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Report on the in-depth review of the third national communication of Latvia

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I. INTRODUCTION AND NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

A. Introduction

1. Latvia acceded to the United Nations Framework Convention on Climate Change (UNFCCC) on 23 March 1995 and ratified the Kyoto Protocol to the Convention on 5 July 2002**.** The first national communication (NC1) under the UNFCCC was submitted in 1995, the second (NC2) in 1998 and the third (NC3) in November 2002. The in-depth review was carried out from July to November 2002 and included a country visit by a review team to Riga from 8 to 12 July 2002. The team consisted of Mr. Andrej Kassenberg (Poland), Mr. Didier Goetghebuer (Belgium), Mr. Adriaan Perrels (Finland) and Ms. June Budhooram (UNFCCC secretariat, coordinator).

2. The NC3 was prepared in four months in both Latvian and English by the Ministry of Environmental Protection and Regional Development (MEPRD) with funding provided from the Latvian Environmental Protection Fund. The NC3 was prepared in close collaboration with 45 experts from the Inter-ministerial Working Group comprising representatives from state institutions, non–governmental organizations[1] and independent experts. The review team also met non-governmental groups involved in climate change issues.

B. National circumstances

3. Latvia is a small country with a total land area of 64,589 km^2, situated on the Baltic coast between Estonia and Lithuania and bordering on Russia and Belarus to the east. The landscape is mostly flat, with its highest point at 312 m above sea level, and most of the coastal and central regions lying just above sea level. Forests cover 45 per cent and agricultural land 40 per cent of the total land area. Latvia has a temperate climate; average summer temperatures range from 11 to 13ºC and average winter temperature from –2 to 2ºC.

4. Latvia is an independent democratic parliamentary republic. The parliament (Saeima) is the highest legislative authority and it elects the President whose government is entrusted with executive power. There are 552 local governments and the territory is divided into 26 regions with 473 rural municipalities and 65 towns, which are entrusted with managing their own budgets and have the right to levy local taxes.

5. Latvia's population has been declining since 1991. In 2000 it was estimated at 2.4 million (more than a third of whom live in Riga, the capital), which is an 11 per cent decline compared to 1990. The average population density of 37 persons per km^2 is less then the western European average[2] of 140 persons per km^2.

6. Transition to a market economy in Latvia started after 1991 and this process initiated major structural changes. The development focused first on the transition towards a market-based economy and later, after 1995, on accession to the European Community (EC).[3] After a dramatic decline in overall

[1] State institutions involved in the preparation of the NC3 included: Ministry of Agriculture, Ministry of Economy Ministry of Finance, Ministry of Transport, Ministry of Environmental Protection and Regional Development, Latvian Environmental Agency; Latvian Development Agency; State Hydrometeorology Board, Central Statistical Bureau, Riga City Council.

[2] Organization of Economic Cooperation and Development – Population Report 2000.

[3] The European Agreement or Associate Agreement came into effect in Latvia on 1 February 1998.

gross domestic product (GDP) between 1990 and 1992 and a further gradual decline until 1995, GDP rose by 26 per cent between 1995 and 2000 (except for a slight fall in 1998 as a result of the economic crisis in Russia), averaging 3.8 per cent per year in this period. The fastest growth came from a rapid expansion of the services sector, which grew from 48 per cent of GDP in 1992 to 70 per cent in 2000; and from development in the manufacturing sector. Agricultural production declined by 12 per cent annually between 1990 and 1999, although a slight improvement was registered in 2000 (3.9 per cent). Growth in investment between 1995 and 2000 averaged 19 per cent annually and is expected to continue at this rate in the near future.

7. In 1999 and 2000, Latvia had the fastest growing economy among the Baltic States and in 2000 in the group of EC candidate countries. Although the economy has been growing, emissions of greenhouse gases (GHGs) have declined (table 1) since 1990 as a result of a decline in industrial output, active energy efficiency policies and restructuring and partial privatization of the energy sector, mainly in the supply of gas.

Table 1. Main macroeconomic indicators and GHG emissions for Latvia

	1990	1995	2000	Change (%)
Population (million)	2.7	2.5	2.4	–11.0
Per capita energy consumption (GJ)	NE	71.85	64.90	–9.7
Energy productivity (LVL[a]/terajoule)	NE	12.52	18.96	51.4
Total CO_2 emissions (Tg[b])	23.70	11.80	7.00	–70.5
CO_2 emissions per capita (tonnes)	8.87	4.67	2.95	–36.8
CO_2 emissions per unit GDP (tonnes per LVL, 1995 constant prices)	NE	0.0050	0.0024	–52.0

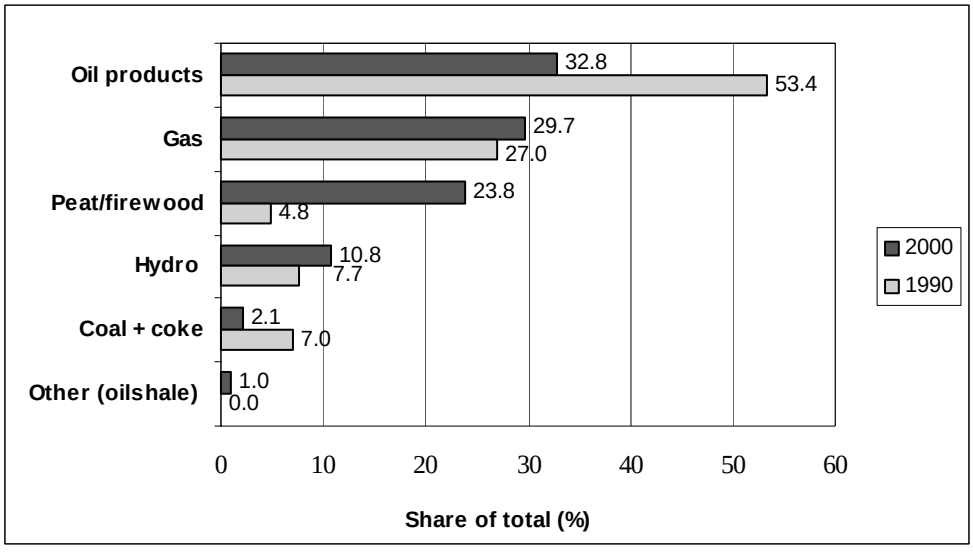
[a] The national currency, the lat (LVL), is informally pegged to the Special Drawing Right (SDR), the accounting unit of the International Monetary Fund. US$1 = 0.49LVL (July 2002).

[b] One teragram (Tg) is equal to 1,000 gigagrams (Gg) or one million tonnes (Mt).

NE = not estimated.

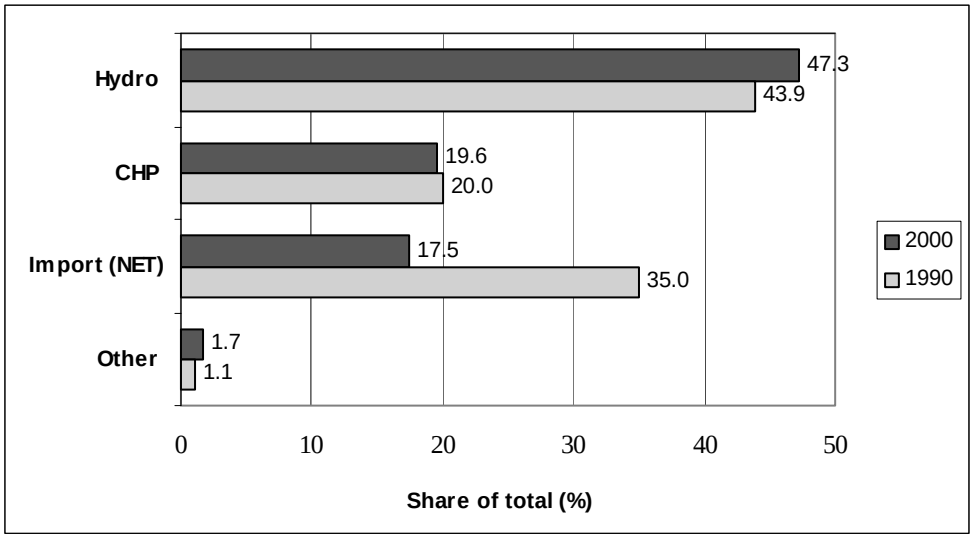
8. Latvia is heavily dependent on fuel imports. Russia supplies all the natural gas, and most of the oil and oil products. Electricity is generated mainly from large hydropower stations (HPSs) on the Daugava River and combined heat and power systems (CHP). There are also some small HPSs. HPSs and CHP systems provide 60–70 per cent of total electricity. Any shortfall in electricity demand is met by imports from Russia, Estonia and Lithuania. Other indigenous sources of energy include small quantities of peat, wood and wind potential (figures 1 and 2). Recently, an oil field was discovered on the Baltic Sea shelf, where preliminary oil drilling is taking place.

Figure 1. Primary energy supply in Latvia 1990 and 2000



Note: The shares may not add up to 100 per cent because of rounding.

Figure 2. Structure of electricity supply in Latvia 1990 and 2000



Note: The shares may not add up to 100 per cent because of rounding.

C. Relevant environmental policies

9. MEPRD was established in 1993 to address environmental issues including climate change. There are eight regional boards, subordinate to MERPD, which implement state policy on environmental protection, regional development and construction. The review team was informed that there are plans to strengthen the function of these boards. Latvian experts claimed that, because of their emission profile, there is no explicit Latvian climate change policy but that GHG mitigation policies are incorporated into national and sectoral planning. In 1997–1998 the Climate Change Mitigation Policy Plan was developed under the guidance of the MERPD for the first time and was being updated during the review period. It is expected to be completed by the end of 2003.

10. In harmonizing Latvian policies with EC directives, there has been an extensive revision of energy and environmental policies which may be beneficial for climate change. In July 2001 the Saeima approved the Strategy for Integration into the European Union, which sets out the commitments of the government until 2003 to prepare for accession. The Environment Chapter of EC accession negotiations were concluded in 2001 with Latvia now implementing the strategy, which contains targets for full compliance by 2012. This reflects the government's efforts to harmonize environmental legislation with EC directives, which have already begun in several areas including energy efficiency, air pollution and waste. The National Program on Energy and the Law on Energy are two other important elements in responding to EC directives. At the time of the review, the establishment of a high-level inter-ministerial working group for climate policy was also under consideration.

11. National GHG emissions in 2000 were well below 1990 levels. Under the Kyoto Protocol, Latvia should take steps to decrease GHG emissions by 8 per cent between 2008 and 2012. It is clear that Latvia will have no difficulties in meeting its commitments under the Protocol. However, the review team is of the opinion that there are still issues associated with data collection and verification (see chapter II) that need to be addressed to ascertain the actual levels of GHG emissions in Latvia between 1990 and 2000.

II. GREENHOUSE GAS INVENTORY INFORMATION

A. Inventory preparation

12. Inventories presented in the NC3 are prepared by the Latvian Environmental Agency (LEA) under the supervision of the MERPD. The LEA is also responsible for creating and maintaining databases on air pollution, water use, water treatment facilities, hazardous and municipal waste and waste disposal sites, and for reporting annual inventories under the UNFCCC. The LEA relies almost exclusively on default emission factors from the Intergovernmental Panel on Climate Change (IPCC) guidelines[4] and also on energy balances produced by the Latvian Central Statistical Bureau (CSB) for preparing the inventories. Emissions from the energy sector were prepared in collaboration with the CSB. The Ministry of Transport provided data on emissions from transport, and the Forestry Department and the Ministry of Agriculture provided data for estimating sinks and emissions from the agriculture sector.

13. The NC3 contains inventory data for carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), nitrogen oxides (NO_X), carbon monoxide (CO), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2) for 1990 and 1995–2000. Inventories for 1991–1994 are not presented in the NC3 as energy balances for these years are not available. Latvian experts also explained that emissions of the "new gases" HFCs, PFC and SF_6 (only data on SF_6 from electrical equipment – 0.09 Gg CO_2 equivalent in 1999 – was presented) and for international bunkers were not presented in the NC3, due to difficulties in collecting reliable information (these gases are not produced in Latvia and most of the activity data are contained in import invoices that are not easily accessible or reliable). Experts explained that there is also a discrepancy in the data on soils (emissions were calculated based on the Russian classification of soils and not on the IPCC classification) and that work is under way to rectify this.

14. Although in very general terms the inventories in the NC3 were prepared using the IPCC 1996 Revised Guidelines,[5] the review team noted that there are still some problems with the statistical data (activity data) used for preparing the inventories, and that this urgently needs to be addressed. Although there have been improvements in statistical data on energy and GHG emissions for the most recent years (1999, 2000), data on energy consumption especially for earlier years (1990) appear to have discrepancies – for example, CO_2 emissions from transport decreased from 6011 kt in 1990 to 2143 kt in 2000 (table 3.1 of NC3) while the number of passenger cars increased from 283,000 to 557,000 in the same period (table 2.6). The transport experts explained that in 1990 the automobile fleet was less efficient than it was in 2000, and as a result, the difference in fuel consumption reflects this change. In addition, many cars that were registered with the Road Traffic Safety Directorate early in the decade were taken out of service in 2000. The review team also noted that there is a large amount of energy in the transport sector unaccounted for in the energy balance. The review team was informed that this might be the sale of fuel to vehicles from neighbouring countries that is undocumented and estimated to account for 30 per cent of total fuel sales.

15. Similarly, it was difficult for the review team to ascertain which GHG emissions in the energy sector have decreased during the most recent years as a result of a change in activity level or weather conditions, or for other reasons such as fuel switching or an increase in energy efficiency. The national inventory team has recognized these deficiencies, and for this reason is not using the GHG inventory as a basis for any mitigation strategy, but will do so in the future, as needed.

16. Nevertheless the quality of the energy balances, and of emissions disaggregated by gases, is increasing. The 1990 total net CO_2 emission estimate reported in the NC3 is the same as in the NC2

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[4] "IPCC Guidelines for National Greenhouse Gases Inventories", IPCC, 1995.

[5] "Revised IPCC 1996 Revised Guidelines for National Greenhouse Gas Inventories", IPCC, 2000.

(table 2). However, data for other years are different because of the change in the data system from the statistical system used before independence. The review team recommended that the energy balances series be reviewed for the quality, consistency and reliability of the information, especially that for 1990. Since the publication of the NC3 the time series have been recalculated, but these data were not available during the review.

17. Latvian officials noted that an essential prerequisite for the integration of Latvia into the EC is the creation of a statistical system that provides timely, accurate, complete and internationally comparable statistics, especially for the energy sector and environmental performance indicators. This requires better coordination among the agencies involved – the LEA, the Latvian Development Agency (LDA) and the CSB. The team recommended that a separate document should be prepared for these statistics and used as a reference report for the policy-makers. Up to now, it seems that the inventories have been prepared only for the UNFCCC and not for internal use.

18. The review team noted a number of areas in which the CO_2 inventory could be improved. In particular, there are no estimates of emissions from the household and tertiary sectors. An improvement in data collection and presentation for these areas can allow for a better analysis of GHG emission trends in these sectors as well as the attribution of certain factors such as number of dwellings, degree-days, energy bill or energy efficiency. A large part of the inaccuracies found in the NC3 by the review team has already been corrected during the creation of the following GHG emission inventory.

19. Some important developments, which took place after the review week, and submitted to the secretariat, included the recalculation of GHG emissions for the period 1990 to 1998. These recalculations were based on more precise data, emission factors, and more detailed expert opinion. For example, in the transport sector automobiles have been grouped by their age, which changes the emission factors; international aviation and shipping emissions have been calculated separately; in the energy sector fugitive emissions (CH_4) from natural gas have been recalculated using emission factors and data from the joint stock company "Latvijas Gāze". The national inventory will include more precise activity data and emission coefficients wherever possible in the future for the preparation of GHG inventories.

Table 2. Comparison of 1990 and 1995 emissions between the NC2 and NC3

	NC2		NC3		Change (%)	
	1990	**1995**	**1990**	**1995**	**1990**	**1995**
Gross CO_2 emissions (Gg)	23 661	10 262	23 527	10 145	0.56	1.14
Land-use change and forestry (Gg)	–10 960	–10 600	–10 825	–10 483	1.23	1.10
Net CO_2 emissions (Gg)	12 701	–338	12 702	–338	0	0
CH_4 (Gg)	194	101	196	101	1.03	0
N_2O (Gg)	11	4[a]	11	4	0	0

[a] After corrections from the Ministry of Agriculture during the second in-depth review (see paragraph 30 in the report on the in-depth review of the NC2).

B. Overall emission trends

20. Trends in individual GHGs using their global warming potential (GWP) values for a time horizon of 100 years and the total with and without land-use change and forestry (LUCF) between 1990 and 2000 are shown in table 3 and figure 3. From 1990 to 1995 total aggregated emissions excluding LUCF fell by 57 per cent as a result of the transformation to a market economy as well as a decline in economic growth. Even with economic recovery between 1995 and 2000, total GHG emissions were 65 per cent lower than in 1990. Although CO_2 continued to be the largest contributor to total GHG emissions (see figure 4), accounting for 65 per cent of the total in 2000, its overall share dropped from 76 per cent in 1990 to 65 per cent in 2000. In contrast, CH_4, which accounted for 13.3 per cent of total emissions in 1990, increased to 24 per cent by 2000. The share of the emissions of N_2O remained stable

between 1990 and 2000, at around 11 per cent of the total emissions, although this figure is considered very preliminary until the methodology for calculating emissions from soils is improved.

Table 3. GHG emissions by gas, 1990–2000

	Gg CO_2 equivalent							Change (%)	Change (%)
	1990	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**1990–1995**	**1990–2000**
CO_2	23 527	10 145	9 549	8 619	8 287	7 545	7 100	–57	–70
CH_4	4 116	2 127	1 997	2 180	2 622	2 596	2 599	–48	–37
N_2O	3 411	1 162	1 169	1 187	1 240	1 243	1 279	–66	–63
HFCs, PFCs, SF_6	NE	NE	NE	NE	NE	NE	NE	–	–
GHG without LUCF	31 054	13 434	12 715	11 986	12 149	11 384	10 978	–57	–65
LUCF	–10 826	–10 484	–10 496	–10 508	–10 508	–5 229	–4 290	–3	–60
GHG with LUCF	20 228	2 950	2 219	1 478	1 641	6 155	6 688	–85	–67

Note: Data were updated by the inventory team in Latvia and provided during the review. Data for 2000 are preliminary.
NE = not estimated.

Figure 3. GHG emission trends by major gases, 1990–2000

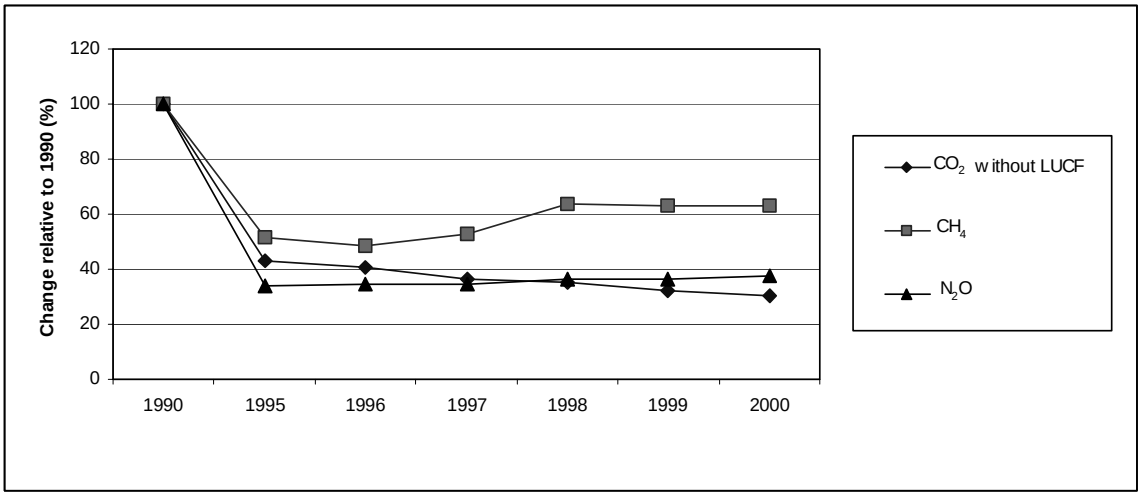
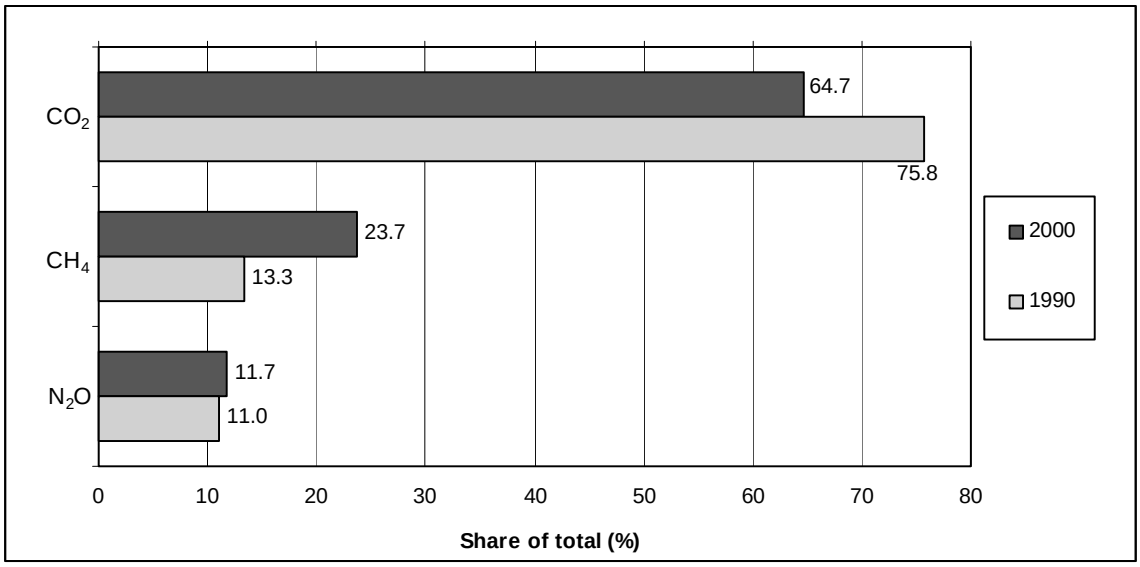


Figure 4. Shares of GHG emissions by gas, 1990 and 2000



21. Analysis of the GHG trends between 1995 and 2000 shows that the aggregated emissions of GHG in 2000 were 18 per cent lower then those in 1995. This is mainly attributed to a reduction of

30 per cent in CO_2 emissions. In contrast, CH_4 and N_2O emissions increased by 22 per cent and 10 per cent respectively. These trends indicate that the structure of direct GHG emissions has changed between 1995 and 2000 when compared to 1990–1995. In 1995 CO_2 emissions constituted 76 per cent of total emissions, but in 2000 they were only 65 per cent. At the same time, the shares of CH_4 and N_2O emissions have risen, from 15.8 and 8.6 per cent in 1995 to 23.6 and 11.7 per cent in 2000, respectively.

22. The energy sector was the main source of GHG emissions as well as of the indirect GHGs and SO_2 emissions. This sector (fossil fuel combustion) was also responsible for 98 per cent of CO_2 emissions. CO_2 removals from LUCF were 10,83 Tg of CO_2 in 2000. Between 1990 and 2000, the LUCF sector was a net sink, even though its capacity declined by 60 per cent (from 10.8 to 4.3 Tg CO_2) in that period. In 2000 the GHG removals through LUCF amounted to about 40 per cent of total GHG emissions.

23. The mismatch between the IPCC soil classification and Latvian (Russian) soil classification, mentioned earlier, impeded the inclusion of emissions from soils in the NC3. The review team was informed that a study is under way to establish a conversion system between the classification systems, after which emission estimations will be made.

24. The Latvian energy statistics in general still show numerous deviations from the standard practice for energy statistics in EC and OECD countries. For example, bunkers for (international) sea and air transport are not compiled as part of the Latvian energy statistics and as a consequence no emissions on bunkers were presented in the NC3.

25. The statistical basis for the assessment of fuel use and resulting emissions in transport is highly unreliable because of a substantial flow of motor fuels from imports that is not recorded. There seems to be a sizeable grey sector of oil product trade. It is therefore recommended that these flows are monitored and recorded to obtain reliable data for transport fuel use. Such data would also be helpful for policy-making in transport and in spatial planning. Observation of the generation and disposal of solid waste and sewer waste (sludge) was improved only recently, and is not yet complete.

C. Key emission sources and sectoral trends

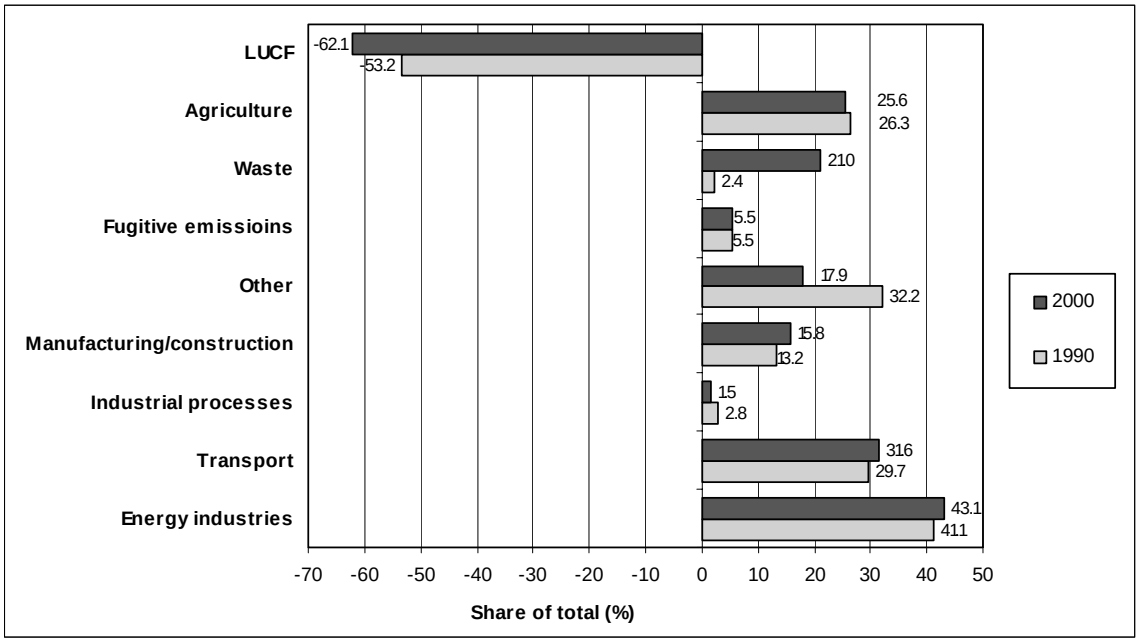
26. The most important sectors contributing to total GHG emissions in 2000 (see table 4) include CO_2 from fossil fuel combustion (98.5 per cent), comprising energy industries (40.8 per cent); industry and construction (14.9 per cent), transport (29.4 per cent) and other sectors such as residential and agriculture (13.5 per cent). Table 4 shows the GHG emissions by sector between 1990 and 2000. On the whole, large reductions were achieved in all sectors of the economy. However, there are some notable sectoral and sub-sectoral trends such as: (i) a decrease in emissions from all subsectors of the energy sector especially the “other sectors” category; (ii) a decrease of 67.4 per cent in emissions from agriculture; (iii) almost a threefold increase in emissions from waste; (iv) a marked reduction in sink capacity through LUCF between 1998 and 2000; and (v) a 67 per cent decline in fugitive emissions. Looking at the GHG emissions by sector in figure 5, one can conclude that in the period 1995–2000 the share of the energy sector has dropped by 16 per cent while the share of transport and waste management increased. The proportion of emissions from agricultural and industrial processes remained practically unchanged.

Table 4. GHG emissions by sector and sub-sector, 1990–2000

	Gg CO_2 equivalent							
Sector	**1990**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Change (%)**
Energy	24 623	10 710	10 007	9 327	8 879	8 004	7 627	–69.0
Energy industries	*8 333*	*4 568*	*3 927*	*3 852*	*3 572*	*3 136*	*2 920*	*–64.9*
Manufacturing and construction	*2 683*	*2 683*	*741*	*1 243*	*1 275*	*1 162*	*1 071*	*–60.0*
Transport	*6 011*	*6 011*	*6 011*	*2 178*	*2 126*	*2 145*	*2 143*	*–64.3*
Other sectors	*6 152*	*2 723*	*3 191*	*1 435*	*1 301*	*1 190*	*1 063*	*–82.7*
Fugitive emissions	*1 118*	*454*	*394*	*484*	*474*	*314*	*371*	*–66.8*
Industrial processes	563	127	185	154	236	161	101	–82.1
Solvents	NE	NE	NE	NE	NE	NE	NE	NE
Agriculture	5 335	1 934	1 848	1805	1794	1708	1 737	–67.4
LUCF	–10 789	–10 437	–10 450	–10 462	–10 462	–5 144	–4 205	–61.0
Waste	491	616	628	655	1 193	1 423	1 423	189.8

NE = not estimated.

Figure 5. Shares of GHG emissions by sector, 1990 and 2000



27. **Decrease in emissions from all sub-sectors of the energy sector, especially the "other sectors" category.** The decrease in emissions in the energy sector resulted from a change in the fuel structure of energy-intensive industries such as steel and cement, where coal was substituted by natural gas. Also, less fossil fuels were needed for heating because average temperatures in the decade were higher than in previous decades, because energy efficiency was improved by the introduction of centralized district heating, and because of the substitution of coal and wood by natural gas. Some reduction can also be attributed to a reduction in the production of cement and steel.

28. The review team noted that transport statistics show declining emissions of CO_2 even though the number of cars is growing sharply. The explanation given by the Latvian officials was that the statistics are distorted by operators declaring domestic deliveries of goods as "goods in transit" in order to avoid taxation; and scrapped cars not being removed from the register. In 1998 and 2001 respectively there were an estimated 450,000 and 610,000 registered cars, but in the same years only 234,000 and 285,000 cars respectively were insured. There were 99,700 registered and 37,400 insured trucks in the country in 2001. The review team was informed that the Ministry of Transport is currently developing a new database with more reliable data that can be used to estimate emissions in this sector. The main

sources of N_2O in the energy sector are catalytic converters used in transport; N_2O emissions decreased from 267 Gg CO_2 equivalent in 1990 to 46 Gg CO_2 equivalent in 2000.

29. **Significant decrease in emissions from agriculture.** Agricultural production declined by 12 per cent annually between 1990 and 2000 as the quality of agricultural products from Latvia was reported as "failing to meet EC standards". For this reason, crop farming, livestock numbers and the use of fertilizers in the sector were all reduced, contributing to a marked reduction in emissions of all GHGs from this sector. During the review of the NC2, officials from the Ministry of Agriculture had also recalculated the emissions of N_2O from soils (histosols); as result, N_2O emissions declined from 15.7 Gg to 3.2 Gg for the agriculture sector in 1995. The review team recommended that N_2O emissions from agriculture be recalculated for 1990 and 1995–1997 with the new data and assumptions on manure management that were presented during the review of the NC3. Nevertheless, N_2O emissions have gone down by 67.4 per cent compared with the 1990 level, as a result of decreased agricultural production and decreased use of fertilizers.

30. **Almost a threefold increase in emissions from waste.** The main reason for this increase was the production of CH_4 from solid waste disposal on landfill sites. Waste management was mentioned in the NC3 as being one of Latvia's most important environmental problems. Most landfill sites are small and are not equipped with gas recovery systems. Where they are installed, such systems are not very efficient. Almost 52 per cent of CH_4 emissions come from landfill sites where no recovery systems are in place. Since 1998, 250 formerly illegal dumpsites have been legalized; there are still 100 which are not yet legalized. The review team was informed that part of the increase in emissions was due to the use of a new emission factor for data between 1998 and 2000. With the recalculation for the entire series (1990, 1995–1997) using the new emission factor (see para. 3.2.4 of the NC3) this trend of increasing CH_4 emissions from waste may change.

31. **Marked reduction in sink capacity through LUCF between 1998 and 2000.** Latvia has extensive forests, and CO_2 sequestration was estimated as being stable between 1990 and 1998, estimated at approximately 10.8 Gg CO_2 equivalent in 1990 and 10.5 Gg CO_2 equivalent in 1998. However, in 1999 the net annual sequestration of CO_2 in forest has halved to 5.3 Gg CO_2 equivalent as a result of increased harvesting of forests for export and for pulp between 1998 and 2000 – from 200,000 m^3 in 1998 to 4,030,000 m^3 in 2000.

32. **A 67 per cent decline in fugitive emissions.** Fugitive emissions from Latvia's 1300 km of natural gas pipelines are calculated on the basis of percentage of gas consumed. These emissions have declined sharply from 1990 to 1996. Also, the emissions factor for calculating losses in the natural gas pipeline system in 1999 and 2000 is different from the one applied in previous years. The figures need to be recalculated for the other years (1990, 1995–1998) in order to ascertain the actual reduction in emissions between 1990 and 2000.

33. The review team believes that the analysis of emission trends in the NC3 could be improved by ensuring that in future recalculations are made for the entire time series and that discrepancies in activity data are addressed in the development of data systems. In addition, the use of relevant indicators or key emission drivers for explaining certain trends needs to be strengthened.

III. POLICIES AND MEASURES

A. Policy framework

34. There has been considerable progress in policy development since the NC2. Because Latvia is an economy in transition, policies and measures (PAMs) are focused on integrating national sectoral legislation and regulations into those of the EC. For this reason PAMs in the NC3 are those contained in

the Declaration of the Planned Action issued by the Cabinet of Ministers and implemented in preparation for accession to the EC, as well as the latest plans and programme for national and sectoral development. The Environment Protection Policy Plan (EPPP) forms the basis for policy direction and it is supported by the Investment Programme. The policy context of most measures is well presented, with detailed information on each policy objective and its GHG reduction potential. The structure of the PAMs section generally follows the UNFCCC reporting guidelines,[6] and includes summary tables in accordance with the guidelines. The PAMs chapter gives a broad impression about all the important PAMs in each economic sector and those that are planned for the future. However, there is no indication of how PAMs are prioritized in terms of their GHG mitigation potential or cost-effectiveness.

35. The NC3 presents information on PAMs by sector in a very general way. However, each policy is accompanied by a detailed description of the corresponding measures, and the GHG gases that will be most affected. In accordance with the reporting guidelines, the description of each measure, its objectives, GHGs affected, type, status, implementing entity and funding are all presented in the section. Despite some reporting omissions, there has been a substantial improvement in reporting PAMs in the NC3 compared to the NC2.

36. The review team is of the opinion that including information on the GHG mitigation effects, costs of policies, and the cost-effectiveness of the major PAMs would have greatly assisted the understanding of the role of various PAMs in reducing GHG emissions. Policy development and prioritization of measures are guided mainly by generic guidelines and principles on sustainable development in all sectors, including agriculture. However, cost-effectiveness is not currently used as a criterion for policy selection.

37. Legislative reform in keeping with the provisions of EC legislation guides the policy-making process and the implementation of measures. For this reason, most policies and measures are cross-sectoral with environmental goals or priorities. Although most sectoral policies generally do not focus directly on climate-related measures, many of them are favourable for climate protection. The Latvian experts informed the review team that a climate policy would be developed in keeping with the climate policies of the EC in the very near future. Latvia is at the final stage of negotiations with the EC and membership is expected in 2004, so structural and cohesion funds will be available for Latvia in the near future. Financial assistance from the EC for developing most of the PAMs in all economic sectors is granted on the basis of the National Development Plan, which was prepared by Latvia for the period 2000–2002. In this regard, Latvia benefits from assistance from two pre-structural funds: the Instrument for the Structural Policies for Pre-accession (ISPA) in the sectors of transport and environment protection, and the Special Action for Pre-accession for Agriculture and Rural Development (SAPARD). The third area of pre-accession financial support comes from the EC Programme on Renewable Energy Resources (PHARE).[7]

38. Since the 1990s, and as a result of structural reform and transition to a market economy, Latvia has achieved a substantial reduction in total GHG emissions; they fell from 31 Tg CO_2 equivalent in 1990 to 11 Tg CO_2 equivalent in 2000, excluding LUCF, representing a 65 per cent reduction. For this reason, Latvia did not establish quantitative reduction targets under the UNFCCC, but under the Kyoto Protocol the country committed itself to reduce its total GHG emissions, individually or jointly, by 8 per cent below 1990 levels in the period 2008–2012. In 2000 Latvia's total GHG emissions were estimated at 17.6 Tg CO_2 equivalent, well below its 8 per cent Kyoto target. The projections presented

[6] Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications. Document FCCC/CP/1999/7.

[7] PHARE provides financial and technical support to 13 partner countries in central Europe. The programme aims to prepare the 10 countries that have applied to join the EC for accession.

in the NC3 indicate that in 2012 total GHG emissions will be approximately13–15 Tg CO_2 equivalent (a 52–58 per cent reduction compared with 1990).

39. MEPRD is responsible for implementing environmental policy, including commitments under the UNFCCC and its Kyoto Protocol. MEPRD is supported in its work on environmental protection by other government ministries, agencies and institutions. These include the LEA, Ministry of Economy, Ministry of Finance, LDA, Ministry of Agriculture, Ministry of Transport and State Forest Services. These ministries are also responsible for applying economic and administrative instruments such as taxes, charges, penalties and permits.

40. As no GHG targets have been established, there are no sectoral targets for PAMs. The review team expressed the view that without clear and precise sectoral GHG reduction targets it would be difficult to ascertain the performance of individual policies and measures. To this end, the review team suggested setting up domestic targets for policy packages or for sectors in preparation for possible GHG mitigation commitments in the future that may go beyond the Kyoto Protocol target. The establishment of such targets has the advantage of allowing for effective monitoring of the implementation of each policy and/or measure as well as for making adjustments as required, if policy objectives are not being met. The establishment of a national target would also provide additional opportunities for future arrangements from Joint Implementation (JI) or international emissions trading.

41. The use of flexibility mechanisms is, for the moment, not widely reflected in the Latvian climate policy. Because the use of such mechanisms will greatly influence future abatement technology developments and foreign direct investment, as Latvia possesses a substantial asset of sellable emission rights, it is important for Latvia to set up a strategy and organizational structures in order to be able to maximize the potential benefits of the flexible mechanisms in the near future.

B. Cross-sectoral policies and measures

42. The most important recent cross-sectoral PAMs developments since the NC2 are the amendments to the Law on Environment Protection, the Law on Natural Resources Tax and the Energy Law.

43. The **Law on Environment Protection** has been in force since August 1991. Its key objectives are the preservation and development of ecosystems. In March 2001, the law was amended to include all economic sectors, and the engagement of the wider community in observing environmental protection and the implementation of an environmental policy in all sectoral development plans.

44. The **Law on Natural Resources Tax**, which came into force in September 1995, was amended in April 2000 by stipulating higher tax rates for pollution (particulates, carbon monoxide, SO_2, NO_X) from all fuels. At the moment CO_2 emissions are not taxed but the NC3 states that this tax may be introduced in the future.

45. The **Energy Law** was introduced in September 1998 to regulate the supply and use of energy resources (gas and heat) and contained the obligation to purchase energy produced from renewable energy (small hydro and wind). The Law was amended in May 2001 to include the regulation of energy-efficient equipment and technology and to give customers a choice in selecting more equipment that can reduce their energy bill.

C. Energy production and transformation

46. The energy sector in Latvia accounted for 70 per cent of total GHG emissions in 2000, a decrease from 79.3 per cent in 1990. The sector continues to dominate the emissions profile, but in absolute terms there has been a marked decrease in emissions mainly as a result of policies aimed at

privatization and restructuring of the electricity sector, energy efficiency, reliability of energy supply and fuel switching. Emissions originate from energy generation and transmission (40 per cent of the total), manufacturing industry and construction (15 per cent) and transport (27 per cent) and other sectors (15 per cent). The driving force behind these policies continues to be achieving compatibility of national energy legislation with that of the EC. The wide range of the projects focuses on increasing the participation of renewable energy sources in energy production (wood for central district heating, small HPSs, wind energy); increasing energy efficiency and energy conservation; and constructing power plants that emit less GHGs.

47. Since the NC2 there have been important policy developments in the energy sector, using a combination of economic and regulatory instruments to meet objectives. The Climate Change Reduction Policy Plan 1997–1998 was under revision at the time of the review. The goal of the revised plan is to reduce GHG emissions by 2010 by 92 per cent below 1990 levels. This plan also included some notable economic tools for implementing environmental policies, including the Natural Resource Tax and its related exemptions, the creation of the Latvian Environment Protection Fund law and the Environmental Investment Fund.

48. Several projects were initiated after the NC2, to increase the share of renewable energy in the energy supply mix. One of the most important is PHARE 2000. The aim of this programme is to prepare a medium- and long-term (until 2010) strategy and action plan for the development and use of renewable resources in Latvia. This programme is part of the EC-wide PHARE programme (see para. 36).

49. Small HPSs have been very successful in reducing CO_2 emissions since 1990. The government embarked on an intensive plan for reconstructing and constructing small HPS in all the regions. In 1995 there were only six small HPSs, but by 2001 there were 89. Installed capacity had increased from 1.45 MW in 1995 to 11.7 MW in 2001. There are 74 more HPSs earmarked for construction between 2002 and 2005, with a total installed capacity of 18.8 MW. An important concern for the short term is the intended closure of the Ignalina nuclear power station in Lithuania. This station has been an important source of low-priced electricity imports to Latvia. This source of electricity cannot be replaced solely by hydro generated electricity, and GHG emissions may increase if fossil fuels are used to generate electricity to supplement imports.

50. The government has a project promoting the wider use of fuelwood and wood wastes for heating in homes. Wood will substitute heavy fuel oil in domestic heating boilers. A marked reduction in CO_2, NO_X and CO emissions is expected. At the moment there are 126 wood-fuelled boilers in the country and the project will double this number by 2005. The project is supported by soft loans from the Nordic Investment Bank and the Energy Efficiency Fund.

51. Increasing energy efficiency and energy conservation is the goal of the State Energy Efficiency Strategy, which was developed by the Ministry of Economy in 2002. This strategy identifies a set of measures for increasing energy efficiency so that by 2010 primary energy consumption per unit GDP will be reduced by 25 per cent from 2000 levels. The Efficient Lighting Programme under the strategy will initiate a process to create a market for modern lighting technologies in Latvia. Benefits are expected after two years of implementation with a direct reduction of 2.7 Gg of CO_2 and indirect reductions of 47.7 Gg of CO_2 by 2010.

52. There will be energy efficiency improvements from the rehabilitation of district heating systems, dairies, bakeries and commercial buildings in Riga, with the application of design and construction norms for heating and ventilation according to the European Standardization Organization (CEN) standards and building codes. The reduction of heat losses in buildings will decrease the fuel demand for heat production. Already, with foreign assistance, four milk-processing enterprises and twelve bakeries have been identified as possible candidates for energy efficiency improvement. The projects will provide

small reductions in GHG emissions as well as cost savings. The new World Bank programme on loans for the renovation and insulation of building stock will assist in funding some of these projects.

53. Since signing the Kyoto Protocol Latvia has developed 27 Activities Implemented Jointly (AIJ) projects as a pilot phase of JI, in preparation for the Kyoto flexibility mechanisms. The joint projects were developed with Sweden, the Netherlands, Finland and Germany and focus on renewable energy sources, cogeneration, reconstruction of central heating systems and energy consumption efficiency. The review team was informed by the national experts that the best JI projects in Latvia are cross-sectoral projects in energy, industry and agriculture. To develop this mechanism Latvia is preparing a strong institutional framework and guidelines for participating in JI. At the moment, monitoring of the AIJ projects is fully carried out by donor countries, but Latvia is considering the development of its own systems.

54. Because of the financial crisis in the energy sector in the mid-1990s and problems with electricity supply, the Energy Development Plan was adopted to modernize the energy sector and to reduce energy imports. Foreign investments of US$ 5 billion were provided by 2000 for constructing power plants that emit less GHG emissions. Modernization of four power stations, and the construction of two new HPSs and one thermoelectric (gas) plant are included in this package, which is expected to reduce the rate of growth of GHG emissions from power generation.

D. Transport

55. Between 1990 and 2000 transport emissions decreased by 64 per cent. In spite of this decrease, this sector's share of total GHG emissions increased from 24.4 per cent in 1990 to 28.0 per cent in 2000, which is slightly above the EC average of 26 per cent of total CO_2 emissions in 1999.[8] This increase is a reflection of Latvia's favourable geographical position: its proximity to the Baltic Sea, its ice-free seaports (Ventspils and Liepaja) and its rail and road network have all contributed to making it an important transport link between eastern and western Europe. It has a relatively well-developed transport network that caters particularly for transit traffic of goods, including fuels. There are three major pipelines for the transhipment of oil, oil products and gas running through Latvia – one for crude oil, one for oil products and one for gas, which comes from Russia. Another pipeline is planned for 2004.

56. Transport experts explained that the transport sector in Latvia, as in many other countries with economies in transition, poses several difficulties in terms of selecting appropriate PAMs and assessing their effects on emissions. The difficulty arises from the fact that, firstly, transit operations account for about 80 per cent of all rail traffic and 70 per cent of road freight traffic. Secondly, there has been an unprecedented increase in the number of newly registered cars between 1990 and 2000. At the same time, between 1990 and 2000, the numbers of lorries has increased more than 60 per cent and passenger cars have almost doubled, although the CO_2 emissions for the sector have declined by 64 per cent. Experts claim that if this trend of increasing numbers of vehicles continues, by 2020 about 50 per cent of energy consumed will come from road transport alone. For this reason, the integrated package of measures in this sector should be aimed at drastically reducing the rate of growth of GHG emissions from road transport in the future. As transit services are an important source of revenue, since independence the government has given priority to infrastructure development of the large transit highways and this may explain in part why adequate funding and attention have not been given to upgrading the local road systems that are accounting for an increase in GHG emissions.

57. The National Transport Development Program was formulated in 1995 by the Ministry of Transport, for development of the transport sector by 2010 as part of the harmonization plans for

[8] "CO_2 emissions from fuel combustion" (2001 edition), OECD/IEA, Paris 2001.

accession to the EC.[9] The main objective of this programme was to improve the public transport network, including highway construction, road repairs, and rural road development, and the development of transport legislation and regulations in keeping with those of the EC. Funding for the programme is provided from the state budget, private companies and foreign assistance. Some key measures of the programme specifically targeted to reduce GHG emissions include the Law on Excise Tax on Oil Products; stricter control of technical standards in old vehicles; improvement in public transport and promotion of environmentally friendly transport (public transport and bicycle routes); and the reduction in fugitive emissions from gas pipelines. These measures were introduced in 2000 and for this reason their impact on GHG mitigation is not presented in the NC3.

58. The Law on Excise Tax on Oil Products was introduced in November 1997. It establishes tax rates for different oil products (heavy fuel[10] 4 LVL/litre and diesel 0,13 LVL/litre in 2000). The law also makes provision for reducing taxes by 0.02 LVL/litre on fuels spiked with bioalcohol (see para. 62). In an effort to promote a shift from heavy fuel to natural gas, the government proposes an increase in tax on heavy fuel to 6 LVL/litre by 2002 and to 7 LVL/litre by 2007.

59. Strict control of the technical standards for all vehicles was introduced in 2000 with the introduction of regulation No. 2 of the Ministry of Transport on "The Technical Condition of Transport Vehicles and State Technical Inspection". The regulation was amended in 2001 and will regulate, among other technical parameters of engine efficiency and soundness, the emission of exhaust gases including N_2O, NO_X and CO.

60. The policy to improve public transport and promote environmentally friendly transport by introducing bicycle routes is considered as a major and challenging step for improving the congestion problems in transport as well as for reducing GHG emissions. Improvement of the public transport system includes renovation of the bus fleet, expansion of the tram fleet and network and construction of bicycle routes in central Riga. The bicycle transport project in Riga began in 2001, with cooperation from the government of Denmark, and the Riga City Council estimated a 5–8 per cent reduction in emissions from cars annually as a result of this initiative. It should be noted that, to date, land-use planning and transport planning have not been interlinked.

61. In keeping with EC standards, a regulation on "Environmental Quality for Fuel Filling Stations, Oil Storage Facilities and Mobile Fuel Tanks" was introduced in 2000 whereby such installations must be equipped with vapour and gas recovery systems. At present, only 5 of the 61 oil storage facilities are equipped with these collecting devices. Complementary to this regulation is the introduction of the European benchmark for NMVOCs, which is expected to reduce emissions of these gases from storage of fuel and from stationary sources such as large petrol stations and large fuel terminals at the ports by 50 per cent in 2010 compared to 1990. The cost of introducing these changes is borne by the owners of the installations.

62. Natural gas storage capacity in 2001 was 4 billion m^3, and 1.3 billion m^3 of gas per year is delivered through the pipeline network. Between 1995 and 2000, CH_4 emissions from gas pipelines and underground storage sites amounted to 2.8 Gg. The gas supply company, Latvijas Gaze, adopted a "Planned Investment Program 2002–2005" for continued modernization of the gas storage and gas pipeline system, given that the volume of gas delivered is expected to increase by 20 per cent between 2000 and 2005. A reduction of fugitive emissions of CH_4 from gas pipelines and gas storage facilities is expected as a result of these measures.

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[9] By 2010, Latvia expects to adopt the European Transport Plan of the EC.

[10] It should be noted that heavy fuel is not used for transport.

63. The Ministry of Agriculture promotes the production of alternative motor fuels (biofuels such as biodiesel and bioethanol) as a CO_2 mitigation option. One pilot project producing biodiesel from rapeseed, run by a private company, produces 2,500 tonnes of fuel/year, which is sold to five fuel stations close to the factory. During the review, the national programme "Production and Use of Biofuel in Latvia" was being formulated. The programme will oversee the production and use of biofuel in Latvia until 2010, and includes the production of bioethanol and biogas from manure for small-scale co-generation plants and for transport. The Government will provide a subsidy of EUR 25/hectare for rapeseed farming as an incentive to encourage the production of biofuels. Latvian experts noted that the success of this programme will depend on the future market for biofuels, which is still small, and government incentives for promoting these fuels.

E. Industry

64. Industry is an important sector for GDP growth in terms of the added value of products for export. In spite of an increase in industrial output after 1996, emissions from the sector declined by 82 per cent between 1990 and 2000 as a result of fuel switching from coal to natural gas and improved energy efficiency in processes. The main sources of emissions in this sector are the production of cement, lime, steel and chemicals.

65. The main policy driver in this sector is the introduction of the "Environment Management System and Clean Manufacturing Practice" pursuant to ISO 14001 requirements. Since 2001, with funding from the Danish Agency for Trade and Industry, industrial enterprises in Latvia have participated in the programme "Environmental Management in Eastern Europe" through which they receive their ISO 14001 certificates. Within the programme industries are required to manage all resources (raw materials, fuels, chemicals) in accordance with established environmental indicators. Notable successes have been achieved in the chemical and pharmaceutical industries.

F. Agriculture

66. The share of agriculture of GDP in 2000 was 4.6 per cent, compared to around 21 per cent in 1990. Agriculture production has been declining on average by 12 per cent annually since 1997, but in 2001 for the first time agricultural output increased by 3.9 per cent compared to the previous year. The initial decline was attributed to a decrease in the competitiveness of agricultural products on the domestic and foreign markets. As a consequence, fertilizer use, animals reared and crops harvested declined and GHG emissions from the sector decreased by 67 per cent between 1990 and 2000. In 1990 the sector contributed 47 per cent to total emissions but in 2000 its share fell to 16 per cent (8 per cent of which came from soils) Most of the reduction was due to a drop in fertilizer use (by 90 per cent in 10 years) reducing N_2O emissions, and a drop in livestock affecting CH_4 emissions.

67. The main policies for the development of the agriculture sector are included under the Law on Agriculture, the Concept on the Development of Agriculture and annual development programmes for agriculture. There are no special measures for GHG mitigation in the sector. However, as a result of sustainable and competitive agricultural practices, there is a collateral benefit of reduced GHG emissions. These practices are part of the EC accession package under its agro-environmental scheme. They include organic farming and good agricultural practice, by means of which N_2O emissions from the use of organic fertilizers and from soils could drop. In 2001 there were 269 farms practising organic farming methods; a significant growth in the number of such farms is expected by the time Latvia accedes to the EC. However, SAPARD, which includes the improvement of rural infrastructure and marketing of agricultural and fishery products, could result in increased agricultural activities and hence more CH_4 and N_2O emissions.

G. Forestry

68. Forests are an important resource in Latvia. In January 2001, forests occupied 2.9 million ha, which is 44.4 per cent of the total land area. Forest land has expanded in the past decade as agricultural lands (arable lands and pastures) have been converted to forests. The total growing stock in 2000 was 544 million m^3 and the gross annual increment was 16.3 million m^3. About half of the forest area is owned by the state, 43 per cent by private landowners and the rest by agricultural enterprises. Annual forest harvesting between 1993 and 2000 grew from 4.8 million m^3 to 11 million m^3, and for this reason the sink capacity of forests has been reduced by more than 50 per cent.

69. The main objective of the Latvian Forest Policy, which was adopted in 1998, is the sustainable management of forest and forest land. In 2000 the Forest Law and the State Forest Service came into force, as part of the harmonization to EC policies in the sector. The policy also stipulates the preservation of biological diversity, productivity and reproduction capacity that meets the integrated ecological, social, economic needs of current and future generations. The goal of the policy is to increase the share of forest land to 48–52 per cent of total Latvian territory during the next 20–25 years, and at the same time to increase its CO_2 removal capacity. The Forest Law is intended to ensure that forest holders regenerate the forest stand no later than 3 years after felling.

70. Afforestation and increasing productivity of forests are identified in the NC3 as promising measures. Some 580,000 ha of agricultural land are estimated to be abandoned by 2020, and targeted afforestation of this land in 2002–2006 would result in the removal of 300 Gg of CO_2. This activity is already being implemented as part of SAPARD programme. Forest coverage is expected to increase to 50–55 per cent of total land area by 2010.

H. Waste

71. Waste management has been recognized as the most important environmental problem in Latvia. Although emissions from waste accounted for only 13 per cent of total GHG emissions in 2000, these emissions more than doubled between 1990 and 2000. This can be attributed to an increase in the generation of waste over the decade. About 700,000 tonnes of waste was generated in 2000, of which 500,000 tonnes were from households. Waste collection services are available to only about 60 per cent of residents and only 50–60 per cent of waste produced is collected and transported to landfills. In 1998 there were around 550 operating landfills, about two-thirds of which were smaller than 2 ha, 160 closed landfills and no waste incineration facilities.

72. The national municipal solid waste management strategy for 1998–2010 was adopted in 1998 and was followed by the policy framework of the National Household Waste Management Program "500", and other related documents. These establish priorities to prevent waste production, reduce waste volumes, recover and recycle waste, utilize waste for energy production, limit illegal dumping and safely dispose of waste not suitable for recycling or energy production. The strategy aims to have only 10–12 landfills, with gas collection for energy use, for the whole of Latvia by 2010. The potential for household waste recycling in Latvia is limited, and only small pilot projects are in place. Because of its high costs and the low purchasing power of the public, waste incineration is not considered as a viable option.

73. Under the strategy, two crucial measures are established. The first is to reduce the amount of waste, and the second to generate biogas from landfills and use it for energy production. Other options include recycling of glass, hard plastic containers, polyethylene products, paper and paper scrap, car tyres and metal scrap. The Latvian Environmental Protection Fund organizes tenders to receive state subsidies for enterprises. The project has already started and already 1.8 million m^3 of biogas have been captured, but the potential production capacity is estimated at 170 million m^3 per year. There are two projects to

generate energy from this biogas, by installing power generators with a total capacity 6.3 MW by 2005, and this will achieve an annual reduction in GHG emissions of more than 300 Gg of CO_2 equivalent.

74. The Law on Waste Management was introduced in 2000, and a national plan for waste management was developed in 2001. The aim of the plan is to continue existing programmes to (i) improve water and wastewater services in nearly 500 municipalities and waste management countrywide through programmes closing more than 800 dumpsites, (ii) create a collection system and final disposal facility for hazardous waste, and (iii) monitor improvements in air quality. Nevertheless, environmental protection issues remain – for instance, waste management services are still available to only 20 per cent of the population of the countryside, and wastewater collection and treatment services are available to only 77 per cent of the total population. In addition, although much water-borne pollution has been curbed, non-point-source pollution remains an issue, and Latvia is planning to participate in a regional Baltic Sea Project to be supported by the Global Environment Facility (GEF).

IV. PROJECTIONS AND THE TOTAL EFFECT OF POLICIES AND MEASURES

75. Several institutions prepared projections in the NC3, with coordination by the LEA, under the supervision of the MEPRD. Emissions for the agriculture sector were prepared the Ministry of Agriculture, the Forestry Department provided the projections on LUCF and the Ministry of Transport prepared the outlook for this sector. The Structural Policy Department of the Macroeconomic Analysis and Prognoses Division of the Ministry of Economy prepared macroeconomic data used for the projections in the NC3. GHG emissions were calculated by a sub-team of the Inter-ministerial Working Group (IWG) which oversees the preparation of projections. They used the energy output from the MARKAL model and emission coefficients, either default IPCC values or national factors. The LEA provided inventory data and emission factor estimates to ensure consistency between the inventory and projections data.

76. Different estimation methodologies were applied to each sector. The projections are based on economic model simulations, and the results from these (economic growth, price levels, etc.) are fed into an energy system model simulation. The economic projections are based on a general equilibrium model (GEM), which is run by the Ministry of Economy. Energy projections are based on the energy systems model MARKAL, a dynamic linear programming model which is maintained by the LDA (a branch of the Ministry of Economy). Projections in the LUCF sector were made using a model developed by the Latvian State Forest Science Institute "Silava" using the database of the Forest Fund and expert judgement.

77. In general, the projections in the NC3 follow the reporting guidelines. The projections cover all gases and sources as well as LUCF. For HFCs and SF_6 only potential emissions are presented, but their quantities are quite small. The projections section documents in great detail the activity data forecast for the major sectors and activities, for primary energy supply and demand and energy balances for 2005, 2010, 2015 and 2020. However, as with the inventories, emissions from soils have not been included because of a mismatch in soil classification between the Latvian and the IPCC methodologies. The review team was informed that a project is planned to change the Latvian soil classification to that required for the UNFCCC inventory. Projections of international bunkers were not presented in the NC3.

A. Scenario definitions and key assumptions

78. The NC3 presents two scenarios – a baseline scenario "without measures" and a "with measures" scenario. The Latvian expert explained that as the Kyoto target has already been met, a "with additional measures" scenario is considered irrelevant at this time, and was therefore not included. The baseline scenario includes measures that have been implemented since 1995 as well as those approved in 2001 but

not yet implemented. A set of specifically identified measures was designated to the "with measures" scenario. However, the review team noted after discussion with the projections experts that the baseline scenario does, in fact, include some PAMs that have been planned but not yet been implemented.

79. The assumptions for future trends of key variables are reasonable, well formulated and presented in detail in the NC3. Population is assumed to decrease by 8.8 per cent by 2010 largely as a result of migration. Macroeconomic variables are derived from the Long Term Economic Strategy prepared by the Ministry of Economy. Growth is assumed to continue at its current rate without any profound financial or economic shocks. Growth rates in GDP are assumed to be medium to high (5–6 per cent) between 2006 and 2010, and 3–5 per cent by 2020. The industrial and service sectors are expected to maintain a steady rate of growth of between 4.6–5.8 per cent and 5.5–6.5 per cent respectively till 2020. Agriculture output, which declined in the 1990s, is projected to grow by 2.5 per cent between 2001 and 2005 and thereafter by an average of 4.3 per cent until 2020. These macroeconomic scenarios also assume a modification in the national taxation system for energy carriers and of technical characteristics of energy conversion installations as required for accession to the EC, and that Latvia accedes to the EC no later than 2010.

80. Energy projections are directly linked to economic development whereby long-term macro-economic growth rates are used to forecast the demand for energy. The "with measures" scenario for the energy sector takes into account several policies, mainly on energy efficiency improvement (exogenous and implied trends), as well as an increase in renewable energy sources in the energy balance. Projections of fuel consumption in transport are based on fuel consumption trends between 1990 and 2000. The EC directive on labelling of appliances, which has already been introduced in Latvia, was also included in the forecast.

81. Emissions from agriculture were based on projected data on the production of agricultural products. They also include the policies contained in the SAPARD rural development programmes, mentioned in chapter III of this report. As the effects of the Common Agricultural Policy on Latvia are still not fully studied,[11] they were not included in the projections. In the LUCF, it is assumed that forests will increase by 3.4 million ha by 2020, with no change in the distribution of the dominant tree species. Expansion of forest land through afforestation will increase and the productivity of forests will remain constant.

82. As far as possible, the models have taken into account current, pending and planned policies and measures. In that sense the projections are overall consistent with the current, impending and planned policies. The GHG emission reductions generated by sectoral measures are shown in table 5.

Table 5. Emission estimates by sectors, 2000–2020

	Gg CO_2 equivalent				
Measures	**2000**	**2005**	**2010**	**2015**	**2020**
Energy transformation	–210.3	–21.6	–20.5	–22.8	–25.4
Transport	NE	–93.4	–148.7	–234.1	–486.9
International projects	NE	–16.6	–12	–12	–12
Land use change and forestry	2.7	–7.8	–14.8	–14.8	–14.8
Waste management	NE	–298.6	–296.7	–238.1	–224.5

Source: Third national communication of Latvia.
NE = not estimated.

B. Projected emission trends

83. Projection of the three main GHG gases (CO_2, CH_4 and N_2O) are presented in figures 6 and 7. Projected emissions of HFC and SF_6 are presented in table 6. In the LUCF sector, CO_2 sequestration is expected to increase in spite of a decline between 1999 and 2000. After a dramatic decrease in emissions

[11] There are many uncertainties associated with the full effects of the CAP on the agricultural sector in Latvia.

of the three main GHG gases in the 1990s, GHG emissions start increasing after 2000, but all gases continue to be well below their 1990 levels and below the Kyoto target. A similar trend was presented in the NC2, although the projections in the NC3 differ significantly from those in the NC2 as a result of the application of higher economic growth rates and much stronger energy coefficients for efficiency improvements. This has resulted in a significant reduction in projected GHG emissions for 2005 and 2010 compared to those presented in the NC2.

Table 6. Potential emissions of HFC and SF_6, 2000–2020

	kg				
	2000	**2005**	**2010**	**2015**	**2020**
HFC	NA	NA	2 287	8 500	9 200
SF_6	0.86	1.6	2.4	3.0	3.2
Total	**0.86**	**1.6**	**2 289.4**	**8 503**	**9 203.3**

NA = not available.

Figure 6. Percentage GHG trends by gas, 1990–2020

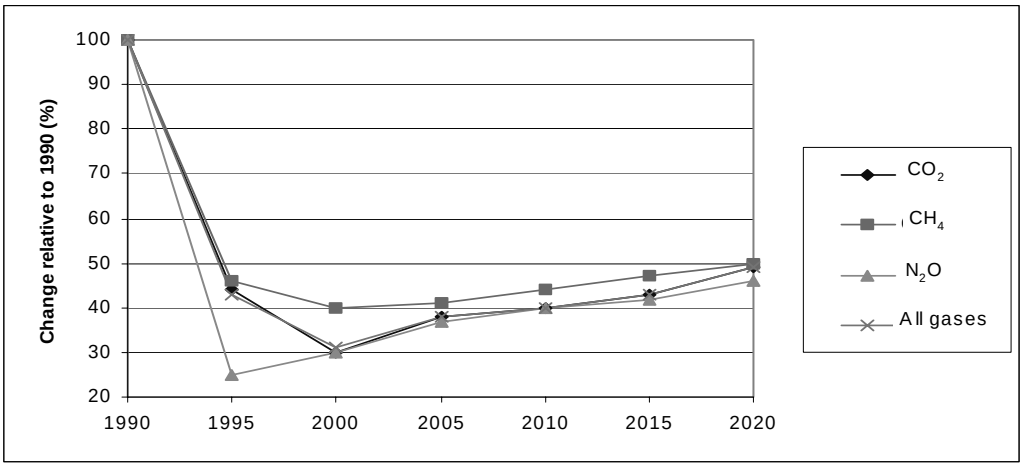
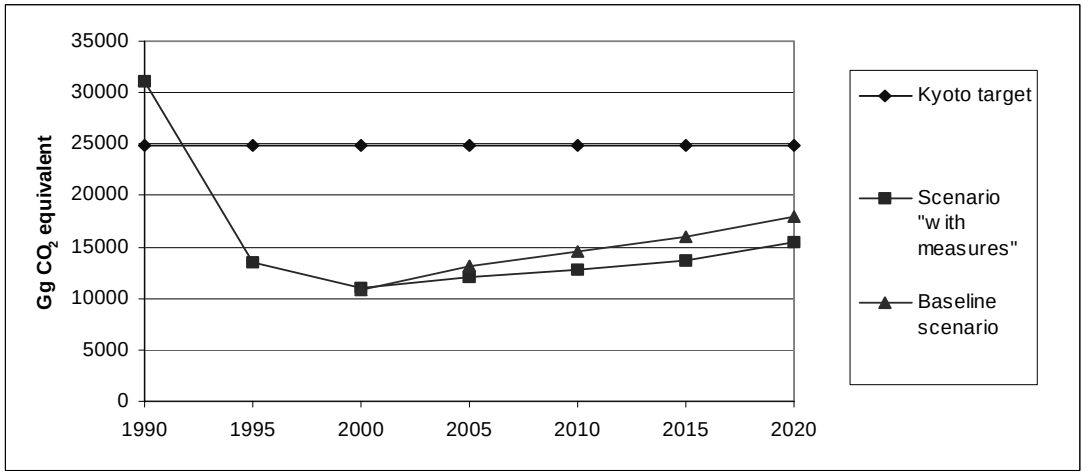


Figure 7. Comparison of GHG emission scenarios



84. The baseline scenario has been presented only for comparison. It is based on the assumption that no new PAMs would be implemented and that the share of coal, peat and oil in primary energy would increase.

85. The sensitivity of projections to changes in key variables was not presented in the NC3. Experts explained that the sensitivity analysis was not included as a result of the uncertainty in inventory data (waste, soils, transport, tree growth) and in policy implementation (effectiveness of policies, interference with other policy areas, including EC regulations) as well as the need to recalculate data in the inventory time series 1990–2000.

86. HFC emissions are generated in the production of cooling equipment. As this equipment is not produced in Latvia, potential emission estimates are based on its importation. SF_6 is found in high-voltage equipment used by the Latvian power company, Latvenergo. The company plans to replace all high-voltage equipment by 2010, so the projections assume an increase of 500 kg per year by 2010 but thereafter this amount will decrease as vacuum switches replace the old switches.

C. Overall evaluation of GHG emissions projections

87. The projections presented in the NC3 have substantially improved compared to the NC2. All major GHGs were covered in the NC3, and in spite of the discrepancies in data in the inventories, these were used as the basis for the projections. The projections experts explained that the distinctions between the definitions "baseline" and "with measures" are not very easy to identify in Latvia, especially in the absence of a comprehensive and concrete climate policy strategy. Despite these problems, the review team encouraged the IWG to play a more active role in providing clear guidance at an early stage of the definitions of the concepts "baseline" and "with measures" contained in the reporting guidelines; providing generic, overall consistent, guidelines to all institutes making projections; overseeing the compliance of the projection methods and presentation in accordance with the reporting guidelines; and filling in the few remaining gaps in inventories and projections while ensuring overall consistency and presentation (format) between the inventory and the projections.

88. The review team also noted that the application of the MARKAL model as an analytical forecasting tool has improved considerably since the preparation of the NC2. The national team working on the model has made a tremendous effort in presenting estimates for the energy sector. The review team strongly recommends the use of the MARKAL model for calculation of future emissions related to energy use. More detailed information on the GEM in the NC3 would have increased the understanding of the macroeconomic scenarios presented.

89. Further development work for both models and their interaction is still needed to ensure consistent approaches, for example in assessing the financial aspects of investments and financial decision variables in MARKAL, and in dealing with the availability of data for simulating a small economy in transition using a complex GEM. The former is important in order to be able to check on realistic investment portfolios and to take unfinished amortization of existing capacity into account. The latter means that the small size of the Latvian economy, together with the need to disaggregate between sectors in order to be meaningful in a climate policy context, limits the applicability of standard GEM procedures. Also, the interaction effects between measures and feedback into the economic model should be considered in future iterations.

90. Projections of emissions from waste deposits or waste (water) treatment were included in the NC3. However, the high uncertainty of activity data for waste and the partial implementation of the waste policy call for caution in the interpretation of projected emission levels and future trends of CH_4 generated from waste. The review team noted that MEPRD is working diligently in putting a comprehensive waste policy in place and developing an adequate information and assessment framework for policy support.

91. In the transport sector, the review team is of the opinion that the projections for transport emissions may need to be revised, as activity data for the inventory base year are highly uncertain. The

deficiencies in the observations of inland transport fuel sales and the lack of in-depth knowledge of the driving forces fuelling growth in car ownership and car use give rise to projected emissions that have very large uncertainty ranges.

92. During the in-depth review more insights were provided on the details involved in preparing the projections and the quality of the data used. For example, in the case of industrial processes, LUCF and waste, the NC3 does not provide sufficient details on the disaggregation of these sectors and the impacts of policies and measures on reducing GHGs. Unfortunately, for LUCF and waste, the incompleteness of the basic data limits the usefulness of the projections. For the measures under the "with measures" scenario, the attribution of effects to measures is self-evident and very well presented. This was not the case for the baseline scenario. The review team strongly encourages the analysts and the IWG to adopt a policy analysis framework that ensures the ability to connect the principal results to key input variables, including both assumed exogenous trends and changes due to policies, and to apply a reporting format in which such a clarification is a default feature. The review team believes that this is important not only for added transparency of the NC3, but also to determine the effectiveness of policies in terms of cost-effectiveness of measures.

93. Both models currently used, MARKAL and GEM, enable the policy analysts to assess the effectiveness of single measures (direct cost-effectiveness by means of MARKAL) and of policy packages (national economic impacts and macroeconomic cost-effectiveness by means of GEM).

94. Projected data show that, similarly to the trend in the 1990s, the energy intensity per unit of GDP will continue to decrease by 2020, even though total primary energy consumption will start to grow soon after the year 2000. The changes in the projected energy mix presented in the NC3 imply, however, that without extra policies the economy could become substantially more carbon intensive with an increase in the use of oil and oil products.

95. In addition, electricity consumption could be considerably larger than projected, especially after 2005. By then most of the potential savings on household equipment will have been realized whereas the penetration of other domestic appliances with significant annual consumption (tumble dryers, dishwashers, more diversified illumination, electric cooking ranges) will start to take off; also electricity use in services may grow at a higher pace (compared to the sector's growth in value added) than assumed in the simulations presented in the NC3. Conversely, delivered energy for thermal applications in buildings (both services and households) could grow less than projected, if policies to exploit energy efficiency are intensified; the current baseline seems rather pessimistic about the default improvement of energy efficiency in buildings.

96. Trade in emissions permits and green certificate trade policies have not been taken into account in either the baseline or the "with measures" scenario. The review team admits that up to the end of 2001 there was still considerable uncertainty about the actual significance of these options in Europe. Technically speaking their absence does not make the current scenario inconsistent. However, the likelihood that both systems will play a significant role and represent substantial sales potential for Latvia is increasing by the day. Consequently, provided that Latvia approves participation in at least one of the systems, their position as key factors in the upcoming climate strategy should be assessed on their economic, social and ecological merits for Latvia. For clear guidance at concrete operational levels, it is of paramount importance that the MARKAL/GEM tools are used for such an assessment to obtain clarity about direct cost-effectiveness at project/measure level and overall macroeconomic cost-effectiveness, and thereby to prioritize measures accompanied by the right dosage of instruments. The NC3 has functioned as a useful exercise in this context, but in all likelihood Latvia's entry into the EC and the introduction of EC and other trading systems, as well as possible changes in the power supply system in the future, imply that the projections presented in the NC3 have a short practical lifetime.

V. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

97. The coverage of vulnerability and adaptation in the NC3 follows the reporting guidelines and is much more comprehensive than in the NC2. An executive policy committee provides policy direction and approval of projects, and a Technical Committee of Science Advisors makes recommendation on proposals and other technical advice. The Latvian Research Council (LRC) oversees most of the efforts on adaptation to climate change. The NC3 explains in detail Latvia's vulnerability to climate change. Studies show that mean annual temperature in Riga has risen by 1ºC in the past 100 years. Scientists have linked this change to urban environmental effects. Studies have also shown that in the future, effects of climate change could be that the period of snow coverage would become shorter, the vegetation period would be longer, rivers would have varying through-flows and distribution of precipitation would change.

98. Sea level in Latvia's lowest coastal zone (Riga Bay) may rise by 50–70 cm, and this may result in relocation of settlements in the coastal zones which lie 0.7– 2 m above sea level. There is a high risk of flooding in the lower parts of the large rivers such as the Lielupe, Daugava and Gauja.

99. In the absence of specific studies, the scientific community estimates that agriculture and forestry are the most vulnerable to climate change. At the moment, the effects on climate change on coastal zones and on vegetation are the two main areas being studied. The Latvian experts noted that specific studies are planned for evaluating the extent of the effects of climate change, but these can only be conducted if funding is available. Such studies include indicators of Latvian coast sensitivity regarding climate change, based on historic data; climate changes and variability in Latvia and comprehensive analysis of influence parameters; the impact of climate on Latvian inhabitants from ancient to modern times (based on anthropological studies); the evaluation of dendrochronology studies to separate the impacts of climate changes; climate changes and their impact on the Latvian agriculture and forestry sectors; impacts of sea-level changes on silting and trade operations of Latvian ports; and the vulnerability of the Latvian west coast to climate changes, and impacts on traditional local economy and tourism.

VI. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

100. The NC3 outlines in detail projects that have been implemented under the AIJ pilot phase. To date successful projects have been reported under bilateral cooperation agreements with several countries including Denmark, Sweden, the Netherlands, Germany and Finland. These include 16 projects in new and renewable energy sources (wind and biomass), 2 projects on the rational use of fuel for co-generation in an environmentally friendly manner; 5 projects on increasing energy efficiency in transmission of energy produced from centralized district heating networks; and 5 projects for improving the efficiency of heat insulation in public buildings, including the introduction of new regulations for heating.

101. In 1992, Latvia initiated work with the Prototype Carbon Fund (PCF) of the World Bank. The review team was informed that the PCF is already operational for projects in Latvia and to date several projects have been accepted, including one for collecting and using biogas from landfills. A JI policy is under development and should be ready by 2003, and projects in forestry management have also been formulated.

102. As a country in economic transition, Latvia receives assistance from the GEF. Four projects have been developed with GEF funding: modernization of the Getlini waste landfill, the efficient lighting programme, the regional Baltic wind energy programme and a project on economically efficient use of wood waste in local government heating systems. Latvia is also involved in many EC programmes such as PHARE, SAPARD and ISPA.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

103. Since the NC2, several new studies have been conducted and their results presented in the NC3. The status of national and international research and observation activities presented was in full compliance with the reporting guidelines. Many research institutions, ministries and NGOs are involved in climate change research in Latvia. These include the University of Latvia, Riga Technical University, Latvia University of Agriculture, the Latvian State Forest Science Institute, ministries and agencies such as MERPD and the LEA, and government environmental institutions such as the Vides Projekti.

104. National researchers cited lack of funding for research as a major constraint to expanding the areas of research to include specific effects of climate change. Most of the funding is provided by state grants from the LRC, the Latvian Environment Protection Fund and Latvenergo. The governments of the Netherlands, Denmark and Sweden provide some funding for specific research.

105. Research on climate change is concentrated in several areas, including the impact of climate and climate change; technologies for GHG reduction; sea-level observation; and ice conditions in the Baltic Sea and Riga Bay. In addition to research, the NC3 mentions the development of the environment data information system by the LEA as an important achievement in making the information obtained through research available to the public.

106. Latvia contributes to international research efforts on weather conditions and climate such as the World Climate Research Programme and the World Weather Watch, where Latvian experts provide results of meteorological, oceanographic and related observations derived from the national observation network. They are also actively involved in the Baltic Sea experiment BALTEX, as well as Europe-wide studies such as PHARE and CLICOM (climate computing).

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

107. Since the NC2, many important initiatives in education, training and public awareness of environmental issues in general have been introduced. The most noteworthy was the development of the Strategy on Environmental Communication and Education and Action Plan for 1998–2000 under the provisions of the Århus Convention. Its primary objective is to provide information to the general public on environmental problems including climate change, and to propose possible solutions including the role of all stakeholders in the process. It comprises several policy documents, which outline specific activities to encourage cooperation between different target groups in the society in the area of environment-related decision making. As a result of this strategy, environmental studies are now included in the curricula of primary and secondary schools as well as universities. Degree programmes at bachelor, engineer, master and doctoral level in various environmental science and management areas have been implemented in Latvia since 1992. At the moment the most active programmes focused on the study of climate change problems operate in the University of Latvia. Three of the largest universities in Latvia have included subjects that reveal and analyse the impact on climate change in their study programme.

108. In schools, each year a special week (“Olympiad”) is organized during which school students develop projects on topics related to global climate change. These Olympiads on environmental projects in Latvia have been held since 1995 and are organized by the Ministry of Education and Science in cooperation with MEPRD. Since 1998, Latvenergo has also organized annual competitions (“Vatiņš”) in the schools on the rational use of energy.

109. Environment education plays an important role in the secondary vocational curriculum. Access to environmental information, including activities resulting in climate change, is also provided through the mass media and the Internet by NGOs as well as by activities of international organizations and the

implementation of individual programmes focused on the environment. The most important web sites are those of the MEPRD (http://www.vidm.gov.lv) and the LEA (http://www.lva.gov.lv).

110. Community information actions are implemented with the assistance of state institutions and of public and non-governmental environmental organizations. The role of NGOs is crucial even though not many of them cover climate issues. Those involved organize rallies and campaigns to attract the attention of the public to climate change issues. An energy conservation campaign was implemented within the scope of the Dutch–Latvian SCORE cooperation programme. An information campaign on the labelling of household electrical appliances, as well as prepared informational material, was implemented within the framework of the Danish–Latvian cooperation programme. The introduction of compact fluorescent bulbs (CFB) in the residential sector under the Efficient Lighting Initiative programme was implemented in some rural municipalities and towns: "Days of Light" were organized where CFB were sold at a reduced price. Climate change problems are included in various training programmes, both as separate courses and as topics of study programmes.

IX. CONCLUSIONS

111. National GHG emissions in 2000 were well below 1990 levels. Under the Kyoto Protocol, Latvia is to decrease GHG emissions by 8 per cent between 2008–2012 relative to 1990 levels. It is clear that Latvia will have no difficulty in meeting its commitments under the Protocol. Since the 1990s, as a result of deep restructuring of the economy and the introduction of market forces as well as the introduction of effective PAMs, Latvia has achieved a reduction in total GHG emissions, which fell from 31 Tg CO_2 equivalent in 1990 to 11 Tg in 2000, excluding LUCF – a 65 per cent reduction. For this reason, Latvia has not established quantitative reduction targets under the UNFCCC, but under the Kyoto Protocol the country committed itself to reduce its total GHG emissions by 8 per cent below 1990 levels in the period 2008–2012. In 2000, GHG emissions were estimated at 17.6 Tg CO_2 equivalent below the Kyoto Protocol level. It will not be difficult for Latvia to maintain this level of emissions for the period 2008–2012. Projections presented in the NC3 show that by 2012 total GHG emission would be between 13–15 Tg CO_2 equivalent (representing a 52–58 per cent reduction compared to 1990).

112. However, the review team is of the opinion that, given the serious problems associated with data collection and verification (see chapter II), these need to be addressed to ascertain the actual levels of GHG emissions in Latvia between 1990 and 2000. In addition, economic growth is estimated to grow faster than projected in the NC3. The Latvian economy, and the transport sector in particular, is developing more rapidly than was assumed under the baseline scenario and this may result in an increase in GHG emissions from waste and transport that are higher than those assumed in the current projections in the NC3. Priority should therefore be given to data verification procedures to allow the monitoring of such developments.

113. The review team noted substantial improvements in the preparation of the NC3 compared to the NC2, in terms of compliance with the UNFCCC reporting guidelines. This has been attributed to the work done by MEPRD in collaboration with other agencies. However, the review team believes that there is a need for even closer collaboration among agencies in preparing the national communication and, most importantly, in the compilation and dissemination of data, to ensure consistency in methodologies and in data used for policy-making regarding climate change. This will add value to energy balances and emission inventory statistics and also provide indicators for better understanding of inventory trends.

114. As explained in chapter III, a comprehensive inter-ministerial umbrella programme for climate policy (targets, conditions, etc.) is not yet in place to provide a clear steering mechanism for future policy direction. A Strategy for Sustainable Development is almost now in place and a climate policy will be one of the principal building blocks of this strategy. The review team is hopeful that this strategy

document, together with the establishment of a high-level inter-ministerial working group on climate policy, will provide a sound institutional basis for the formulation of scenarios for climate policy assessment.

115. Transport emissions are growing in Latvia. Measures to control the growth of GHG emissions from transport need to be strengthened, especially in demand-side management, urban development with control of urban sprawl, and reduction of emissions from vehicles in road transport.

116. Latvia is not a large country but it has developed many international links focusing on climate measures. Latvia cooperates with many international institutions as well as with individual countries: the World Bank, GEF, the European Bank for Reconstruction and Development, EC programmes, the Netherlands, Sweden, Germany, Finland and Denmark.

117. Commendable initiatives have been taken since the NC2 in education, training and public awareness of environmental issues in general. The most noteworthy was the development of the Strategy on Environmental Communication and Education and Action Plan for 1998–2000 to include these issues in primary, secondary and tertiary levels of education.

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