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

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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 Germany and specific information drawn from a compilation and synthesis report covering all Parties that have submitted national communications.)

Summary¹

1. Germany ratified the Convention on 9 December 1993. Its national communication was received by the Secretariat on 28 September 1994. The in-depth review was carried out during the period from October 1995 to February 1997 and included a country visit by the team in November 1995.
2. Unification of the two parts of Germany in October 1990 had a major impact on both economic and social life. It also complicated the preparation of the first national communication due to the differences in the basic economic and statistical data. Germany is one of the leading economic powers of the world. The growth rate of its gross domestic products in 1990-1993 was 1.3 per cent per year and in 1993-1994 2.9 per cent per year. Its population in 1990 was 79.4 million, and in 1994 81.4 million.
3. In 1990, per capita energy-related emissions of carbon dioxide (CO₂) in Germany were about 12.8 tonnes, compared to an average of 8.9 tonnes for countries of the European Community and 11.8 tonnes for countries members of the Organisation for Economic Co-operation and Development. In 1994 this indicator for Germany decreased to 11.0 tonnes. Germany has limited reserves of fossil fuel and it imports significant quantities of oil and natural gas; in total it imports over 55 per cent of its primary energy. Coal plays an important role in the energy balance (its share in electricity production is still above 55 per cent), although in the period from 1990 to 1994 its production decreased from 121.8 to 81.0 million tonnes of oil equivalent. The coal industry is subsidized from the Federal budget and, because of social considerations, some subsidies will remain - on a lower level - at least until 2005.
4. In terms of 1994 Intergovernmental Panel on Climate Change, global warming potentials CO₂ accounted in 1990 for about 82 per cent of total greenhouse gas (GHG) emissions, methane (CH₄) for about 11 per cent, nitrous oxide (N₂O) for around 5 per cent and other gases for about 1.5 per cent. The 1990 inventory shows that emissions of CO₂ (excluding land-use change and forestry) in Germany amounted to 1,014,155 Gg. Total CH₄ emissions in 1990 amounted to 5,682 Gg, of which 36.0 per cent came from livestock, 32.9 per cent from waste and 27.3 per cent from fugitive fuel emissions. In the period 1991-1994 emissions of CH₄ decreased by about 8 per cent.
5. The national target is to reduce carbon dioxide (CO₂) emissions by 25 per cent by the year 2005 in comparison to 1990. There is no national target for other GHGs but it is expected that the measures implemented under the CO₂ reduction programme will cut emissions of other GHGs (including chlorofluorocarbons, CFCs) back by 40 to 50 per cent by the year 2005 compared to 1990. Coordination of climate change related activities is

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 Germany, which had no further comments.

entrusted to an interministerial working group established in 1990 and convened by the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety.

6. The main fields of action in the climate change programme are energy conservation, improving energy efficiency both on the supply and the demand side and fuel substitution. The proposed introduction of a CO₂/energy tax aroused strong opposition from German industry, which proposed to take voluntary actions aimed at increasing energy efficiency and reducing GHG emissions, provided such a tax was not introduced. In March 1996 a declaration by German industry and trade on global warming prevention was made public and accepted by the Government. The declaration states that industry's target is a 20 per cent reduction of CO₂ emissions by 2005 relative to 1990 levels, and it also includes a monitoring component. It is expected that as a result of the implementation of the declaration CO₂ emissions from industry, private households and small-scale consumers could be reduced by 170 Mt (170,000 Gg) by the year 2005. As a result of the declaration, the Government has postponed adopting regulatory measures directly targeting the industrial sector.

7. Greater use of natural gas is seen as one way of reducing CO₂ emissions. To this end Germany undertook a number of projects and concluded agreements with foreign producers to increase supplies of natural gas to the country. Nuclear power is considered to make an important contribution to the avoidance of CO₂ emissions in Germany, obviating up to 150 million tonnes of these emissions per year. However, there were no plans to build new nuclear power plants at the time of the visit, and after reunification all nuclear power stations in the new Länder were shut down for safety reasons. One of the major challenges for the Federal Government is abatement of GHG emissions from the transport sector and a number of measures are under consideration. Germany is actively promoting renewable energy, although the share of renewable energy in the fuel mix for electricity generation remains small (about 0.5 per cent). The buildings sector is given special emphasis in Germany's climate programme, and is expected to be a major contributor to the achievement of the national target, with a planned reduction in energy use in buildings of 25 to 30 per cent by 2000 (and a reduction in CO₂ roughly equivalent to this). A number of Länder have initiated specific local climate protection and energy efficiency programmes. Conservation of existing forests is seen as a major way to preserve the removal capacity of this sink. Support for new afforestation has been improved considerably since 1991. Subsidies for afforestation have been provided since the 1970's. In addition to a programme of afforestation and forest management, the Federal Government introduced a number of wide-ranging measures for combatting new types of forest damage caused primarily by air pollution.

8. Emissions of GHGs other than CO₂ have in general been declining, mainly thanks to improvements in technological processes or implementation of regulatory measures. For example, catalytic destruction of N₂O introduced at an adipic acid production facility slashed these emissions by 90 per cent at this source; emissions of tetrafluoromethane (CF₄) and hexafluoroethane (C₂F₆) from aluminium production are expected to fall by half by the end of the decade.

9. It was acknowledged by the German authorities that "the measures taken so far within the framework of the CO₂ reduction programme do not suffice to achieve the CO₂ reduction target". The reduction of Germany's CO₂ emissions from 1990 to 1994 was mainly due to the significant decrease in industrial activity and closure of inefficient and polluting lignite-fuelled power plants as well as reconstruction of infrastructure in new Länder. CO₂ emissions in the old Länder in this period increased slightly (by about 2 per cent). The projections submitted to the secretariat after the country visit cover CO₂, CH₄ and N₂O and provide both "with measures" and "without measures" scenarios for the year 2000 in comparison to the 1990 baseline. The projections indicate that total CO₂ emissions are expected to decrease (compared to 1990) by 9.6 per cent in 2000, 10.2 per cent in 2005, 11.6 per cent in 2010 and 13.5 per cent in 2020. The projections for methane emissions indicate that, compared to the 1990 level, they will decline by about 30 per cent by the year 2000; by the year 2020 this decline could amount to about 50 per cent. The scenario for nitrous oxide indicates that total N₂O emissions in Germany are projected to decrease by about 36 per cent by the year 2000 compared to 1990 and remain stable afterwards till the year 2020.

10. In 1991-1993 Germany made contributions of US\$ 147 million to the pilot phase of the Global Environment Facility. In the period from mid-1994 to mid-1997 it pledged to contribute another US\$ 240 million to the Facility. An additional amount of DM 5 million was allocated as direct financial assistance with respect to FCCC to a number of developing countries. Germany is actively promoting activities implemented jointly (AIJ) and is at present at the first stage of a pilot programme for AIJ with the aim of testing in practice the broadest spectrum of theoretically conceivable projects.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

11. Germany ratified the Convention on 9 December 1993. Its national communication was received by the secretariat on 28 September 1994. The in-depth review was carried out during the period from October 1995 to February 1997 and included a country visit by the review team in November 1995. Additional information was made available to the team and to the secretariat after the country visit. The review team consisted of Mr. Shaoxiong Xie (China), Ms. Ingrida Apene (Latvia), Mr. Yuichi Moriguchi (Japan), Ms. Fiona Mullins (Organisation for Economic Co-operation and Development), and Mr. Vitaly Matsarski (UNFCCC secretariat, Coordinator).

12. Unification of the two parts of Germany on 3 October 1990 had a major impact on the country. It also influenced the preparation of the first national communication, since the economies of the eastern and western parts were completely different. Statistical data in the new Länder (as the territory of the former German Democratic Republic (GDR) is referred to now) differed substantially and were difficult to reconcile with those of the Federal Republic. Reunification also led to drastic economic changes in the new Länder, such as the privatization of state-owned industries, closure of inefficient enterprises and highly polluting installations, and decommissioning of nuclear power plants for safety reasons.

13. In a series of resolutions adopted in 1990, 1991 and 1994 the Federal Cabinet approved a comprehensive programme aimed at reducing emissions of carbon dioxide (CO₂) by 25 to 30 per cent by the year 2005 in relation to 1987. This national target was further strengthened in April 1995 when, during the first session of the Conference of the Parties, the Federal Chancellor announced that Germany was committed to reducing CO₂ emissions by 25 per cent by the year 2005 in comparison to 1990. There is no national target for other greenhouse gases (GHG) but it is expected that the measures implemented under the CO₂ reduction programme will reduce emissions of other GHG by 35 to 40 per cent by the year 2005 compared to 1990.

14. Germany's climate change policy is based on a number of decisions taken by the Federal Government after consideration of reports prepared by the an interministerial working group established in 1990. The Working Group's third report (1994), and the Federal Government decision based on it, were used for the preparation of the first national communication. This decision indicates that, in implementing measures aimed at reducing CO₂ and other GHG emissions, Germany will take into account international consultations, the effects of these measures on its economy and the importance of a "precautionary and no regrets policy".

15. The coordination of climate change related activities is entrusted to the working group, which has the task of continuing to develop an overall concept for the reduction of CO₂ emissions as well as enhancement of carbon sinks and consideration of measures aimed at reducing emissions of GHG other than CO₂. The working group includes representatives from various federal ministries. Both during and after the visit, the team and the secretariat received additional documentation supplementing the initial communication, in particular the updated GHG inventory for 1990-1993 and the "Supplementary report of April 1996 to the first communication of the Government of the FRG pursuant to the UNFCCC - Projections for greenhouse gases" referred to in this review as the April 1996 report.

16. In 1990, per capita energy-related CO₂ emissions in Germany were about 12.8 tonnes - the highest among the European Community (EC) countries except Luxembourg - compared to an average of 8.9 tonnes for EC member countries and 11.8 tonnes for OECD countries. In 1994 this indicator for Germany decreased to 11.0 tonnes. Total primary energy supply (TPES) in the period from 1990 to 1994 fell by about 5 per cent, while total final consumption (TFC) also fell by around 3.5 per cent. From 1990 to 1994 the share of coal in TPES decreased from 36.2 to 28.5 per cent, while that of oil increased from 35.7 to 40.2 per cent, and that of natural gas rose from 15.5 to 18.2 per cent. The shares of nuclear energy and renewables remained practically unchanged at the level of about 11.4 and 0.5 per cent, respectively. In the same period electricity intensity (defined as production plus net imports divided by gross domestic product (GDP) and measured in kWh per dollar of GDP) decreased by about 3 per cent.

17. Germany's future energy policy, on which CO₂ emissions depend to a large extent, is still under consideration. The "consensus talks" involving all major political and economic stakeholders and aimed at developing the main directions of the energy policy have so far

produced limited results. In May 1994, an omnibus bill was passed which, inter alia, amended the Nuclear Energy Act (so that it is now allowed to store unprocessed fuel), and the Act on Feeding Electricity from Renewables into the Grid (fixing premium prices for electricity generated from renewables) and introduced an upper limit on subsidies to the coal-mining industry. Elements of competition are yet to be introduced into the electricity and natural gas sectors. At present the electricity supply system is based on the 1935 Energy Sector Law (partially revised in 1991) which brought about "demarcation agreements" and "concession agreements". "Demarcation agreements" among the electricity utilities delineate the territories on which they have exclusive rights to operate. "Concession agreements" are concluded between utilities and their "customers" on these territories; the customers are mainly local municipal bodies which, in return for granting these exclusivity rights, receive payments from the utilities of the order of 10 to 20 per cent of revenue. This system resulted in high electricity prices and does not provide strong incentives for the adoption of energy-saving measures by municipalities.

18. Germany has limited reserves of fossil fuel and it imports significant quantities of oil and natural gas; in total it imports over 55 per cent of its primary energy. Coal plays an important role in the energy balance, although in the period from 1990 to 1994 its production decreased from 121.8 to 81.0 million tonnes of oil equivalent (Mtoe). In the same period its share in final consumption grew from 10 to 13 per cent and its net imports increased from 7 to 15 Mtoe. The coal industry is subsidized from the Federal budget and the Länder and the team was informed that, because of social considerations, these subsidies will remain at least until 2005. The level of subsidies was fixed at DM 7.5 billion for 1996 and at DM 7.0 billion per annum for the 1997-2000 period. The share of coal in electricity generation in 1994 was 56.7 per cent, down from 58.8 per cent in 1990; in 1994 the share of nuclear energy was 28.8 per cent and those of natural gas, hydro and oil were 7.6, 3.5 and 1.7 per cent, respectively.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

19. In its national communication, Germany submitted inventory data for 1990 on both direct GHGs - CO₂, methane (CH₄) and nitrous oxide (N₂O) - and indirect GHGs - carbon monoxide (CO), nitrogen oxide (NO_x), and non-methane volatile organic compounds (NMVOC) - in the format recommended by the Intergovernmental Panel on Climate Change (IPCC), with the breakdown by source categories. Perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) were not included in the summary tables because at the time of preparation of the national communication they were not required by the draft reporting guidelines; these data were made available to the team at the time of the visit and updated in a separate submission to the secretariat in April 1996. Historical trends in GHG emissions were also included in the national communication for the following years: CO₂ for 1970 to 1993, CH₄ for 1970 to 1992, NO₂, CO₂ and NMVOC for 1970 to 1991. As requested in decision 3/CP.1 of the Conference of the Parties, Germany also provided the secretariat with inventory data for the years 1991-1993, at the same time slightly revising upwards its CO₂ emission data for 1990, the difference of 0.2 per cent being explained by better data on the emissions in the

new Länder. In general, emission inventory data communicated by Germany exceed the minimum requirements specified in the guidelines for the preparation of national communications.

20. Methodologies used for the preparation of emission inventories were country-specific, although they are similar to those recommended in the IPCC guidelines. The IPCC format was used for presentation of data only. A "top-down" approach was used for developing GHG inventories for old Länder and a "bottom-up" approach later converted into a "top-down" one was used for new Länder. Up to 1994 emission data were calculated separately for the eastern and western parts of Germany, owing to differences in underlying statistics, and then aggregated. In 1995 it became possible to use a single approach for both new and old Länder. Emission factors are also country specific although most of them do not differ significantly from those in the IPCC guidelines. Emission factors reported in the annex to the national communication, in particular energy-related ones, are based on more detailed emission factors, by type of fuel, by sector, and by type of technology, equipment and activity (e.g. emission factors for automobiles are disaggregated to different levels of emission control measures). The national communication contains a detailed table indicating the level of confidence in emissions data, ranging from "excellent" (3 to 5 per cent) for energy-related CO₂ emissions to "fair" or "poor" for CH₄ and N₂O, although no quantitative estimates were given for these latter confidence levels. Removals of CO₂ are not included in the national totals and emissions from international bunkers are also reported separately, as recommended by the Intergovernmental Negotiating Committee and as requested in the IPCC guidelines.

21. In terms of 1994 IPCC global warming potentials (GWP), **carbon dioxide** (CO₂) accounted in 1990 for about 82 per cent of total GHG emissions, methane for about 11 per cent, N₂O for around 5 per cent and other gases for about 1.5 per cent. The updated 1990 inventory shows that emissions of CO₂ (excluding land-use change and forestry) in Germany amounted to 1,014,155 Gg. The share of fuel combustion was 97.3 per cent, the remaining 2.7 per cent originating from industrial processes. Fuel combustion (including emissions from energy use in agriculture and forestry) contributed 986,640 Gg, of which 44.5 per cent was due to the energy and transformation sector, 20.1 per cent to residential, commercial and institutional uses, 17.2 per cent to industry and 16.1 per cent to transport; other end-uses accounted for the remaining 2.1 per cent. Relative inventory figures for anthropogenic emissions of CO₂ excluding land-use change and forestry for 1991-1995 in comparison to 1990 indicate a decrease of 13 per cent.

22. Methodologies for estimating removals of CO₂ by forests were adequately described in the national communication and were based on national methods, since the IPCC methodology was not considered suitable for Germany. Nevertheless, the team noted that the estimates of carbon sequestration in forests are approximate, since the last inventory of forests in Germany was done in 1987, next inventories will be done in 2002. The land-use change and forestry sector is assumed to be a net sink of 20,000 Gg of CO₂, although no data were given separately on emissions and removals for this sector.

23. Estimation of **methane** (CH₄) emissions is considered to be relatively uncertain, in particular because the amount of waste is evaluated in Germany every three to four years. Total CH₄ emissions in 1990 amounted to 5,682 Gg, of which 36.0 per cent came from livestock, 32.9 per cent from waste and 27.3 per cent from fugitive fuel emissions. In the period 1991-1994 emissions of CH₄ decreased by about 8 per cent.
24. Estimates of **nitrous oxide** (N₂O) emissions are described as uncertain but no percentage is given. N₂O emissions in 1990 were estimated to be about 211 Gg, of which 39.3 per cent came from organic chemical (adipic acid) production, 35.9 per cent from agriculture, and 12.0 per cent from inorganic chemicals (nitric acid). Relative inventory figures for emissions of N₂O for 1991-1994 in comparison to 1990 (100 per cent) are as follows: 1991 - 99 per cent, 1992 - 84 per cent, 1993 - 75 per cent, 1994 - 87 per cent.
25. In general, emissions of other GHGs had a tendency to decline in the period from 1990 to 1994. **CO** emissions, which amounted to 10,743 Gg in 1990, decreased by about 37 per cent, **NO_x** emissions (2,640 Gg in 1990) by about 16 per cent, and **NMVOC** emissions (3,155 Gg in 1990) by around 32 per cent.

III. POLICIES AND MEASURES

26. Germany's national communication lists 109 measures for reducing GHG emissions. Although the national communication does not indicate explicitly which GHGs are targeted by these measures, the majority of them seem to address CO₂. Intermediate indicators of progress or expected effects of measures were not mentioned; the status of implementation was given for many measures but not all. Additional information was provided to the review team on the implementation of many policies and measures. Some new measures are at the early stage of implementation, while some measures were implemented before adoption of the FCCC. It was difficult for the review team to evaluate the overall effectiveness of the current climate change policies, as the relative importance of various measures was not clear and the GHG reduction effects of the measures that have been implemented had not been assessed at the time of the visit. The review team was informed that measures cited in the national communication as having the greatest potential to effect reductions are measures which are still being debated in the European Union (EU) and have not been implemented: the Energy Management Act was amended with the aim of developing a Union-wide electricity and gas distribution system and applying the EU carbon/energy tax. The team was informed that the subsidies programme to support heat and power cogeneration and modernize the district heating network in the former GDR has been successful. In addition, the team was told that a large combustion plant ordinance for the eastern Länder to reduce SO₂, NO_x and particulates has been especially successful in reducing CO₂ emissions (this ordinance was part of the unification law and was not reported in the national communication).
27. The April 1996 report states that "the measures taken so far within the framework of the CO₂ reduction programme do not suffice to achieve the CO₂ reduction target". The team noted that the reduction of Germany's CO₂ emissions from 1990 to 1994 was mainly due to

the significant decrease in industrial activity and closure of inefficient and polluting lignite-fuelled power plants in new Länder rather than to the implementation of specific measures. CO₂ emissions in the old Länder in this period increased slightly (by about 2 per cent).

28. When the national communication was prepared it was envisaged that one of the main instruments for reducing CO₂ emissions would be a CO₂/energy tax adopted by all European Union member states. At the time of the visit the team was informed that introduction of a CO₂/energy tax had encountered strong opposition from German industry, which proposed to take voluntary actions aimed at increasing energy efficiency and reducing GHG emissions provided such a tax was not introduced. In March 1995, German industry published a declaration announcing its intention to reduce its specific CO₂ emissions or specific energy consumption by up to 20 per cent by the year 2005 relative to 1987 levels. The supplementary April 1996 report indicates that in March 1996 an updated and extended declaration by German industry and trade on global warming prevention was made public and accepted by the Government. This declaration states that the target is a 20 per cent reduction of CO₂ emissions by 2005 relative to 1990 levels. The new declaration was signed by industries and associations that account for more than 70 per cent of industrial final energy consumption and more than 99 per cent of the public power generation capacity. Each association that signed the declaration has given a quantitative estimate of the reduction potential for its members. It is expected that implementation of the declaration could lead to a fall in CO₂ emissions from industry, private households and small-scale consumers of 170 Mt (170,000 Gg) by the year 2005. A system of independent monitoring was agreed upon by the Federal Government and industrial associations. As a result of the declarations the Government has postponed adopting regulatory measures and has undertaken to "take full account of the voluntary agreements in an EU-wide CO₂/energy tax as long as voluntary agreement action is effective and business is able to show clear and effective proof of its CO₂ reductions through the monitoring system".

29. The team noted that the main fields of action in the climate change programme are energy conservation, improving energy efficiency and fuel substitution. More than 80 per cent of the measures described in the national communication are energy-related and aim at improving energy efficiency on both the supply and the demand side. The legal basis for energy-related measures includes the Energy Saving Act, which was adopted as a result of two oil crises, the Federal Emission Control Act and a number of ensuing ordinances and amendments to them as well as regulations, such as the Thermal Insulation Ordinance, Heating Appliances Ordinance, Heating Plant Operation Ordinance, Heating Costs Ordinance, Ordinance on Large Combustion Plants, Ordinance on Small Combustion Systems, and Technical Regulations on Air Quality Control. An amendment to the Energy Management Act is also an important part of the energy-law reform. It aims at the introduction of effective competition within the electricity and gas industries. This Act has not yet been implemented.

30. In the electricity sector, demarcation and concession agreements allow utilities to maintain high prices for non-industrial consumers (twice as high as for industries in 1995), act as barriers to competition and give little incentive for using energy efficient equipment on the production side, in particular combined heat and power (CHP). The Federal Cartel Office

started investigating the legitimacy of such agreements but no action has been taken so far. CHP was mentioned as one of the most important measures to improve energy efficiency on the supply side. Nevertheless, it seems to be encountering difficulties as the Act on the Sale of Electricity to the Grid has not yet been implemented in the part related to CHP. An amendment to the Act adopted in 1994 extends its coverage to electricity generated from organic residues and waste produced in the commercial use and processing of wood.

31. The Ordinance on Large Combustion Plants (adopted in 1983 and amended in 1990) resulted in closure of many lignite-powered plants in eastern Germany, leading to significant reductions in CO₂ emissions. This Ordinance supplemented a number of other measures in eastern Germany aimed at improving energy efficiency in all sectors. These measures included restructuring and privatization in all areas of the economy, including the energy sector, and adaptation of production and consumption patterns to those in the old Länder. A large inter-regional power generation and distribution company which owns and operates power stations and high-voltage transmission lines was privatized in 1994. In the new Länder municipalities are authorized to set up their own electricity production and distribution utilities if they agree to renounce their shares in regional companies. A number of high-voltage electricity connections between the new and old Länder have been established.

32. Coal still plays an important role in electricity generation and this industry will be supported by subsidies from the Federal budget and the Länder, as mentioned in chapter I above. The end of 1995 saw expiry of a long-term exclusive contract between the coal industry and electricity utilities. As of 1996 the latter are free to choose their coal suppliers; this policy thus introduces some competition into the electricity generation market with potential gains in energy efficiency. At the end of 1995 the law fixing import quotas and tariffs on hard coal in the western part of Germany also expired and, as it was never effective in new Länder, coal imports are now fully liberalized in Germany as a whole.

33. Greater use of natural gas is seen as one of the measures to reduce CO₂ emissions. To this end Germany undertook a number of projects and concluded agreements with foreign producers to increase supplies of natural gas to the country. In 1994 a pipeline delivering Norwegian gas to the new Länder was completed and a new agreement on supplies of natural gas from Russia was signed in 1995.

34. Nuclear power is considered to make an important contribution to the avoidance of CO₂ emissions in Germany, obviating up to 150 million tonnes of these emissions per year. However, there were no plans to build new nuclear power plants at the time of the visit. After unification all nuclear power stations in the new Länder were shut down for safety reasons and the nuclear option is not likely to be pursued in the near future as a measure to reduce CO₂ emissions, because of opposition from the public and environmental organizations.

35. Germany is actively promoting the wider use of renewable energy, although the share of renewable energy in the fuel mix for electricity generation remains small. In 1994 the

Federal Government allocated DM 10 million for development of renewable energy sources. This programme was extended for 1995 to 1998 with a total funding of about DM 100 million and provides direct investment grants for utilization of non-conventional sources of energy, such as wind power plants, photovoltaic plants, solar collectors, and biomass and biogas facilities. The amended Act on the Sale of Electricity to the Grid sets forth minimum payment levels for electricity generated from renewable energies. As a result of this measure the installed capacity of wind power increased in the period 1990 to 1995 from 61 MW to 1,122 MW, of geothermal power from 32 to 36 MW, and of photovoltaic from 1.6 to 10 MW. The team was informed that one of the largest electricity plants in Europe using biofuels was commissioned in late 1994, but further introduction of this technology is inhibited by its high costs. The Second Ordinance for Amendment to the Ordinance on Small Combustion Plants was implemented in 1996. This ordinance prescribes the maximum permissible waste-gas losses by specifying the relevant standards.

36. The majority of energy and emissions savings on the demand side are expected to come from the residential and commercial sector. The buildings sector is given special emphasis in Germany's climate programme, and is considered by the Government and environmental non-governmental organizations to be a major contributor to achieving the Government's target of a 25 per cent reduction from 1990 levels by 2005, with a planned reduction in energy use in buildings of 25 to 30 per cent by 2000 (and a reduction in CO₂ roughly equivalent to this). The amendment to the Thermal Insulation Ordinance came into force on 1 January 1995. The amended ordinance improves the energy performance of new buildings on average by 30 per cent (less for large buildings, more for small buildings). This ordinance puts German insulation standards for new buildings among the upper range of European standards. The effects of the amendment to the Thermal Insulation Ordinance were calculated at 8 million tonnes of CO₂ emission reduction per annum (out of a total of 117 million tonnes of CO₂ emissions for all households). This was the only measure for which the effects were provided (calculated by taking 200 buildings insulated to the former standard, renovating them to the new standard, and measuring the difference in net energy balance - the energy performance measurement required by the ordinance is a net annual balance which takes into account energy losses and solar gains, not just energy use). The Federal Government/Länder District-Heating Modernization Programme for the Area of Former GDR has been already implemented. The annual modernization rate is estimated on average to be about 4.5 to 5 per cent of the existing building stock, with up to 10 per cent for prefabricated concrete buildings and of around 2 per cent for small residential buildings. In 1992 a support programme was started with the aim of promoting heat and power cogeneration and modernizing the district-heating network in the area of the former GDR. The annual funding of the programme amounted to DM 300 million until 1995, the majority of which was concentrated on energy-generation plants.

37. The team was presented with a separate report prepared by the Federal environment ministry describing the involvement of local authorities in the mitigation of climate change, and with a report entitled "Cities for a sustainable development" prepared by the Association of German Cities and Towns, as well as with a list of Federal Länder which have initiated specific local climate protection and energy efficiency programmes. This information

indicates that municipalities are expected to play an important role in the overall efforts aimed at reducing GHG emissions. At present eight Länder have initiated climate-related programmes which mainly aim at improving energy efficiency at the end-user stage and taking measures to optimize use of public transport instead of private cars, as well as facilitating the penetration of renewable sources of energy.

38. The team was informed that one of the major challenges for the Federal Government is the abatement of GHG emissions from the transport sector. The number of passenger cars is growing rapidly and road haulage through Germany is expected to increase significantly. One of the most important measures taken was the increase in 1991 of the mineral oil tax; a further increase was approved in 1993 for the mineral oil tax on petrol and diesel fuels. However, the team was informed that the mineral oil tax would need to be doubled and road haulage charges greatly increased to achieve a reduction from 1987 emission levels by 2005. The additional tax revenue resulting from the increase in the mineral oil tax amounts to about DM 8.5 billion per year and it is to be used to reduce the debt of the German railways and finance urgent tasks in the transport sector. Since 1 January 1994, fuel taxes and prices in many neighbouring countries have been lower than in Germany. Therefore, Germany is striving to achieve greater harmonization of mineral oil taxes throughout the European Community. Another important measure that is pending is an EU directive defining guide values for CO₂ emissions of motor vehicles. By the year 2005 (2010 at the latest), newly registered automobiles are to have a maximum mean fuel consumption of 5 litres per 100 km. Combined rail-road transport was under consideration at the time of the visit with the aim of expanding the network of railway freight stations at 44 German cities. It was planned to allocate about DM 4 billion for this purpose, so that by the year 2010 about 100 million tonnes of goods could be transported by rail-road systems. With the measures implemented so far, one study shows that a 7 to 37 per cent increase in emissions could be expected in the transport sector by 2005.

39. In the agricultural sector, extensive methods have been supported since 1992. An important contribution to the reduction of CO₂ emissions in agriculture is expected to be achieved by reducing indirect energy use, and through extensive methods of production, including ecologically oriented cultivation methods. As the main sources of CH₄ and N₂O emissions from agriculture are livestock and nitrogenous fertilizers, the measures are aimed at improving cultivation methods and animal digestive efficiency. The proposal for a fertilizer ordinance which would establish proper practices in fertilizer use entered into force on 1 July 1996.

40. Emissions of GHGs other than CO₂ were in general declining, mainly thanks to improvements in technological processes or implementation of regulatory measures. For example, the Waste Avoidance, Recycling and Disposal Act adopted in September 1994 was designed to further reduce methane emissions from solid and liquid waste. Technical instructions on municipal waste management were implemented in 1993. The purpose of these instructions is to reduce the amount of solid municipal waste that must be stored in dumps and to promote waste separation and recycling. They also require that gas be collected and used at old dump-sites. The introduction of catalytic destruction of N₂O at an

adipic acid production facility reduced emissions of that gas by 90 per cent at this source; this technology is to be introduced at other facilities as well. Emissions of tetrafluoromethane (CF₄) and hexafluoroethane (C₂H₆) from aluminium production are expected to decrease by half by the end of the decade as a result of the switch to plants with prebaked anodes and modernization of the ovens.

41. Conservation of existing forests is seen as a major way to preserve the CO₂ removal capacity of this sink. New afforestation has been supported since 1991, mainly through subsidies to help defray initial investment costs, with the emphasis on planting of near-natural deciduous and mixed-species forests. Up to 85 per cent of eligible costs are reimbursed for planting of deciduous stands, and up to 75 per cent for mixed-species stands. Since 1991, a new-afforestation bonus has been paid. In 1993 the bonus amounted to DM 1,400 per year and hectare. Forest management techniques in which clear-cutting is largely avoided have gained considerable significance, since they avoid the releases of CO₂ and nutrient losses that occur when humus is temporarily lost through clear-cutting. In addition to a programme of afforestation and forest management, the Federal Government introduced a number of wide-ranging measures for combating new types of forest damage caused primarily by air pollution.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

42. It was not possible at the time the national communication was being drafted to produce meaningful projections for the whole of Germany on the basis of the different and often irreconcilable statistical data for new and old Länder. The national communication does contain some information on different scenarios for energy consumption and CO₂ emissions, as well as other GHG emissions (for the years 2010-2020 based on 1987-1991 figures), prepared in 1991-1993 by a number of private institutions, but the communication explicitly states that "the Federal Government has not adopted any of the statements made by these predictions".

43. The communication gave no projections for greenhouse gas emissions or for CO₂ sinks for the year 2000. Projections were provided for the year 2005 compared to 1990 for CO₂, CH₄, N₂O, NO₂, CO₂ and NMVOC, and there were aggregated 2005 projections on a GWP basis for CO₂, CH₄, and N₂O. The national communication did not disaggregate projections by sector. The German Government informed the team during the country visit that it would prepare projections for the year 2000 and estimates of the effects of measures. The April 1996 report which was submitted to the secretariat contains this information. The projections in the report cover CO₂, CH₄ and N₂O and provide both "with measures" and "without measures" scenarios for the year 2000 in comparison to the 1990 baseline, as requested in the guidelines. The report reiterates Germany's position on the validity of these projections indicating that "it does not adopt any of the conclusions to be drawn from the projections documented in the report, but will take into account the results when considering formulation and implementation of policies and measures to protect the climate system by reducing anthropogenic greenhouse gas emissions".

44. The basic assumptions used in developing the scenarios were as follows: zero population growth, 7 per cent growth in the number of private households, 1.7 per cent GDP growth in western Germany and 8.2 per cent in eastern Germany, 27 per cent total increase in industrial output. No information on the type of models used in the projections was given in the April 1996 report.

45. According to the "without measures" scenario for **total CO₂** emissions, these emissions would increase by 13 per cent by 2000, 19 per cent by 2005, 27 per cent by 2010 and 40 per cent by 2020 (1990 = 100 per cent). The "with measures" scenario takes into account currently implemented and some of the planned measures, as well as expected technological progress, but excludes the most recent measures, in particular the updated declaration by German industry and trade of March 1996. The projections indicate that total CO₂ emissions could decrease (compared to 1990) by 9.6 per cent in 2000, 10.2 per cent in 2005, 11.6 per cent in 2010 and 13.5 per cent in 2020. In the period 1990-2000 energy-related emissions are projected to decrease by about 10 per cent, with a decrease of about 14 per cent in energy and transformation industries, 30 per cent in industry and about 7 per cent in the small combustion category; in the same period transport CO₂ emissions are projected to increase by around 19 per cent. Emissions from industrial processes and carbon sequestration by forests are assumed to remain stable.

46. The "without measures" scenario for **methane** emissions projects them to remain stable over the period 1990-2020. The "with measures" scenario contains certain explicitly stated assumptions about possible developments in the major sectors responsible for these emissions: coal industry, production and distribution of natural gas, agriculture, waste management and waste water treatment. The April 1996 report indicates that it is primarily the mining industry, changes in livestock numbers and the implementation of the technical instructions on waste from human settlements that influence the results of the projections. It is projected, that compared to the 1990 level, methane emissions in Germany will decline by about 30 percent by the year 2000; by the year 2020 this decline could amount to about 50 per cent.

47. For **nitrous oxide**, the "without measures" scenario also projects stable emissions on the 1990 level up to 2020. The "with measures" scenario makes a distinction between assumptions for energy-related and for other emissions; these assumptions are described in the April 1996 report. This scenario indicates that total N₂O emissions in Germany are projected to decrease by about 36 per cent by the year 2000 compared to the 1990 level and remain stable thereafter till the year 2020.

V. EXPECTED IMPACTS OF CLIMATE CHANGE

48. The national communication provides adequate information on the state of research into climate change and its expected impacts. These research activities cover both global and local scales, e.g. they attempt to estimate the possible effects of climate change on sea level, sensitive habitats and sectors of the economy, as well as the social and economic

consequences of climate change and feasible options for political actions. A special research institution was established in 1991 with the aim of developing, evaluating and applying interdisciplinary theories and models of interaction between natural and anthropogenic processes in relation to global climate change. At present, the main emphasis is put on evaluating the possible influence of climate change on coastlines, with a special programme which has been started at the Federal/Länder levels. No specific adaptation measures have been implemented yet.

VI. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

49. In 1991-1993 Germany contributed US\$ 147 million to the pilot phase of the Global Environment Facility (GEF). In the period from mid-1994 to mid-1997 it pledged to contribute another US\$ 240 million. The team was informed that an additional amount of DM 5 million had been allocated as direct financial assistance with respect to FCCC to a number of developing countries.

50. Germany considers one of its important tasks to be assistance to developing countries in the field of capacity building, in particular in relation to climate change activities. In this respect, it is assisting ten developing countries in the preparation of their national GHG inventories, and as a second phase it envisages facilitating the preparation of national communications by these countries.

51. In 1992, the Federal Government set up a special consultative and assistance programme for countries in transition to a market economy. Assistance is provided in the form of consultancy, training and equipment. In addition, more than DM 40 million was provided recently to finance a number of environment protection projects in central and eastern Europe.

52. Transfer of technology mainly takes the form of consultancy projects, licensing, training of personnel in Germany or abroad, and environmental assessment of traded goods. Special emphasis is put on improving energy efficiency, using adequate technologies and introducing equipment to produce energy from renewable sources. Private-public partnerships, under the auspices of the Business Council for Sustainable Development for example, are also considered to be a channel for transfer of technology.

VII. ACTIVITIES IMPLEMENTED JOINTLY

53. By way of additional information, the Federal Government also submitted to the secretariat a 1996 progress report on activities implemented jointly (AIJ). The report indicates that the aim of the German pilot programme for AIJ is to test in practice the broadest spectrum of theoretically conceivable projects. At present, the Government is engaged in a process of discussion with all industrial sectors in order to initiate pilot AIJ

projects. To that end a booklet describing the AIJ concept and criteria for the selection and implementation of projects has been published and distributed both in Germany and abroad.

54. The main criteria, as defined by Germany, are to ensure that pilot AIJ projects are in line with relevant national environmental and developmental policy priorities and strategies, are subject to prior approval by the governments concerned, and result in actual, measurable and lasting environmental benefits relevant to the mitigation of climate change. The projects should be funded from additional sources pledged by developed countries, and should be scientifically supported and adequately documented. Two pilot projects on renewable energy in Indonesia and Latvia are reported to be under way and five more (in the Czech Republic (2), Romania, Portugal and the Russian Federation) were at the planning stage with implementation dates in 1997-1998.

VIII. RESEARCH AND SYSTEMATIC OBSERVATION

55. The Federal Government's spending on environmental research and related technologies amounts to about DM 1 billion annually. Additional funding is provided by the Federal Ministry of Environment, Nature Conservation and Nuclear Safety, the Federal Ministry of Food, Agriculture and Forestry, the Federal Ministry of Economic Cooperation and Development and some other institutions and agencies.

56. The main research areas are systems research, which seeks to improve understanding of the interaction between natural and man-made systems, effects research aimed at assessing the effects of anthropogenic influences, and research into mitigation and adaptation. Germany actively participates in international climate related activities, including the IPCC, the International Geosphere and Biosphere Programme, and the World Climate Research Programme. At the national level, the Federal Government established a scientific advisory board on global environmental change which provides recommendations on possible mitigation and adaptation actions.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

57. The team was impressed with the high level of public awareness on environmental issues, including climate change. It took note of a long history of public involvement in the development of the national environmental policy. It welcomed the fact that both environmental and business non-governmental organizations participate in the discussions and actions related to mitigating adverse effects of climate change.

58. Activities related to education, training and public awareness were adequately described in the national communication and additional information was provided to the team during the visit. It included, in particular, booklets, leaflets and visual aids aimed at both general public and specific groups, such as engineers, business community and architects. The team noted a programme of subsidies for on-site advising by engineers on such issues as

structural thermal insulation, heating system technology and use of renewable energies. It found this programme innovative and potentially replicable.

59. A number of public awareness programmes are being conducted by the German Institute for Adult Education. Among them there is a trainer's training programme "Concepts for the Protection of the Earth's Atmosphere" which has a strong climate related component.

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