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Report of the in-depth review of the national communication of Estonia

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed on by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 33 national communications from Annex I Parties was prepared (FCCC/CP/1996/12 and Add.1 and 2).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of Estonia and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary¹

1. The in-depth review was carried out between April and August 1996, and included a visit by the team to Tallinn, from 16 to 17 May 1996. The team included experts from Costa Rica, Finland, Poland and the Organisation for Economic Co-operation and Development (OECD).

2. In its first national communication Estonia did not fully comply with the approved reporting guidelines for national communications. However, a significant amount of additional supporting material on Estonia's greenhouse gas (GHG) emissions inventory, policies and measures, and projections of emissions was provided to the review team during the country visit. This additional documentation shows that Estonia now has much of the information requested in the reporting guidelines, and is continuing to work towards improvement of the information provided in the communication. In preparing its national GHG inventory, Estonia has followed, as far as possible, the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (1994) and has initiated work, with the assistance of the United States Country Studies Program, to develop data using the IPCC standard tables and worksheets.

3. In its national communication, Estonia provided information on objectives and strategies for policies and measures which will eventually help to reduce GHG emissions and enhance sinks. Owing to its transitional circumstances, Estonia had not implemented policies and measures to reduce greenhouse gas emissions and enhance sinks at the time the national communication was submitted, and did not present a projection of emissions. The review team was given information on carbon dioxide (CO₂) emission scenarios that have been subsequently developed by Tallinn Technical University; the model is not disaggregated by sector. No information was included in the national communication on research, education, training and public awareness. During the review, the team was informed that since the national communication had been submitted, a vulnerability study of the country had been prepared according to which climate change is expected to increase food production and reduce consumption of energy for heating.

4. Emissions of GHG in 1990 were estimated at 46,479 Gg using IPCC 1994 global warming potential values (GWP), with CO₂ amounting to 37,797 Gg, methane (CH₄) 323 Gg and nitrous oxide (N₂O) 2.4 Gg. CO₂ removals by sinks were estimated separately, as required by the guidelines, at 8,555 Gg per year. Calculations by the review team showed that in terms of GWP carbon dioxide accounted for 81 per cent of GHG emissions, methane for 17 per cent and nitrous oxide for 2 per cent. For CO₂, the largest emission source is fuel combustion, contributing 98 per cent of the total, within which energy and transformation contributed 75 per cent, industry and transport 7 per cent each and cement production 2 per cent. For CH₄ emissions, underground and surface oil-shale mining and operations in oil and

¹ In accordance with decision 2/CP.1 of the Conference of the Parties, the full draft of this report was communicated to the Estonian Government, which had no further comments.

natural gas distribution systems account for 67 per cent of total emissions, with agriculture contributing 19 per cent from enteric fermentation and animal waste and the waste sector about 13 per cent. Estimates of N₂O emissions are highly uncertain, with fuel combustion as the major source. The inventory data presented in the communication also estimate emissions of CO₂ and CH₄ from wetland drainage at 9,750 Gg, while CO₂ emissions from forests and land-use change amounted to about 3,400 Gg.

5. Estonia has not set any specific national target relating to emissions and removals of GHGs. Estonia expects to record a 40-50 per cent reduction of CO₂ emissions by the year 2000 compared to 1990 levels, primarily through the ongoing process of economic restructuring and removal of energy subsidies. The gradual increase of domestic energy prices towards world levels and privatization of industry led to a decline in the energy-intensive industrial sector of 40 per cent between 1990 and 1994. It is recognized that there is considerable potential for improving efficiency in the generation of heat and for conserving energy in residential buildings. Estonia has introduced measures for efficiency in energy production and conservation, and additional measures are planned. The number of road vehicles is expected to continue to increase as incomes rise, but the effect of this increase on greenhouse gas emissions could be partly offset by the improved fuel efficiency of new vehicles.

6. Estonia's per capita energy consumption is now at levels similar to those of neighbouring OECD member countries but pollution levels, and the energy and carbon intensity of the Estonian economy, remain higher than in European OECD countries by a factor of two for energy intensity, and a factor of four for carbon dioxide.

7. Estonia's energy balance and greenhouse gas emissions are dominated by oil-shale, which accounts for about 95 per cent of electricity generation, one quarter of the heat requirements, three quarters of total energy-related CO₂ emissions, and two thirds of methane emissions. Oil-shale reserves are expected to last for the next 30 years. Studies are under way to seek ways of improving the efficiency of oil-shale electricity generation and less carbon-intensive alternatives.

8. Estonia has made institutional arrangements to carry out energy planning and management, which will serve to attenuate longer-term trends in GHG emissions. The scientific community and non-governmental organizations play an important part in undertaking studies and influencing environmental policy and attitudes towards sustainable development. Estonia has a commitment to reduce transboundary pollution, which will also affect emissions of greenhouse gases, and is promoting energy efficiency. Estonia has a strong tradition of forest management and conservation. Forests cover almost half the land area and the sink capacity is likely to increase despite a greater expected reliance on wood-based products and resources.

9. The review team noted that the transition from a centrally planned to a market economy has required basic changes in legislative, administrative and fiscal arrangements, as well as dramatic changes in most economic sectors, making it difficult to implement policies

and measures and to assess their effects. The statistics system has undergone major modifications, which has made it particularly difficult to prepare the inventory and projections of greenhouse gas emissions. Additionally, funding constraints make important measures, such as those to improve the efficiency of energy production and use, difficult to implement. It was noted that the Government of Estonia is reviewing the data reported in the national communication and intends to include additional information on policies and measures and projections of emissions in its next communication.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

10. Estonia ratified the Convention on 27 July 1994. Its national communication was received by the secretariat on 6 May 1995.

11. The in-depth review of the national communication was carried out between April and August 1996 and included a visit by a review team to Tallinn from 16 to 17 May 1996. The team included Ms. Patricia Ramirez (Costa Rica), Mr. Seppo Oikarinen (Finland), Mr. Edward Radwansky (Poland), Ms. Fiona Mullins, (Organization for Economic Co-operation and Development) (OECD), and Mr. Mukul Sanwal (UNFCCC secretariat, Coordinator). In the course of the visit the team met representatives of ministries concerned with climate change issues and members of the scientific and academic communities, as well as representatives of non-governmental organizations.

12. The Republic of Estonia covers an area of 45,215 sq km to the east of the Baltic Sea, including the two large islands of Saaremaa and Hiiumaa. It has a coastline of about 3,794 km, characterized by numerous bays, straits, and islets. Estonia has a temperate continental climate with high levels of precipitation. It is a lowland country, with agricultural land covering 25 per cent of the territory (half under annual or perennial hay), and wetlands (fens, bogs, swamps) covering approximately 22 per cent of the territory, most with peat layers more than 5 metres thick. Estonia has a population of 1.5 million inhabitants. Over half of the population is concentrated in five urban zones, with one third of the urban inhabitants in Tallinn and the surrounding area. Tallinn produces 60 per cent of Estonia's gross domestic product (GDP).

13. Estonian forests are mixed, with conifers covering two thirds of the forest area. Estonia has a tradition of extensive silviculture, afforestation of agricultural land and reforestation of drained wetlands and phosphorite and oil-shale quarries. Forests at present account for 47 per cent of the land area. The forest area has more than doubled in the last 50 years, and grew by 5 per cent between 1990 and 1994.

14. Estonia has the world's largest exploited deposits of oil-shale (3,800 million tonnes) on its northern coast. Based on current extraction levels, the reserves are sufficient to cover Estonia's electricity and heat needs for the next 30 years. Estonia also has large deposits of peat (560 million tonnes), limestone (300 million tonnes) and phosphorite (260 million tonnes). Mineral and forest resources have been, and will continue to be, the basis for the

national economy. Estonia is the only country in the world with an electric power generation system based almost exclusively on oil-shale. Estonia is also heavily reliant on oil-shale and other fossil fuels for residential heating. Oil-shale has a low net calorific value and emits higher levels of carbon dioxide per unit of energy than other fossil fuels (up to 25 per cent in flue gases), and also has environmental disadvantages such as lowering the groundwater level and producing large quantities of ash. With the discontinuation of energy subsidies and the resulting increase in domestic fuel prices and decrease in energy imports, relative dependence on oil-shale has increased.

15. Prior to 1991 Estonia specialized in electricity generation, producing 17 TWh in 1990, half of which was exported to Russia and Latvia. Emissions of greenhouse gases (GHGs) decreased substantially between 1990 and 1994 with the fall in electricity and heat production of about 30 per cent, and the collapse of energy-intensive industries such as chemicals and pulp and paper following the increase in fuel prices. The prices of imported fuels have risen very sharply since 1991 (within 18 months, the price of natural gas rose by more than 700 per cent, heavy fuel oil by about 450 per cent, and gasoline and diesel oil by 150 per cent). Prices of oil-shale and electricity are controlled by the Government at a level sufficient to cover operating costs but not to cover normal capital investment and maintenance. Between 1990 and 1994 the consumption of primary energy dropped by 40 per cent, domestic electricity consumption by 30 per cent and heat consumption by 50 per cent, and imports of fuels declined by 60 per cent. Consequently, emissions of carbon dioxide (CO₂) dropped by 45 per cent, sulphur dioxide (SO₂) by 40 per cent and nitrogen oxides (NO_x) by 30 per cent. Energy demand, and GHG emissions, now appear to be increasing gradually with the economic recovery.

16. Since 1990, the share of agriculture in the economy has declined and emissions of methane (CH₄) and nitrous oxide (N₂O) have decreased by over 40 per cent. Most agricultural activities have been decreasing because of the restructuring of farm production, privatization of land, loss of traditional markets in the former Soviet Union, and increased prices of fuel and fertilizers. According to available statistics, between 1990 and 1995 the total land area used for agriculture decreased by 16 per cent, there was a 55 per cent reduction in the number of cows and a 52 per cent drop in the number of pigs. Between 1990 and 1994 the use of inorganic and organic nitrogenous fertilizers decreased by 50 per cent.

17. Estonia has initiated major political and economic reforms in its transition to a market economy. Manufacturing output and GDP fell sharply over this period, but the growth of GDP since 1995 indicates that the economy is recovering. In particular, the services sector is growing rapidly. Both the reduction in GDP and the change in its composition have contributed to the reduction in emissions of GHGs. It is likely that, if the economy continues to recover, emissions will increase but they are not expected to exceed the 1990 levels until at least the year 2010.

18. Privatization of small business was virtually completed by the end of 1994. That of medium-sized and large enterprises still has to be completed; 30 per cent of Estonia's physical output is still produced by state-owned enterprises, including electricity, oil-shale mining, chemicals and engineering. Most district heat boilers (which represent the largest energy end-use in Estonia) and distribution systems are owned by municipal governments. At present, the lack of individual apartment heating meters makes it impossible to bill householders accurately for the services they use.

19. Estonia has adopted a number of framework environmental laws since 1990 that provide a basis for policies to be implemented in the future. The new Constitution of the Republic of Estonia, approved in 1992, states that everyone has a duty to preserve the human and natural environment and to compensate for damage caused to the environment. The Sustainable Development Act (1995) specifies guiding principles and requires a national energy programme to be drawn up in order to balance economic activities with environmental needs. A commission on sustainable development was established in early 1995 but its functions are yet to be defined. The adoption of the concept of sustainable development within Government is a major step in ensuring that environmental concerns are integrated into economic sectors. A national environmental strategy and a national environmental action plan are under preparation. Estonia has signed an Association Agreement with the European Union, and efforts are under way to develop legislation and criteria which would correspond to those used within the European Union.

20. The Ministry of the Environment, established in 1989, is responsible for implementing the Framework Convention on Climate Change. Implementation of policies, environmental monitoring, and control also involve the regional environmental departments in 15 counties and the cities of Tallinn and Narva, the Institute of Meteorology and Hydrology and the Environmental Information Centre. The Ministry of the Environment has created mechanisms for inter-ministerial cooperation through informal working groups between ministries. The team recommends that key deliberations of these working groups be reported in the next communication.

II. INVENTORY OF ANTHROPOGENIC EMISSIONS AND REMOVALS

21. The preparation of the inventory is the responsibility of the Institute of Ecology. The review team was informed that, since the presentation of the first national communication, Estonia has prepared more detailed estimates of the greenhouse gas emissions in each sector. This inventory is being prepared with the assistance of the United States Country Studies Program and presents Estonia's GHG emissions in the Intergovernmental Panel on Climate Change (IPCC) standard tables and worksheets.

22. The emission inventory being prepared at the time of the visit was drawn up using the IPCC methodology and covered all gases included in the IPCC guidelines. The IPCC default emission factors were used except for oil-shale, which was calculated as 29.1 tonnes of carbon per terajoule; there are no default emission factors for oil-shale in the IPCC guidelines

(oil-shale not being exploited in any countries other than Brazil, China, Estonia, and Romania). In the case of oil-shale oil combustion the IPCC emission factor for residual fuel oil was applied.

23. GHG emissions in 1990 are now estimated at 46,479 Gg of CO₂ on a global warming potential (IPCC 1994) basis, and removals of CO₂ by sinks are estimated separately, as required by the guidelines, at 8,555 Gg. Total GHG emissions by sector were not presented in the national communication, but were submitted to the review team during the country visit.

24. Calculations by the review team showed that carbon dioxide accounted in 1990 for 81.3 per cent of GHG emissions, methane for 17 per cent and N₂O for 1.7 per cent. For CO₂ emissions excluding the forests and land-use sector (37,797 Gg), the largest source was fuel combustion, with the energy and transformation sector contributing 75.3 per cent, industry 7.7 per cent, transport 7 per cent, and cement production 1.6 per cent. For CH₄ emissions (323 Gg) underground and surface oil-shale mining and operations in oil and natural gas distribution systems accounted for 67 per cent of total 1990 emissions, with agriculture contributing 19 per cent from enteric fermentation and animal waste and the waste sector about 13 per cent. Estimates of N₂O emissions (2.4 Gg) are highly uncertain, with fuel combustion as the major source. Emissions of gases from fuel combustion and from land use were estimated to be: carbon monoxide (CO) about 185.8 Gg, nitrogen oxides (NO_x) 94.4 Gg and non-methane volatile organic compounds (NMVOC) 22.9 Gg. These results must however be treated as preliminary. No information has been provided on emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

25. From forests and land-use change, carbon dioxide emissions in 1990 were estimated in the national communication at 3,399 Gg, and removals at 11,347 Gg. Emissions from biomass burned for energy use are included in the energy sector data. Removals of CO₂ by the forest sector, including changes in land use and removals from areas abandoned as managed lands and converted to forests, have now been calculated at about 8,555 Gg of CO₂. The inventory estimates being developed indicate emissions of CH₄ from forest conversion (605 Gg) and wetland drainage (9,746 Gg), giving total emissions of 10,351 Gg. The review team encouraged Estonia to continue to refine data on emissions and removals in the forest and land-use sector.

26. The inventory was prepared using a top-down methodological approach based on aggregate fuel consumption data for energy sector emissions. Data on specific activity levels of most sources are not yet available. The review team recommended that emissions from other industrial sectors (for example, the pulp industry), the use of solvents (which is low) and agricultural waste be included in the next communication. Activity data and emission factors for the transport sector and waste landfills also need to be refined and submitted with the next national communication. Because of economic restructuring and changes in the way statistics are collected, the post-1993 data are much more reliable than those for earlier years.

27. The team was of the view that the work being done is of excellent quality, particularly that on improving the inventory. A great deal of effort is being devoted to preparing a thorough and well-documented inventory according to the IPCC guidelines. The effort is commendable particularly in view of the limited resources, problems with statistics and the rapid changes taking place in the economy.

III. POLICIES AND MEASURES

28. In its national communication, Estonia described its strategic goals and indicated possible measures that could help to reduce greenhouse gas emissions, with the emphasis on measures to improve the efficiency of energy end-use. However, because of the transitional circumstances, Estonia was not able to report any policies and measures implemented or committed to at the time the national communication was submitted.

29. During the country visit Estonia provided the review team with additional material on measures that have been implemented or will be implemented in the near future with finance from the European Bank for Reconstruction and Development (EBRD), the World Bank, bilateral assistance from other countries, and domestic funds. These resources include the rehabilitation of district heating systems, conversion of fossil fuel boilers to biofuel, improvement of energy efficiency in buildings, retrofitting of energy generation plants, and education and training. No estimates were available of the effects of these measures on greenhouse gas emissions, or on how the measures are expected to interact. Some information was provided on the degree of implementation of these measures. There has been no monitoring of the effects of measures because they are still at the planning or early implementation stage.

30. The team noted that Estonia has adopted a number of environmental laws since 1990 that provide a framework for the design and implementation of climate change policies. These laws, enacted or under preparation, include the Environmental Fund Act (1994), which lays down the Fund's purpose, funding administration and accountability (the Fund itself has existed since 1983); the Sustainable Development Act (1995), which specifies guiding principles and requires a national energy programme to be drawn up in order to balance economic activities with environmental needs; a draft air pollution act, which will require implementation of emission standards; and a draft energy law which will require energy industries to take environmental concerns into account.

31. A number of economic instruments have also been introduced, which are expected to stimulate the introduction of new technology, one example being the emission charges on sulphur dioxide, nitrogen oxides, carbon monoxide and particulates. The import tax for vehicles over 13 years old, although very low, is 50 per cent higher than that for newer ones.

32. The 1992 Energy Conservation Programme includes the modernization of existing oil-shale fired energy production units, heat production and distribution facilities and the installation of heat meters.

A. Energy

33. Estonia is likely to continue to use oil-shale for another 30 years. Prior to 1991 Estonia exported about half of the electricity it produced. Because of the collapse of Estonia's traditional export markets for electricity (in Russia and Latvia) there is large overcapacity in electricity generation. Two oil-shale fired power plants provide around 95 per cent of the electricity consumed in Estonia; two other power plants provide about 5 per cent of total capacity to meet peak loads. The electricity and heat production plants use outdated technology and are poorly maintained so their efficiency is low, about 28 per cent on average.

34. Estonia's energy policy aims to improve the efficiency of power generation, distribution and consumption, open the electricity and fuel markets to competition, foster fuel substitution by local fuels (peat, wood), and encourage the population to save energy. The drafting of energy legislation and the establishment of a national energy board are under consideration.

35. District heating systems deliver heat to more than 75 per cent of residential buildings, and the heating distribution network is well developed with over 2,500 km of pipelines. The many small boilers in Estonia that provide heat have very low efficiency and high heat losses. There are heat losses of between 6 per cent and 12 per cent from the pipelines and losses could be as high as 30 per cent when connections to consumers are taken into account. More than 60 per cent of state-owned buildings are prefabricated concrete block constructions with little insulation and high heat losses. In a significant number of buildings residents are unable to regulate their energy consumption. At present most customers are charged a flat rate based on the floor area of the dwelling rather than according to the amount of heat they consume. There is a technical potential for saving more than 25 per cent of the energy used in residential heating through improved insulation and other energy efficiency measures. The introduction of cost-effective measures could result in energy savings of about 10 per cent .

36. Estonia's Energy Conservation Programme, initiated in 1992, has an allocation of \$1.2 million for energy-saving projects to update heat production and distribution facilities, for example by changing boilers over to wood and peat from gas, coal and oil-shale, laying improved pipelines, and installing heat meters and modern substations in buildings to provide more accurate control and regulation of heat consumption.

B. Industry

37. Restructuring of the industrial sector led to a 40 per cent decrease in industrial energy use between 1990 and 1994. The energy intensity of industry is still in many cases very high, because production processes are inefficient, equipment is worn out, and technologies are obsolete. To curb regional transboundary pollution, polluting enterprises are required to pay charges based on the volume of emissions of the major regulated pollutants: SO₂, NO_x, CO and particulates. The revenue from these charges goes into the Environmental Fund, making up 20 per cent of the Fund's income. This measure is expected to reduce carbon

dioxide emissions by increasing energy efficiency. There are no specific measures to reduce emissions of GHGs from the industrial sector.

C. Transport

38. After a sharp fall between 1991 and 1992 emissions from private cars have begun to increase again because of the rapid rise in the number of vehicles. The number of private cars rose by about 30 per cent between 1991 and 1994. The number of trucks and buses remains about 20 per cent below the 1990 levels. There has been a relative increase in the transport of goods by road at the expense of rail; but the share of transport as a percentage of total fuel consumption is still less than 10 per cent. Total consumption of petrol has increased, but in 1994 was still lower than in 1990. Newer cars often have bigger engines which consume more fuel, but they are also more fuel efficient. Interpretation of what these trends mean for future emissions is difficult.

39. There are standards for CO₂ and NO_x emissions for new passenger cars. A road tax and parking fees have been introduced in the cities. There is an import tax on vehicles, and the tax on cars older than 13 years is 50 per cent higher than that for newer cars. The taxation of motor fuels (in addition to the 18 per cent value added tax) is low, but there are proposals to implement differentiated fuel taxes to provide incentives for the use of cleaner fuels. These measures, while not enacted specifically in connection with climate change, will help to curb emissions of GHGs.

D. Agriculture, forestry, land-use change

40. The team was provided with extensive information on forestry and silviculture. Forestry activities focus on continuing to expand the forested areas in the extensive natural grasslands. Exemption from land taxes is granted to owners to preserve wetlands in their natural state, which will enhance the sink capacity. Peat exploitation is expected to increase to provide boiler fuel but the area of managed peat fields remains a small percentage of the total area.

E. Waste

41. Waste policy focuses on management of hazardous waste and only a few measures in the waste sector are expected to have any impact on emissions of GHGs in the near term. In Tallinn, where one third of the population lives, landfill gas is collected and used to produce heat. There are charges for inert waste and higher charges for hazardous waste. Reused or recycled waste is exempted from these charges. Estonia aims to improve urban waste management, but implementation of measures to achieve this will depend on availability of financial resources.

F. Measures under preparation

42. Estonia is drawing up legislation and regulations which will correspond to those of the European Union. For example, Estonia is working to gradually introduce European Commission directives on building standards; draft regulations have been prepared for building materials and methods; and insulation and thermal performance standards are to be implemented in the future.

43. Improving the efficiency of the electricity generating plants and researching the possibility of fluidized bed combustion technology for oil-shale have high priority. Modernization of existing oil-shale fired power plants to reduce SO₂ and fly ash discharges into the atmosphere is also a priority in Estonia, but the technology to improve the efficiency of oil-shale plants is still at the development stage. A decision on the approach to be adopted - whether to increase combustion efficiency, or retrofit, or both - has yet to be made.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

44. Estonia did not present a projection of GHG emissions in its national communication. However, the review team was given detailed information on CO₂ emission scenarios that have been developed by Tallinn Technical University since the submission of the national communication. According to these estimates, emissions of CO₂ in the year 2000 will be 40-50 per cent of 1990 levels, as a result of economic restructuring, greater efficiency in energy production, transformation and distribution, and energy conservation measures. Projections have not been developed for CH₄, N₂O or other gases or sinks. The review team noted that there are major problems in making assumptions on key economic variables in a situation of rapid socio-economic change, but strongly recommends that an effort be made for the next communication when updated official projections should be available.

45. The CO₂ emission scenarios were developed using MARKAL - a demand-driven, multi-period linear programming model of the energy system. The base year used for the projections is 1993, which is the first year for which reliable data are available. GDP assumptions were provided, although data for GDP are highly uncertain owing to the major changes in the structure of the economy, in the national statistical system and in the calculation of the exchange rate. All important assumptions used for the scenarios were provided, including energy prices and population growth rates.

46. The scenarios provide a "without measures" or base case projection which assumes that current trends continue, as well as two projections that include some measures of different stringency: one scenario incorporates the impacts of measures for reducing SO₂ and NO_x emissions to control transboundary pollution; and the other includes measures specifically for reducing CO₂ emissions. Under the base case - which assumes that no measures are taken in the future to reduce emissions - CO₂ emissions rise from 18,000 Gg in 1993 to 21,000 Gg (low demand growth) and 25,000 Gg (high demand growth) in 2003.

Under both of the “with measures” scenarios, CO₂ emissions remain relatively stable at around 18,000 Gg from 1993 to 2003 under low growth assumptions and increase to 20,000 Gg under high growth assumptions. These scenarios do not correspond to the energy conservation measures that are being implemented. Each of the scenarios includes a sensitivity analysis with a range of assumptions about energy demand growth.

47. The model that was used also produces cost estimates for different scenarios and technology options. These results show that construction of new oil-shale power plants would not be cost-effective under any scenario. A thorough description of the model is provided, but this does not describe the model's strengths and weaknesses. The model is not disaggregated by sector and cannot provide sectoral projections of emissions.

V. EXPECTED IMPACTS OF CLIMATE CHANGE AND ADAPTATION MEASURES

48. The team was informed that, since the national communication was submitted, a vulnerability study for the country has been developed with assistance from the Country Studies Program of the United States. This study used five general circulation models to assess the possible future climate in Estonia and possible impacts on four main sectors: forestry, agriculture, water resources and coastal zones.

49. The response of forests to the proposed climate scenarios was studied for five sites with rich forest ecosystems and different climatic zones. Water resources vulnerability was assessed for three rivers with different hydrological regimes and landscape conditions. Impacts of a one-metre rise in sea level on groundwater fluctuations and the response of natural and socio-economic systems were studied in low-lying coastal areas.

50. The effects of climate change on forests are difficult to define. The total biomass of the species is expected to decrease by 21-35 per cent. However, a replacement of present coniferous and deciduous species is likely, with different productivity and economic impacts.

51. Changes in agriculture are expected to influence the structure of the rural economy. Because of climate change the barley yield is expected to decrease by 17-18 per cent, and the potato yield to become unstable; the conditions are expected to be favourable only for herbage cultivation. The increase in biomass would support dairy farming. It is estimated that the ultimate effect will probably not be damaging to agriculture.

52. The economic loss because of sea level rise is expected to be considerable. It is estimated that with a one-metre rise in sea level, about 3 per cent of the territory would be inundated or damaged. According to the vulnerability assessment, climate change is not expected to affect the water supply although it could increase food production and reduce consumption of energy for heating.

VI. INTERNATIONAL COOPERATION

53. Several programmes are being implemented with external assistance for reconstruction of heating facilities, metering, and energy conservation in buildings. This includes an EBRD 10 year loan of DM 73.4 million for reconstruction of power plants and heat distribution networks and supply of meters and a European Union loan of EK 76.4 million for reconstitution of heat markets and production of peat and wood. Low interest loans for rehabilitation of energy facilities and reduction of losses are also available from bilateral donors, such as Finland, Sweden and Denmark. Estonia has obtained grant funding from the European Union, for example under the PHARE programme, which includes support for studies and training towards energy sector restructuring, development of energy policies and legislation, and energy-saving measures; under the THERMIE programme, for workshops and training on energy audits, energy management, and renewable energy; and under the SYNERGY programme, which aims to develop European Energy Charter policies, for energy policy and planning, and to improve energy efficiency.

54. The review team was informed that cooperation with other countries in the Baltic Sea area on energy and environment, and international assistance for the environment, are important areas for international cooperation. Cooperation among the Baltic States (Estonia, Latvia and Lithuania) is given high priority.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

55. No information was included in the national communication on research. The review team was informed that several institutes provide data to assist in the development of environmental policy. Scientific organizations - the Institute of Ecology, the Institute of Energy Research, the Institute of Meteorology and Hydrology, and different universities - participate in working groups to develop measures to combat climate change. The team recommends that key deliberations of these working groups be reported in the next communication.

VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

56. No information was included in the national communication on raising public awareness. During the country visit, however, the team was informed of training activities being carried out with the help of funding under the European Union's PHARE and THERMIE programmes.

57. Environmental awareness is high, and non-governmental organizations continue to play an important role in carrying out studies and influencing policy formulation. The Ministry of the Environment has created a post for a specialist responsible for organizing training for environmental experts and for promoting contacts with ministries, schools and the media. Training related to the introduction of new combustion technology is being carried out.

58. The Government has the obligation to disseminate information for general public use with the exception of information that is classified by law and information intended for internal use only. The radio regularly broadcasts environmental news.

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