 1984–2001



SOURCE: SGU ('GRAVEL, SAND AND CRUSHED ROCK. PRODUCTION AND RESOURCES 2001')

The term 'reused materials' is not clearly defined in the Environmental Objectives Bill. To help assess progress towards this target, there needs to be a reporting system for aggregates produced at sites other than pits and quarries. If reused materials are to make up a higher proportion of the total, guidelines on how they can be used will be required. Environmental legislation should be amended to allow recycling to take place at sites where crushed rock is produced.

INTERIM TARGET 5, 2005

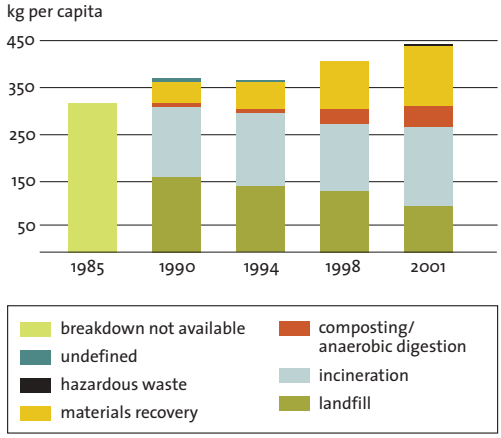
The quantity of waste disposed of to landfill, excluding mining waste, will be reduced by at least 50% by 2005 compared with 1994, at the same time as the total quantity of waste generated does not increase.

A decrease in the amount of waste disposed of to landfill reduces emissions to soil, water and air and promotes more sustainable use of resources, e.g. through recovery and recycling. This target covers waste from households, construction, industry, agriculture and forestry and the public sector. The statistics on waste volumes and treatment and disposal routes are far from complete, but they are being improved – partly as a result of the EC Regulation on waste statistics.

As regards household waste, two trends may be noted: the proportion disposed of to landfill is decreasing, but the total quantity generated is increasing. In other words, current trends are both favourable and unfavourable to achieving the target. To reduce landfill, several powerful instruments have been introduced, including an increased tax on landfilled waste, a ban on landfill disposal of combustible waste, and differentiated collection charges for households and businesses, depending on the extent to which they sort their waste at source. As a result, the quantity of waste disposed of to landfill can probably be reduced in line with the target.

However, landfill taxes and collection charges do not have much impact on the total amount of waste generated. It is therefore uncertain whether the interim target as a whole can be met by the 2005 deadline. One welcome trend is that local authorities are collecting an

FIG. 15.4 Quantities of household waste 1985–2001, by treatment/disposal route



SOURCE: SWEDISH ASSOCIATION OF WASTE MANAGEMENT, 2002

The total quantity of household waste received by waste treatment and disposal facilities has increased. However, both the quantity and the proportion disposed of to landfill decreased between the base year 1994 and 2001.

increasingly large proportion of hazardous wastes from households for further treatment.

INTERIM TARGET 6, 2008

All landfill sites will conform to uniform standards by 2008 and will meet stringent environmental requirements in accordance with Council Directive 1999/31/EC on the landfill of waste.

The standards which a landfill site meets depend on how it is designed and monitored and the waste that it contains and receives. The principal environmental impacts of landfills are discharges of contaminated leachate and emissions of methane formed from the breakdown of organic waste. Methane contributes to the greenhouse effect.

The Landfill Ordinance is judged to be an adequate instrument for achieving the target. All landfill owners covered by it are supposed to have submitted a plan to the local authority or county administrative board, setting out the steps they plan to take to comply with the Ordinance and the environmental quality objective. From these plans it is clear that many landfill sites will be closed by 2008. This is particularly true of smaller sites that are unable to meet the new stringent requirements.

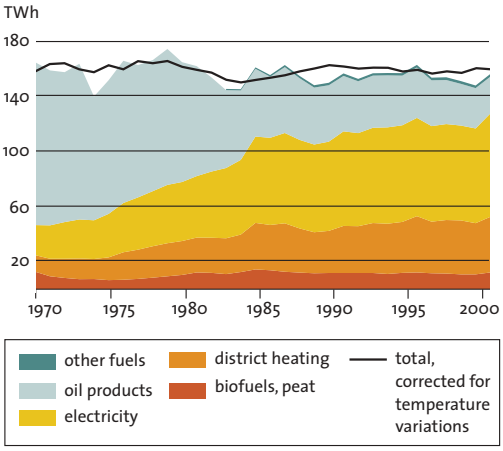
INTERIM TARGET 7, 2010

The environmental impact of energy use in residential and commercial buildings will decrease and will be lower in 2010 than in 1995. This will be achieved, inter alia, by improving energy efficiency and eventually reducing total energy use.

The built environment accounts for some 40% of total energy use in Sweden. Energy consumption per unit area to heat homes and commercial premises is showing a downward trend, i.e. heating has become more efficient. However, consumption of electricity per unit area for non-heating purposes (kitchen appliances, ventilation etc.) has not fallen appreciably. At the same time, residential and commercial buildings are gradually becoming larger, with the result that total energy use has remained relatively constant over a long period.

To reduce the environmental impact of energy use, one necessary step is to replace fossil fuels with renewable energy sources. In the residential sector, the share of total energy use based on fossil fuels fell by around 4% between 1995 and 2000. At district heating plants, the proportion of fossil fuels used decreased even more, by about 15%, over the same period. Continued expansion of district heating networks and higher taxes and energy prices will probably encourage even more property owners to switch to other energy sources for heating. The goal regarding the environmental impact of energy use will therefore probably be met. It has to be remembered, though, that small-scale burning of wood can also affect the environment, especially locally in urban areas. It is more uncertain whether total energy use will be appreciably reduced by 2010. Fine-tuning of existing energy systems in buildings, energy saving campaigns and more widespread use of

FIG. 15.5 Energy consumption in the residential and services sector



SOURCE: SWEDISH ENERGY AGENCY

Total energy consumption in this sector has remained relatively constant over the last 30 years. However, the relative importance of different forms of energy has changed considerably. The proportion of fossil fuels is steadily declining, which is helping to achieve the interim target.

energy-efficient domestic appliances are among the measures that could help in this regard.

INTERIM TARGET 8, 2010/2015/2020

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.*

In Sweden in 1999, almost a million people were judged to have various symptoms of ill health related to problems in their indoor environment. Common symptoms include coughing, irritated eyes, a runny or stuffy nose, headaches and tiredness.

Several studies point to a link between inadequate ventilation and ill health. Property owners are required by law to test and inspect their ventilation systems at regular intervals, and to remedy any defects. Compliance with this requirement has been poor, and local authorities and county administrative boards have not had the resources to enforce it to a sufficient extent. In the case of dwellings, only apartment buildings and newly built houses with mechanical supply and exhaust ventilation are covered by the legislation. The effectiveness of ventilation in existing houses is unclear.

Radon may enter buildings from the ground, groundwater or certain building materials. A link exists between exposure to radon and the risk of lung cancer. The risk increases significantly if radon is combined with tobacco smoke.

At the present rate of monitoring, it will take a very long time for all homes with radon levels above 200 Bq/m³ to be identified. House owners can apply for grants for measures to reduce radon levels to below 200 Bq/m³. However, they themselves have to arrange for measurements to be made, investigate and report the causes if high levels are found, and arrange for and meet at least half the cost of remedial measures. Afterwards, radon concentrations have to be measured again, to assess the effectiveness of the action taken. In the case of rented apartments, no actual grants are available for radon remediation. However, under the Environmental Code it is possible to demand that the owner of the building measures radon levels and takes remedial action. In addition, the owner has a responsibility to perform regular checks if there is a risk of ill health due to the building's status.

Monitoring of radon levels in schools and pre-schools is under way, and the goal for these types of premises is judged to be attainable. On the other hand, it will be very difficult to achieve the other aims expressed in the interim target: problems such as damp, mould and chemical substances from building products and furnishings also need to be tackled. Measures to improve compliance with existing legislation in this area are needed, together with other effective instruments. Increased use of quality declarations in conjunction with selling and letting of homes could help to achieve the target.

TABLE 15.2 Radon in houses

	Number
Number of dwellings in houses	1,950,000
Estimated number where radon levels have been measured	300,000
Number of dwellings still to be measured	1,650,000
Estimated number of dwellings in houses with radon levels exceeding 200 Bq/m³	280,000

SOURCES: SOU 2001:7 AND NATIONAL BOARD OF HOUSING, BUILDING AND PLANNING

Some 280,000 houses are estimated to have radon levels exceeding 200 Bq/m³. Of these, an estimated 80,000 are believed to have levels in excess of 400 Bq/m³. In a normal year, around 1,000 houses are remediated. If the pace is not accelerated, it will take 280 years for all houses to be remediated.

The Environmental Objectives Portal

The Environmental Objectives Portal, miljomal.nu, provides a single gateway to information about Sweden's environmental quality objectives and the work being done to achieve them. It provides an overview of the objectives themselves and the agencies and other bodies responsible for different aspects of implementing them.

The portal's main target groups are government ministers and MPs, decision makers and officials in central and local government, the media and non-governmental organizations. Although the main language is Swedish, the site also includes material in English and links to other sites providing information in that language.

Now with indicators

A new, expanded version of the portal was opened on 5 June 2003. It includes presentations of indicators at the national and regional levels, which can be used to track progress towards the environmental quality objectives and interim targets. By browsing these new pages, visitors can see for themselves how we are doing in relation to the various goals: 'Will the environmental objectives be achieved, or is it going to be difficult?'

Another innovation is that visitors can download the data on which the presentations are based.

A few examples are also given of indicators which reflect progress towards regional objectives. The new, indicator-based joint monitoring system will progressively be expanded to include all the regional environmental objectives that are adopted. The idea is that in future it will also be possible to incorporate local goals in the system.

Who does what

The Secretariat for the Environmental Objectives Council is responsible for operating the portal. The indicator presentations will be kept up to date by the agencies responsible for the different objectives and by county administrative boards. Development of the joint monitoring system is being undertaken on a project basis during 2003.

Glossary

Area of national interest = area designated as being of national interest under ch. 3 and ch. 4 of the Environmental Code.

Base saturation = quantity of exchangeable base cations as a percentage of the total cation exchange capacity of the soil.

Biocidal products = pesticides other than plant protection products.

Biomass = weight; spawning biomass refers to the weight of the sexually mature members of a fish population.

Bq = becquerel, unit of activity of a radioactive material. 1 Bq corresponds to one radioactive disintegration per second.

Bycatch = species other than the target species for a given fishery. May or may not be of commercial interest.

Carbon dioxide equivalent = quantity of a greenhouse gas expressed as the amount of carbon dioxide that has the same impact on climate: 1 kg of methane corresponds to 21 kg of carbon dioxide, for example.

Carbon sink = the ongoing accumulation of carbon in biomass, soil or water.

CFCs = chlorofluorocarbons, used in refrigeration, heating and air-conditioning equipment, chemical products and foamed plastics.

CMR substances = substances that are carcinogenic, mutagenic and/or toxic for reproduction (reprotoxic).

County administrative board = authority responsible for state administration at the regional level in Sweden.

Culturally significant landscape features = e.g. stone walls, wooden fences, ditches, solitary trees, avenues, ponds, midfield pockets of rocky ground, field margins, meadow barns or redundant farm buildings (a full list, with definitions, can be found in Swedish Board of Agriculture Regulation 2001:114).

DAB = Digital Audio Broadcasting, i.e. digital radio.

dBµV/m = decibel microvolt per metre, a unit of electric field strength.

dBA = unit of sound level. Sound pressure level is usually given in decibels (dB). To approximate to the frequency response of the human ear, a sound pressure meter is equipped with a frequency filter (A filter). The value thus obtained is referred to as the 'sound level', and expressed in dBA.

Ecosystem = a dynamic complex of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit.

Electromagnetic fields = radio waves, microwaves, visible light, ultraviolet, X-rays and gamma rays are all examples of the same basic physical phenomenon, the electromagnetic wave or field.

Environmental Code = a major codification of environmental law that came into force in Sweden in 1999.

ERDP = Sweden's Environmental and Rural Development Programme.

Flexible mechanisms = various mechanisms for trading in greenhouse gas emissions.

Glyphosate = (isopropylamine salt), a chemical used to control weeds and other unwanted vegetation.

Habitat protection area = form of site safeguard (area protection) provided for in the Environmental Code (ch. 7, s. 11), used for small areas of land and water.

Habitat type = natural habitat type, i.e. a terrestrial or aquatic area of a relatively uniform character and structure, e.g. an estuary, a calcareous grassland or a wooded pasture. A given habitat type may contain the habitats of many different plants and animals.

Habitats Directive = Council Directive 92/43/EEC, which can be said to be a complement to the Birds Directive, in that it also deals with other groups of species and with different natural habitat types. The term 'natural habitat (type)' is used in a very broad sense in the directive, including everything from geological formations to plant communities.

HCFCs = hydrochlorofluorocarbons, used in refrigeration, heating and air-conditioning equipment, chemical products and foamed plastics.

High production volume chemicals = chemicals manufactured in or imported to the EU in volumes exceeding 1,000 tonnes per year.

ICES = International Council for the Exploration of the Sea.

Indicator = data and text chosen to analyse and illustrate changes in the environmental field. An indicator provides the target group with a basis for deciding on necessary action.

Kyoto Protocol = signed in Kyoto, Japan, in 1997 as a first step in establishing quantified commitments to achieve the

goals of the Framework Convention on Climate Change (1992).

Limit value = the highest or, in certain cases, the lowest permissible value.

Linear features = e.g. stone walls, avenues or ditches.

Low-frequency magnetic fields = magnetic fields occurring, for example, around power transmission lines, computer screens and other electrical equipment.

Malignant melanoma = highly malignant form of skin cancer.

Minimum data = test data required for substances undergoing risk assessment within the programme for existing substances, corresponding to the data required for new chemical substances placed on the EU market in volumes exceeding 1 tonne per year (Annex VII A to Directive 92/32/EEC).

mmol = amount of a substance divided by its atomic or molecular weight.

mSv = millisievert, a thousandth of a sievert, a unit used to express the absorbed dose of radiation, taking into account the biological effect of the radiation. Since one sievert is a very large dose, the millisievert is often used.

National Emission Ceilings Directive = EC Directive incorporating binding national emission ceilings for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds, to be achieved by 2010.

Nature conservation agreement = contract entered into between the state or a local authority and a landowner for the purpose of preserving and developing the natural features of a site.

ng = nanogram, one thousand millionth of a gram.

NYLA = New Features in the Landscape, a scheme (now discontinued) to promote the creation of environmentally beneficial landscape features on arable land.

PB substances = persistent and bioaccumulating substances, i.e. substances that are not broken down in the natural environment and that can accumulate in the food chain.

Permanent repository = facility for final disposal, e.g. of radioactive waste.

PM10 = fraction of particles from which half the particles measuring 10 µm and all particles larger than 14 µm have been removed. Corresponds to the particle fraction that is not filtered off in the nose and mouth and thus reaches the lungs and bronchi.

Point features = e.g. mid-field pockets of rocky ground, mounds of boulders removed from fields, or solitary trees.

ppm = parts per million.

Put-and-take fishing = system whereby specially prepared lakes and streams are stocked with ready-to-catch farmed fish for the benefit of anglers.

Radioecology = study of the transport and turnover of radioactive substances in the natural environment.

Rules of consideration = under ch. 2 of the Environmental Code, anyone pursuing an activity that could affect the environment is required to acquire a knowledge of its environmental effects and ensure that it does not harm the environment or human health.

SIKA = Swedish Institute for Transport and Communications Analysis.

Site safeguard = protection of an area under ch. 7 of the Environmental Code, e.g. through designation as a nature reserve, habitat protection area or national park.

SKB = Svensk Kärnbränslehantering AB, the Swedish Nuclear Fuel and Waste Management Company.

SLU = Swedish University of Agricultural Sciences.

Small-scale habitat = small area of land or water which constitutes or could constitute a habitat for valuable plant and animal species associated with farmland.

SMHI = Swedish Meteorological and Hydrological Institute.

SOU = Swedish Government Official Reports.

Spawning biomass, see biomass.

Squamous cell carcinoma = form of skin cancer that is common, but less dangerous than malignant melanoma.

SSI = Swedish Radiation Protection Authority.

Substitution principle = harmful chemical products (or substances) should where possible be replaced with less harmful or harmless products (or substances).

Swedish EPA = Swedish Environmental Protection Agency.

Swedish Nuclear Waste Fund = fund set up to administer the levies charged to nuclear power producers to meet the cost of final disposal of future waste.

Transport agencies = Swedish National Road Administration, National Rail Administration, Civil Aviation Administration and Maritime Administration.

VOCs = volatile organic compounds.

Whole-tree harvesting = harvesting of branches and tops of trees, as well as stems.

WWF = World Wide Fund for Nature.

The Environmental Objectives Council

On 1 January 2002 the Swedish Government established the Environmental Objectives Council to promote consultation and cooperation in the implementation of the environmental quality objectives adopted by Parliament. The Council consists of representatives of central government agencies, county administrative boards, local authorities, non-governmental organizations and the business sector.

The principal functions of the Environmental Objectives Council are:

- to monitor and evaluate progress towards the environmental quality objectives,
- to report to the Government on how efforts to achieve the objectives are advancing and what further action is required,
- to coordinate the information efforts of the agencies responsible for the objectives,
- to ensure overall coordination of the regional application of the objectives, and
- to allocate funding for monitoring of progress towards the objectives, environmental monitoring, and some reporting at the international level.

The following individuals have been appointed as members of the Council for the period 1 January 2002 – 31 December 2004:

Jan Bergqvist,
Chairman

Lars-Erik Liljelund,
Director-General, Swedish Environmental Protection Agency, *Vice-Chairman*

Gunnar Ågren,
Director-General, National Institute of Public Health

Kerstin Blix,
Director of Environmental Affairs, Hammarby Sjöstad, City of Stockholm

Göran Enander,
Director-General, National Board of Forestry (member since 20 March 2003)

Ann-Sofie Eriksson,
Acting Head of Planning and Environment Section, Swedish Association of Local Authorities (member since 21 November 2002)

Ethel Forsberg,
Director-General, National Chemicals Inspectorate

Ulla-Britt Fräjdin-Hellqvist,
Director of Environmental Affairs, Confederation of Swedish Enterprise

Lars-Erik Holm,
Director-General, Swedish Radiation Protection Authority

Anna Jonsson,
Environmental NGO representative

Thomas Korsfeldt,
Director-General, Swedish Energy Agency

Inger Liliequist,
Director-General, National Heritage Board (member since 1 March 2003)

Lars Ljung,
Director-General, Geological Survey of Sweden

Karl Olov Öster,
Director-General, National Board of Fisheries

Ingemar Skogö,
Director-General, National Road Administration

Karin Starrin,
County Governor, Halland County Administrative Board

Ines Uusmann,
Director-General, National Board of Housing, Building and Planning

Kerstin Wigzell,
Director-General, National Board of Health and Welfare

Representatives of the Swedish Board of Agriculture have also been involved in the work of the Council. As from 10 April 2003, the Director-General of the Board of Agriculture is **Mats Persson**.

Sweden's environmental objectives | de Facto 2003

– will the interim targets be achieved?

This annual report is published by the Swedish Environmental Objectives Council through the Swedish Environmental Protection Agency. The draft texts and data on which it is based have been supplied by the agencies responsible for the environmental quality objectives (see below). Comments on the material included have been made by the organizations represented on the Environmental Objectives Council, through its Progress Review Group.

Environmental quality objectives

1. REDUCED CLIMATE IMPACT
   Swedish Environmental Protection Agency
2. CLEAN AIR
   Swedish Environmental Protection Agency
3. NATURAL ACIDIFICATION ONLY
   Swedish Environmental Protection Agency
4. A NON-TOXIC ENVIRONMENT
   National Chemicals Inspectorate
5. A PROTECTIVE OZONE LAYER
   Swedish Environmental Protection Agency
6. A SAFE RADIATION ENVIRONMENT
   Swedish Radiation Protection Authority
7. ZERO EUTROPHICATION
   Swedish Environmental Protection Agency
8. FLOURISHING LAKES AND STREAMS
   Swedish Environmental Protection Agency
9. GOOD-QUALITY GROUNDWATER
   Geological Survey of Sweden
10. A BALANCED MARINE ENVIRONMENT, FLOURISHING COASTAL AREAS AND ARCHIPELAGOS
    Swedish Environmental Protection Agency
11. THRIVING WETLANDS
    Swedish Environmental Protection Agency
12. SUSTAINABLE FORESTS
    National Board of Forestry
13. A VARIED AGRICULTURAL LANDSCAPE
    Swedish Board of Agriculture
14. A MAGNIFICENT MOUNTAIN LANDSCAPE
    Swedish Environmental Protection Agency
15. A GOOD BUILT ENVIRONMENT
    National Board of Housing, Building and Planning

Broader issues related to the objectives

I. THE NATURAL ENVIRONMENT
   Swedish Environmental Protection Agency

II. LAND USE PLANNING AND WISE MANAGEMENT OF LAND, WATER AND BUILDINGS
   National Board of Housing, Building and Planning

III. THE CULTURAL ENVIRONMENT
   National Heritage Board

IV. HUMAN HEALTH
   National Board of Health and Welfare

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Sweden's environmental objectives – will the interim targets be achieved? de Facto 2003

This report gives an overall picture of the environmental situation in Sweden and of the prospects of achieving the country's fifteen national environmental quality objectives. In particular, it describes progress towards the sixty-nine interim targets adopted by the Swedish Parliament as staging posts towards the objectives. In many cases, efforts to meet the targets are well on track, but this report also shows that further action needs to be taken if they are all to be achieved.

This is the second annual report of the Swedish Environmental Objectives Council on progress towards the objectives, and the fifth publication in the de Facto series.

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