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Report on the in-depth review of the national communication of Romania

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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 Romania and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary[1]

1. The in-depth review of the first national communication of Romania was carried out between October 1996 and April 1997 and included a country visit by the review team to Bucharest from 7 to 11 October 1996. The team included experts from Egypt and the Netherlands.

2. A central aspect of Romania's national context is its transition to a market economy. In this context, gross domestic product (GDP) dropped drastically between 1989 and 1990, as did emissions of greenhouse gases (GHGs). Romania has requested the flexibility provided for under Article 4.6 of the Convention in using 1989 as the base year instead of 1990, and this was granted by the Conference of the Parties (COP). The process of privatization is viewed as a potential tool for improving energy efficiency. Romania relies on external investment to help upgrade plant and equipment, but foreign investment has been lower than expected, despite the low labour costs. An environment strategy has recently been drawn up and approved by the Government, together with a national environmental action plan. A national climate change commission was set up in November 1996. Romania has no voluntary quantified target for the reduction of GHG emissions. Recent key environmental legislation includes the environmental law of December 1995, laying out fundamental principles. A number of sectoral strategies have been established, including an energy sector strategy containing an environmental component, forestry management, and transport, although some of these strategies are still under development, and not yet approved by the Government. Total primary energy supply amounted to 39 million metric tonnes of oil equivalent (Mtoe) in 1994 (compared to 67 Mtoe in 1989), of which 43 per cent was composed of natural gas, 28 per cent oil, 25 per cent coal, and 3 per cent domestically produced hydroelectric power. The building of a nuclear power plant is nearing completion. Per capita emissions of carbon dioxide (CO_2) were approximately 8.6 tonnes in 1989, declining to 4.8 tonnes in 1993; the average for countries of the Organisation for Economic Co-operation and Development (OECD) was about 12 tonnes in 1990.

3. In the national communication or as additional information obtained during the in-depth review, inventory data were provided on the main GHGs carbon dioxide, methane (CH_4) and nitrous oxide (N_2O), and the precursors nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs), for the years 1989, 1990 and 1991. In 1989, in Romania, 198,479 Gg of CO_2 were emitted and 2,925 Gg removed through sequestration. In that year, 2,328 Gg of CH_4 were emitted, as were 67 Gg of N_2O, 553 Gg of NO_x, 2,337 Gg of CO and 529 Gg of NMVOCs. The GHG inventory is based on the Guidelines for National Greenhouse Gas Inventories adopted by the Intergovernmental Panel on Climate Change (IPCC) and default emissions factors, although

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

CORINAIR[2] emission factors are also used where such factors are missing in the IPCC guidelines. Divergences from the IPCC methodology include: the absence of emissions from industrial solid and liquid wastes (owing to a lack of reliable data); reporting of emissions from international bunkers together with those from the transport sector; inclusion of the emissions from the cement and lime industries with the emissions from fuel combustion; and division of emissions from motor fuels into the industrial, household and transport sectors, resulting in low CO_2 emissions from the transport sector (about 4 per cent of the total).

4. The information on policies and measures in the communication was not detailed and some of the recommendations in the reporting guidelines were not followed. With regard to the energy sector, legislation concerning electricity is under preparation which aims at clarifying the role of the different actors in this sector. Preliminary discussions have also started on a special law on energy conservation, which might contain, *inter alia*, fiscal incentives for energy conservation. Revenue from an 18 per cent levy on electricity and heat is currently being used largely to fund retrofit programmes undertaken by the electricity utility, RENEL. A programme on renewable sources of energy conducted before 1990 was reported not to have been very successful, although a draft law on renewable sources of energy has been prepared by the Agency for Energy Conservation (ARCE), containing, *inter alia*, provisions for financial and institutional support to independent power producers. A programme for the development of renewable energy is being carried out in the Ministry of Industries and Trade with support from the European Union (EU) PHARE programme. Work is being carried out at present on efficiency standards for boilers and some household electrical appliances, such as television sets. Energy efficiency standards and voluntary ecolabels are also used for refrigerators and washing machines.

5. The team recognized that, owing to the recent economic crisis in Romania, it will probably not be necessary to take measures in order to achieve the aim specified in the Convention to stabilize its emissions in 2000 at the level of 1989, the year utilized as a base year in Romania.

6. The national communication does not contain projections of GHGs, but a preliminary study on projections was made available to the team during the country visit. Under the "without measures" scenario in this study, emissions of CO_2 are expected to be lower in 2000 than in 1989, but will grow to reach this level in 2007/2008, and will continue to grow beyond that. Emissions of other GHGs are also expected to be higher than their 1989 levels in 2020. Under one of several "with measures" scenarios that were presented, Romania would reduce its CO_2 emissions as compared to the baseline scenario by 12.1 per cent in 2000, 34.4 per cent in 2010 and 48 per cent in 2020. The average cost of this alternative has been estimated at US$ 1.63 per tonne of CO_2 reduction (not including transport and agriculture), and the total cost for the whole period estimated at US$ 28 billion. It should be noted that these financial resources have not been secured.

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[2] CORINAIR is the component dealing with air emissions inventories of the European Community's CORINE (Coordinated Information System on the State of Natural Resources and the Environment).

7. A brief mention was made in the national communication of research activities, financed jointly by Romanian resources and under the vulnerability assessment component of the United States Country Studies Program, on the assessment of the expected impacts of climate change, including impacts on agriculture, forests and freshwater basins. These were elaborated on during the country visit, and possible topics for future research were identified. In the case of one study, several adaptation options were also analysed.

8. Several examples of bilateral and multilateral cooperation exist, such as the United States Country Studies Program, cooperation under the PHARE programme on renewable energy and a Global Environment Facility (GEF)/United Nations Development Programme (UNDP) project on energy efficiency improvement. In spite of these examples, financial constraints may be a limiting factor to the carrying out of studies and implementation of projects and policies in Romania. At the time of the country visit, there were no formal activities implemented jointly under the pilot phase (AIJ), although Romania intended to engage in such activities in the future. In March 1997, a letter of intent was signed by Romania and the Netherlands concerning the improvement of the energy efficiency of several power plants in Romania, as an AIJ project.

9. During the country visit, the information in the national communication on research and systematic observation was elaborated on by experts from several government institutes. There is a strong tradition of research in climate-related fields, and data collection and monitoring have been conducted since 1884. Romania also participates in international efforts, including the World Climate Research Programme, the IPCC and the International Geosphere-Biosphere Programme.

10. The development of education on environmental issues has been listed in the first national communication as one of Romania's short-term objectives, to be achieved by including these issues in all levels of education and by facilitating public access to such information. An environmental information and documentation office has developed a bibliographic database of publications on environmental issues. Within the PHARE project of the EU, a public awareness campaign on energy efficiency and the environment is under way. In universities work on climatology and climate modelling is being conducted in cooperation with the World Meteorological Organization (WMO).

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

11. Romania ratified the Convention on 8 June 1994. Its first national communication was received by the secretariat on 14 March 1995.

12. The in-depth review of the first national communication of Romania was carried out between October 1996 and April 1997 and included a country visit by the review team to Bucharest from 7 to 11 October 1996. The team comprised Mr. Ibrahim Abdel Gelil (Egypt), Mr. Henk Merkus (Netherlands) and Mr. Aniket Ghai (UNFCCC secretariat, Coordinator). In

the course of the visit, the team met with experts from several different ministries and government institutes.

13. Climate change policy in Romania is coordinated by the Ministry of Waters, Forests and Environmental Protection (MWFEP), which was created in 1990. Prior to this, some environmental issues were covered by institutes such as the Institute for Hydrology and Meteorology and the Research and Engineering Institute. The national communication was prepared by the MWFEP, in consultation with other ministries and institutes concerned with climate change. Other than MWFEP, key actors in climate change policy-making include the Ministry of Industry, which has responsibility for energy policy, the electricity utility (RENEL), the Agency for Energy Conservation (ARCE), RENEL's Institute of Power Studies and Design (ISPE), and the Energy Research Centre (ICEMENERG).

14. An environmental strategy has recently been drawn up and was presented, together with a national environmental action plan, at a conference in Sophia in 1995. The goal of devoting 0.6 per cent of gross national product (GNP) to environmental expenditures is included in the strategy. Under the plan, some 296 proposed projects, to be implemented over one to five years, are organized around the following themes: economic analysis; legislation, institutional development and regulation; surface water and groundwater quality protection; air quality protection; soil quality protection, agriculture and silviculture, and biological diversity preservation; and waste management, urban engineering and transport. Furthermore, the national strategy for preparing for membership of the European Union (EU) includes the aim of introducing national environmental standards that approach those of the EU.

15. A national climate change commission was set up in November 1996, comprising relevant ministries, public and private research institutes and non-governmental organizations. The mandate of the commission is being defined.

16. Romania has no voluntary quantified target for the reduction of greenhouse gas (GHG) emissions.

17. Environmental legislation has existed in Romania since an early date. Recent key environmental legislation includes the environmental law of December 1995, which lays out some fundamental principles. Order 462 (1993) establishes technical conditions for atmospheric protection, but now requires revision to harmonize with the recent 1996 law. A norm of 1987 contains standards for air quality, in which pollutants and methods for their measurement are identified, as well as maximum admissible levels. Legislation focuses on combating air pollution in "hot spots", and, to a lesser extent, combating transboundary air pollution.

18. Responsibility for ensuring compliance with environmental legislation lies with the MWFEP (and in some cases also with the Ministry of the Interior), together with the branch agencies of the MWFEP that exist in each of the 41 counties, with duties that include monitoring and inspection. A degree of responsibility also lies with local authorities.

19. A United States Country Studies Program is being carried out in Romania, involving several ministries and institutes. The Program has contributed also to the preparation of the national communication. The first phase of the programme consists of three studies (GHG emissions inventory, vulnerability assessment and impacts, and mitigation options) and also serves as a tool for policy-making, including by raising public awareness.

20. A central aspect of Romania's national context is its transition to a market economy, which impacts on climate change policy-making in a number of ways. Gross domestic product (GDP) dropped drastically between 1989 and 1990, with production declining particularly sharply in the industrial sector, which has a high energy intensity and also high GHG emission level (CO_2 emissions dropped by 14 per cent over this period). Romania requested the flexibility provided for under Article 4.6 of the Convention in using 1989 as the base year instead of 1990, and this was granted by the Conference of the Parties (COP) at its second session, by its decision 9/CP.2 (see document FCCC/CP/1996/15/Add.1).

21. The process of privatization is viewed as a potential tool for improving energy efficiency but, in severely degraded areas, difficulties were encountered with assigning liability for environmental damage already incurred. This, it has now been decided, rests with the former owner, and relevant auditing procedures have recently been defined. Legislation is expected in the near future on the evaluation of environmental damage. Romania relies on external investment to help upgrade plant and equipment, but foreign investment has been lower than expected until now, despite the low labour costs.

22. A number of sectoral strategies have been established, including an energy sector strategy containing an environmental component, forestry management, and transport (the road transport agency is involved in the identification of mitigation options). Some of these strategies are still under development, and have not yet been approved by the Government.

23. Total primary energy supply amounted to 39 million metric tonnes of oil equivalent (Mtoe) in 1994 (compared to 67 Mtoe in 1989), of which 43 per cent was composed of natural gas, 28 per cent oil, 25 per cent coal, and 3 per cent domestically produced hydroelectric power. The building of a nuclear power plant is nearing completion, in collaboration with the Canadian Government, with a planned capacity of 700 MW, and a second one of the same capacity is under construction. Significant quantities of oil and natural gas are imported. Romania has been a net importer of electricity, but the amount imported declined from a peak of 9,476 GWh in 1990 to 725 GWh in 1994. The fact that there are large lignite reserves, estimated to be sufficient for 50-70 years based on current rates of production, together with employment considerations, may result in high utilization of this energy source in the future. Per capita emissions of carbon dioxide (CO_2) were approximately 8.6 tonnes in 1989, declining to 4.8 tonnes in 1993; the average for countries of the Organisation for Economic Co-operation and Development (OECD) was about 12 tonnes in 1990.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

24. In its national communication, Romania provided data on emissions of the main GHGs carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the precursors nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs), although data were not disaggregated by sector. In a subsequent submission to the secretariat, the data were provided in the reporting format recommended by the Intergovernmental Panel on Climate Change (IPCC), for the year 1989, Romania's base year. During the review, data for 1990 and 1991 were also made available, and are contained in a report prepared by the Research and Engineering Institute for the Environment (ICIM), the same institute that prepared the 1989 inventory. No estimates were provided for emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), although the review team was informed that such estimates have been calculated for the first time for 1994. The team notes that estimates of these GHGs are required under the revised reporting guidelines to be used for second national communications from Annex I Parties.

25. In 1989, in Romania, 198,479 Gg of CO_2 were emitted and 2,925 Gg removed through sequestration. In that year, 2,328 Gg of CH_4 were emitted, as were 67 Gg of N_2O, 553 Gg of NO_x, 2,337 Gg of CO and 529 Gg of NMVOCs. The large majority of these emissions occurred in the energy sector.

26. Romania used the IPCC guidelines and default emissions factors. No national emission factors are available and Romanian experts indicated during the country visit that currently there are no plans to develop such national factors, because of the financial constraints associated with the special circumstances of transition. Partly as a result of this, the Romanian experts found the IPCC guidelines to be useful and helpful.

27. The 1989 inventory includes separately the removal of CO_2 in the land-use change and forestry category. GHGs are not aggregated using global warming potentials (GWPs).

28. Although the IPCC guidelines were used to construct and report the inventory, the review team noted that there were some gaps as well as some deviations from the IPCC methodology. Owing to a lack of reliable data on industrial solid and liquid wastes, the inventory does not report on emissions from these source categories. It would be useful to provide estimates for these source categories in future updates. Contrary to the guidelines, emission estimates for international bunkers were not reported separately but were added to emissions of the transport sector. Emission estimates for NMVOCs from the natural gas system were calculated using CORINAIR emission factors, which is not required under the IPCC reporting guidelines. Part of the emissions for industrial processes were added to the emissions from fuel combustion, and part were reported under the industrial processes source category, in particular the emissions from the cement and lime industries. CORINAIR emission factors were also used where such factors are missing in the IPCC guidelines.

29. Some deviations from the IPCC reporting guidelines arise from methodological differences in the reporting of energy statistics in Romania. The Romanian Commission for

Statistics does not report all motor fuels in the transport sector, but divides their consumption into industrial, household, and transport sectors. Consumption of fuel by the vehicle fleets associated with industrial enterprises is assigned to the industrial sector. Similarly, consumption of fuel by privately owned vehicles is assigned to the household sector. Thus the transport sector emissions in the Romanian methodology include only those from publicly owned buses, rail locomotives, and international bunkers. As a result of this methodological divergence, CO_2 emissions from the transport sector appear to be fairly low (about 4 per cent of the total). This also makes international comparisons difficult.

30. The review team noted that the GHGs inventory as reported in the national communication did not provide enough information to allow reconstruction of the inventory, which is a requirement under the guidelines for the preparation of first national communications by Annex I Parties. Supporting documentation made available during the review did, however, enhance this process. Nevertheless, the scarcity of translated material was sometimes problematic, as most of the supporting documentation was available only in Romanian. The availability of these reports in English would increase the transparency of the inventory.

31. Emission estimates for CH_4 from the natural gas industry are derived from the production-based average emission "factors" approach, recommended as Tier-1 in the IPCC guidelines. Discussions with Romanian experts involved in the development of the inventory indicated that, based on data from gas companies, leakage occurs of 4 per cent of gas transported. So the review team has some concerns that this value might underestimate the CH_4 emissions from this source category in Romania. Validation of the current estimates would be helpful.

32. It was not clear in the national communication and in the supporting documents made available to the review team whether the energy products used for non-energy activities have been excluded in the estimates of GHG emissions from fuel combustion. Discussions with Romanian experts indicated that they were included, which would suggest that GHG emissions estimates for the all-energy category might be overestimated by the amount of carbon stored as a feedstock in some industries, for example the fertilizer industry.

33. Romanian experts expressed a high degree of confidence in their activity data, which are based mainly on Romania's statistical yearbook, published annually by the Romanian Commission for Statistics, and on data collected by a network of government institutions working in different sectors.

III. POLICIES AND MEASURES

34. Although the national communication contains a separate chapter on policies and measures, the material was not detailed and some of the recommendations in the reporting guidelines were not followed, particularly concerning the provision of information on the degree or status of implementation of each policy and how it will be monitored over time.

Following a request for additional information made in May 1996 by the UNFCCC secretariat in connection with the preparation of the compilation and synthesis, Romania provided additional information on its policies and measures in which it indicated that, in the context of the environment strategy (approved by the Government at the end of 1995), policies will be implemented for specific sectors and sources, such as energy efficiency improvement, stimulation of renewable sources, waste management and sustainable agriculture and forestry. Only a brief overview was provided of activities to be undertaken in the near future to combat climate change. Some activities are of a general nature, such as the development of research programmes, cooperation in international and bilateral programmes, and the establishment of an integrated monitoring system. Other activities focus on improved management and environmental education. Measures which more directly address emissions of greenhouse gases include retrofit programmes, although many of these activities have not yet been implemented.

35. During the visit, the team was provided with additional, more specific information on the present or near-term policies and measures related to climate change. Nevertheless, the team had some difficulty in gaining a comprehensive and more detailed picture both of the status of policies and measures implemented or agreed upon, and of policies and measures under consideration or being proposed by institutes.

36. The team recognized that, even though policies and measures are being implemented, owing to the recent economic crisis in Romania, which resulted in a sharp decline in GDP and also in GHG emissions, it will probably not be necessary for Romania to take additional measures in order to achieve the present aim under the Convention to stabilize emissions in 2000 at the level of 1989, the year utilized as a base year.

37. Studies have indicated that the most cost-effective policies for the reduction of CO_2 can be achieved through the restructuring and modernisation of industry and the improvement of performance vehicles for transportation.

38. With regard to energy, legislation is under discussion concerning the electricity sector, in which it is proposed that RENEL (the utility with a monopoly in transmission and distribution and main generator) will be restructured and a role will be established for independent power producers, although there is no prospect for agreement in the short term. Preliminary discussions have also started on a special law on energy conservation, which might contain, *inter alia*, fiscal incentives for energy conservation; agreement is expected in the short term. Several years ago, the Government issued a decree establishing a special fund for the electricity sector, financed by an 18 per cent levy on electricity and heat. Although, in principle, a broad range of projects are eligible for financing, until now funding has been restricted to RENEL retrofit programmes. With respect to restructuring in the electricity sector and the role played by RENEL, it appeared to the team that Romania intended to maintain, for the time being, the "single buyer" principle, while allowing independent power producers access to the national grid. At present, there is no legal obligation for RENEL to accept electricity from independent producers.

39. Data for end-1994 indicate thermal power plant efficiency rates of 26 per cent for coal, 35 per cent for natural gas and 36 per cent for oil derivatives, which are considerably lower than those in modern plants in OECD countries. Half of the electricity is produced from coal, some 10 per cent from oil and 30 per cent from natural gas, and 9 per cent is obtained from hydroelectric power stations. Twenty-four per cent of electricity in thermal plants is generated in district heating plants, and 60 per cent in cogeneration plants. In the electricity sector, plans exist for retrofitting several power plants, with a total capacity of up to 5,000 MW (of which 1,000 MW are produced in large-scale hydroelectric plants). A lack of resources at RENEL could slow the pace of implementation. With regard to this capacity, at present, funding exists to retrofit a maximum of 2,000 MW. Another obstacle for realizing CO_2 reductions in the electricity sector might be the lack of transparency in the cost structure of electricity as a result of, *inter alia*, the existence of cross subsidies, which prolongs present inefficiencies and reduces the opportunities for renewable sources of energy. The team noted, however, that under the new Government, elected in December 1996, plans are being developed to increase tariffs for electricity and heat deliveries.

40. A programme on renewable sources of energy conducted before 1990 was reported not to have been very successful, because of, *inter alia*, poor quality control, low electricity prices and the lack of financial support for renewable sources of energy. The capacity for renewable sources of energy at present stands at 96.6 PJ per year (of which 46 per cent is large-scale hydroelectric power and 51 per cent is biomass). A draft law on renewable sources of energy has been prepared by ARCE, containing, *inter alia*, provisions for financial and institutional support to independent power producers.

41. The team was informed of a new energy conservation project in the industrial sector, funded under the EU PHARE programme. The project aims at contributing to energy efficiency improvements in branches of industry containing large numbers of small and medium-sized enterprises. A pilot project will be set up in each branch, and the results will be disseminated in other companies in the same branch. ARCE, including its several regional branches, is closely involved in the implementation of this programme. At the regional level, agreements to combat local air pollution exist between authorities and individual companies containing provisions to address process emissions.

42. In the residential sector, recommendations for efficiency standards for refrigerators have been developed by ICEMENERG. Work is being carried out at present on efficiency standards for boilers and some household electric appliances, such as television sets. In old apartments buildings, there are only limited possibilities for individuals to save energy and there are no special programmes to improve this situation. Efficiency standards for new buildings also exist in the non-residential sector. Furthermore, under the PHARE programme, energy audits are implemented in sectors such as health care.

43. In the waste sector, a distinction is made between industrial and urban waste. Although limited information on industrial waste was provided, the team was informed that in the industrial sector, companies have set up programmes for primary recycling (back to the

process) and secondary recycling (heat and electricity production). With respect to urban waste, the present policy focuses on landfilling, and will continue to do so until adequate waste separation makes it possible and attractive to invest in new incineration plants.

44. No special policies and measures have been implemented in the agricultural sector, either to improve energy efficiency or to reduce methane emissions. The team noted, however, that energy production from biogas existed in the past, as did the use of liquid fertilizers.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

45. The Romanian national communication does not contain information on projections of future emissions of any GHG as, at the time of submission of the national communication, no projections were available. The team is able to confirm, however, that such studies are now well advanced. The communication also omits information on the effects of measures implemented or committed to since the base year, but mentions that the development of emission scenarios is one of the main strategic points of the Romanian climate change policy.

46. During the country visit, a study on emission scenarios was nearing completion, carried out under the responsibility of ISPE, financed partly by the Ministry of Research and Technology and by MWFEP and partly by the United States Country Studies Program. The study is the result of close cooperation between ISPE and several other Romanian research institutes, including the Economic Forecast Institute, the Industrial Economic Institute, the Agricultural Economic Institute, the Forest Research Institute, the Institute for Transportation and the Research and Engineering Institute for the Environment. Furthermore, several ministries participated actively in the discussions associated with the preparation of the report. The team was impressed by the efforts of the institutes to produce the report, which contains detailed information on how scenarios have been constructed, and undoubtedly could contribute to the Romanian climate change policy-making process. The team was able to discuss the preliminary results of this study with the responsible ISPE researchers. At the time of the visit, this study was regarded as a working document which was not yet part of the official position.

47. The ISPE report contains both a "without measures" scenario and a total of 26 "with measures" scenarios, each presenting different policy options that could be implemented in the future. Each "with measures" scenario is supported by detailed information on individual policies and measures, including an assessment of potential emission reduction effects and associated costs. The year 2020 is used as a horizon; results for 2000, 2005 and 2010 have also been calculated. 1991 is used as the reference year. Projections are provided for CO_2, CH_4, N_2O, NMVOC and CO, but not for PFCs, HFCs and SF_6.

48. The "with measures" scenarios have been constructed with the Energy and Power Evaluation Programme (ENPEP) model, which deals with the primary, transformation and end-use sectors. Four of the different ENPEP modules have been used in the ISPE study,

namely Model for Analysis of Energy Demand (MAED), Wien Automatic System Planning (WASP), a model to determine the balance between supply and demand of the energy sector (BALANCE) and a module for estimating the environmental impacts of an energy plan (IMPACT). The MAED model is a disaggregated, bottom-up, activity-based energy accounting model. The WASP model has been used to construct least-cost planning options. The BALANCE model determines (on an individual plant basis) the energy flows to different economic sectors and calculates costs. Finally, the IMPACT model calculates the impact of process changes on emissions in individual sectors. Other techniques have also been used to derive projections for non-energy sectors, such as the agricultural and forestry sectors.

49. The "without measures" scenario assumes that, between 1996 and 2025, rates of economic growth will be around 4.5 per cent, although a population decrease is foreseen, from 22.6 million inhabitants in 1996 to 20.1 million in 2025. Under this scenario, emissions of CO_2 are expected to be lower in 2000 than their levels in 1989. They are projected at 195.5 Mt in 2007/2008, the same level as in 1989. With continued high growth figures in the period until 2020 and the assumption that additional demand for power will be met through coal-fired plants, it is expected that emissions of CO_2 and other GHGs, such as CH_4 and N_2O, will continue to grow between 2007 and 2020.

50. Under the "without measures" scenario, it has also been assumed that lignite and hard coal will continue to play an important role, owing to the abundance of these resources. Continued domestic demand for lignite would be ensured by the rehabilitation of existing lignite power plants and subsequent replacement by new ones. Production of both natural gas and oil is assumed to decline, with domestic demand being met through increased imports. It is also assumed that in 2020, hydroelectric power will increase by 23 per cent compared to its 1995 level. After 2000, electricity will mainly be produced with hard coal, while nuclear power will play a growing role as the second unit of the Cernavoda nuclear power plant becomes operational. In addition, hydroelectric power will remain important, as it is assumed that all stations now under construction will be completed. Owing to the present high capacity and low baseload demand, no new hydroelectric plants to satisfy peak demand will be constructed beyond 2000. Furthermore, rehabilitation of more than 5,000 MW capacity of coal-, gas- and oil-fired power plants has been assumed. The cogeneration capacity will remain constant, taking into account the present excess capacity and the assumption that heat demand will diminish because of decreasing industrial demand.

51. In the residential sector, a decrease in the number of persons per household is foreseen, leading to a 4 per cent reduction in energy demand for cooking in 2020 compared to 1993 levels. On the other hand electricity consumption per household will double in this period. As a result of insulation of old residential buildings, energy demand for space heating will decrease by 5 per cent between 1993 and 2020. With regard to the transport sector, no shifts in modes of freight transport have been assumed in the period 1993-2020, although efficiency gains are assumed for several modes. A shift in the modes of passenger has been assumed, however; an increase in private car use will occur for intercity transport owing to increasing demand for mobility, while the use of bus and rail transport is assumed to

decrease. Furthermore, average motor fuel consumption per vehicle will decrease. An average growth of 4.3 per cent is projected in the industrial sector. No change in economic structure is assumed to take place between 1993 and 2020, implying that the share of specific industrial branches in total industrial output in 2020 will be the same as in 1993. An increase in industrial energy efficiency is assumed owing to better utilization of present capacity.

52. In the team's opinion, future development of Romanian climate change policies will greatly benefit from the strong cooperation between research institutes underlying the ISPE study and from the "bottom-up" approach which provides rich and valuable insights into sector-specific economic developments. However, the assumption in the baseline scenario of a threefold increase in the share of renewable sources of energy (excluding large-scale hydroelectric power) in total electricity production might be optimistic taking into account existing electricity prices and legislation, and therefore might cause the present baseline to be adjusted upwards.

53. In constructing a policy scenario the ISPE report provides for 26 alternatives, which can be regarded as different policy options. For each option, the reduction potential and costs (in United States dollars per tonne of CO_2 reduced in terms of investment and operational costs) have been provided. Some alternatives consist of packages of different options. The team took note of one particular option - a "mixed package" - which was developed at the request of the steering committee of the ISPE study. This option has a substantial overall CO_2 reduction potential; its main elements are: energy conservation in the industrial sector, efficiency growth of vehicles used for freight and passenger transport, industrial and urban district heating development, reduction of transmission and distribution thermal losses and especially more hydroelectric and nuclear power generation. The oil price development is based on World Bank projections. A discount rate of 10 per cent has been applied. This policy scenario would enable Romania to reduce its CO_2 emissions as compared to the baseline scenario by 12.1 per cent in 2000, 34.4 per cent in 2010 and 48 per cent in 2020. The average costs of this alternative have been estimated at US$ 1.63 per tonne CO_2 reduction (not including transport and agriculture). The total costs of this alternative are estimated at US$ 28 billion for the whole period. It should be noted that practically none of these financial resources have been secured. For N_2O a policy scenario has been constructed involving significant reductions owing to improved technologies in the fertilizer industry.

54. The team noted the challenges for policy-making put forward by the different ISPE policy scenarios. It also noted the relevance of the present negotiations on a protocol or other legal instrument for the discussion and decision making on various policy options and policy scenarios by the Romanian Government. The team regretted that Romania did not include projections nor effects of measures in its first national communication, but viewed the ISPE report as a valuable input for Romania's second national communication and for the elaboration of Romania's future climate change policy-making in general. The team noted that the report focuses on mid-term and long-term projection scenarios, and noted further that short-term projections might be less relevant in the Romanian context, considering that the stabilization commitment is likely to be achieved irrespective of the implementation of mitigation options.

V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

Projected progress in greenhouse gas mitigation is covered in chapter IV above.

VI. EXPECTED IMPACTS OF CLIMATE CHANGE

55. A brief mention was made in the national communication of research carried out on the assessment of the expected impacts of climate change, including impacts on agriculture, forests and freshwater basins. These studies were presented to the team during the country visit, and are financed in part by Romanian resources and in part by funds allocated by the United States Country Studies Program, in the context of its component on vulnerability assessment.

56. The study on agriculture indicates that, under assumptions of high fertilizer use and abundant irrigation (at present not the case), a doubling in the concentration of CO_2 will have beneficial impacts on the production of two out of the three crops examined. The study on the expected impact on forests predicted a major change in the type of vegetation covering Romania. Of three freshwater basins studied, only one was found to be sensitive, but it is one of central importance in supplying Bucharest with freshwater. A study indicated that there was evidence of a rise in sea level in the Danube delta, although the causes of this rise are not known conclusively; impacts on soil erosion were noted.

57. Possible topics for future research have been identified as the impacts of variations in run-off on transport on the Danube and the impact on the Danube delta ecosystem of sea level rise.

VII. ADAPTATION MEASURES

58. A brief mention was made in the national communication of vulnerability studies on the coastal zone of the Black Sea and of the Danube Delta Biosphere Reserve. In the case of the study on freshwater basins mentioned in chapter VI above, several adaptation options were analysed by the Water Project Institute (AQUA), including the possibility of building a large storage reservoir and water diversion canals. In the case of the study on forests, an analysis of the economic costs and possible adaptation measures will be carried out in the future.

VIII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

59. Romania receives financial assistance through a variety of channels for the financing of a range of projects and studies. Bilateral cooperation exists with several countries, and involves a wide range of Romanian government ministries and institutes.

60. Multilateral sources of finance include support received under the PHARE programme, to fund, *inter alia*, projects on energy efficiency and on renewable energy. A Global Environment Facility (GEF)/United Nations Development Programme (UNDP) project on the work programme for energy efficiency improvement and GHG reduction is under way, in collaboration with the Ministry of Industry, ARCE and the Romanian electricity authority, at a total cost of US$ 6.5 million. The European Bank for Reconstruction and Development and the European Investment Bank have supported the financing of energy efficiency projects in industry and district heating. Romania is also cooperating with countries on programmes to improve energy efficiency.

61. The team noted that, despite the receipt of some financial assistance, and because of the pressing domestic economic problems such as the high inflation rate and budget deficit, financial constraints appeared to be a limiting factor to carrying out studies and implementing projects and policies.

62. At the time of the visit, there were no formal activities implemented jointly under the pilot phase (AIJ). Since then there has been progress towards establishing such activities, and Romania intends to engage in them on a formal basis in the future. In March 1997, a letter of intent was signed by Romania and the Netherlands concerning the improvement of the energy efficiency of several power plants in Romania, as an AIJ project.

IX. RESEARCH AND SYSTEMATIC OBSERVATION

63. The national communication contains a section on research and systematic observation, in which the research activities that have been carried out in Romania are briefly described. During the country visit, which coincided with an annual symposium on research carried out in the field of climatology, the team met with a range of experts from the National Institute of Hydrology and Meteorology (NIHM), the Research Institute for Soil Science and Agrochemistry and the Research Institute for Forestry Planning and Management. Data collection and monitoring have been conducted since 1884, and, in 1992, a computerized database containing information from 1961 onwards has been established. Data are shared with researchers in many countries. Several studies have also been carried out on climate variability. There is a strong tradition of research in climate-related fields, some of which are described in chapters VI and VII above. Links exist between the NIHM and universities, with NIHM staff delivering lectures to students and directing doctoral theses. Romania also participates in international efforts, including the World Climate Research Programme, the IPCC and the International Geosphere-Biosphere Programme. A research project is under

way in collaboration with the World Meteorological Organization (WMO) to study drought in several parts of Romania and its neighbouring countries.

X. EDUCATION, TRAINING AND PUBLIC AWARENESS

64. The development of education on environmental issues has been listed in the first national communication as one of Romania's short-term objectives, to be achieved by including these issues in all levels of education and by facilitating public access to such information. The communication does not provide sufficient information on how current or planned activities could lead to such an objective being achieved.

65. During the country visit, however, the review team was informed of various information dissemination activities within MWFEP. An environmental information and documentation office has been active in the development of a bibliographic database of material on environmental issues published by Romanian authors and by international experts and institutes. Bibliographies on specific environmental issues, including climate change, are published quarterly, in paper and electronic formats, and circulated to a mailing list which includes government officials, members of academia, consultants, industrialists, students and in some cases the public at large.

66. Within the PHARE project of the EU, a public awareness campaign on energy efficiency and the environment is under way, targeting children, households and the general public, through the media of radio and television spots. In universities, both graduate and postgraduate course work on climatology and climate modelling is being conducted in cooperation with WMO.

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