UNITED
NATIONS

Framework Convention
on Climate Change

Distr.
RESTRICTED

FCCC/IDR.2/POR

20 October 1999
ENGLISH ONLY

PORTUGAL

Report on the in-depth review of the second national communication of Portugal

Review team:

Newton Paciornik (Brazil)
Anca Popescu (Romania)
Henk Merkus (Netherlands)
Katia Simeonova (UNFCCC secretariat, coordinator)

Also available on the World Wide Web (http://www.unfccc.de)

GE.99-

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

1. The secretariat received the second national communication (NC2) of Portugal under the United Nations Framework Convention on Climate Change (UNFCCC), on 26 November 1997. An in-depth review of the national communication was carried out between May and September 1999, including a visit to Lisbon from 18 to 22 May 1998. The review team consisted of, Dr. Newton Paciornik (Brazil), Dr. Anca Popescu (Romania), Mr. Henk Merkus (Netherlands) and Dr. Katia Simeonova (UNFCCC secretariat, coordinator).

2. Portugal is situated in the western part of the Iberian Peninsula. Although the annual average temperatures in the range of 7˚-18˚ C and the annual average precipitation of 900 mm, suggest a relatively mild climate, the climate pattern is in fact diversified across the territory. Moreover, the precipitation, which is unevenly distributed between the mountainous northern regions and the south coast in a wide range of 350-2000 mm, is intensive only for a relatively short period of time, thus contributing to soil erosion and desertification. The coastline is 800 km long and coastal erosion represents a serious threat to sustainable management of the coastal zone, for tourism and for the majority of the population, which lives in a narrow coastal strip between Lisbon and the north of the country. Therefore, the national policy-making process has been strongly influenced by the vulnerability of the country to climate change and the public awareness of the issue.

3. During the last two decades, Portugal has enjoyed steady economic development, with an average annual gross domestic product (GDP) growth rate of about 3.1 per cent during the period 1975-1990, followed by a decline from 5 per cent in 1990 to –1 per cent in 1993 during the recession in the 1990s, and an increase thereafter to 2.5 per cent in 1995. The economic growth was accompanied by profound structural changes in the economy with a steady growth in the share of services and especially of tourism at the expense of industry. The resulting economic pattern in 1996 showed a share of services in GDP of 60 per cent, followed by industry at 36 per cent and agriculture 4 per cent. Tourism was the most dynamic sector of the economy, growing at an annual rate of about 7 per cent and accounting for 9 per cent of GDP in 1996. Economic development in Portugal in the last decade has been influenced by the country's membership of the European Community (EC), especially by the agricultural and structural funds. Economic policy in recent years has been geared towards reducing the budget deficit and restraining inflation in order to meet the Maastricht criteria for entry into the European Monetary Union.

4. As far as the energy consumption pattern is concerned, industry was the dominant energy-consuming sector in 1996 with 41 per cent of the total final energy consumption (TFC), followed by transport with 33 per cent and the residential, agricultural and service sectors, which together took 26 per cent. In terms of the total primary energy supply (TPES), oil and oil products accounted for 69 per cent in 1996, followed by coal with 18 per cent, hydro energy 7 per cent and biomass 6 per cent. Not only has the TPES increased during the last two decades at an annual pace of 4 to 5 per cent on average to meet the demands of a growing economy, but the energy intensity has increased rapidly as well. In fact, Portugal was among the few

members of the Organisation for Economic Co-operation and Development (OECD) whose energy intensity increased over this period, from 0.18 (tonnes of oil equivalent (toe) TPES per thousand US$ 1990) in 1973 to 0.26 (toe TPES per thousand US$ 1990) in 1994. This influenced the carbon intensity of the economy, with specific energy-related emissions of carbon dioxide (CO_2) growing from 0.43 kg CO_2 per US$ 1990 in 1973 to 0.7 kg CO_2 per US$ 1990 in 1995.

5. The installed capacity of 9810 MW in the Portuguese electricity sector in 1996 was shared almost equally between hydro and thermal capacity. The distribution of generation in recent years has been about a third each for coal, oil and hydro, but the exact pattern depended on the hydrological conditions. Thus, 1996 for example was a wet year and 43 per cent of electricity came from hydro, 37 per cent from coal, 18 per cent from oil and 2 per cent from biomass. In the late eighties, an option to construct a nuclear power plant was considered but was not followed up, although no formal decision to ban nuclear power has been taken.

6. Since 1986, Portugal has been a member of the EC and as the first in-depth review report emphasized, its energy, transport and industrial policies have been determined to a growing extent by the EC. Since climate change policy in Portugal was based on the environmental and energy policies, the positive outcome of climate change policy was to a large extent due to the support provided from the EC structural funds for diversification of energy supply, energy efficiency, renewables and environmental projects. An example in this regard was the Energy Programme launched in 1994 with the support of the EC, which had the overall objective of increasing energy efficiency, promoting renewables and introducing natural gas.

7. In the preparation of the NC2, the Ministry of Foreign Affairs served as the key government institution in coordinating the efforts of the working groups from nine ministries and associated institutes working on climate-relevant policies, actively supported by the Institute of Meteorology. The review team learned that an Interministerial Commission on Climate Change was planned to be set up shortly after the review visit, chaired by the Minister for the Environment, with the objective of coordinating the process of climate policy formulation and implementation at both national and EC level. Another new institution to be set up soon after the visit was the Council for Sustainable Development under the Portuguese Council of Ministers. This council was expected to streamline the efforts to address environmental issues effectively, including climate change, by involving in the decision-making process all the important stakeholders and social partners, such as representatives of the ministries, environmental and business non-governmental organizations, labour organization and the business community. The team noted that the strengthening of the national institutional setting reflected a political will to achieve more effective implementation of stronger commitments under the Kyoto Protocol.

8. While the first national communication (NC1) of Portugal under the UNFCCC did not mention any target relating to CO_2 emissions, the 1996 *National Programme for Limiting Emissions of CO_2 and other Greenhouse Gases* was the first policy document to introduce the target to limit the CO_2 emissions growth to 40 per cent by the year 2000 compared to the 1990 base year. The target has changed in the NC2 as a result of policy evolution, limiting the CO_2

emissions growth to 40 per cent in the year 2010 compared to the base year. Finally, Portugal signed the Kyoto Protocol on 29 April 1998 together with other EC countries. According to the June 1998 EC Council conclusion under the EC Internal Burden Sharing Agreement, Portugal was allowed to increase its overall emissions of six gases under the Kyoto Protocol by 27 per cent by the period 2008-2012.

9. The team gathered that the climate change policy in general, and the target in particular, needed to be considered in the context of Portugal's high priority for economic development. In addition, it was emphasized to the team that Portugal was among the EC countries with the lowest per capita CO_2 emissions of 5.13 tonnes in 1995, and it would most likely retain this position by the year 2000 despite the projected emissions growth. The team noted that there was a range of "no regrets" policies and measures available in Portugal that could be implemented on top of the existing measures, which could bring economic benefits and at the same time moderate the emissions growth below the projected 69 per cent growth of CO_2 emissions in the year 2010 compared to 1990. To implement such measures, however, improved policy planning and better coordination among institutions would be necessary. The work on the action plans with municipalities was just one example of such well coordinated effort.

10. With respect to the adherence to the UNFCCC guidelines, the team concluded that while most of the information required was presented in the NC2, the degree of completeness of this information varied substantially from chapter to chapter and many of the recommended table formats were used only to a limited extent, or not used at all. During the visit, the team was provided with a wealth of new information, data and analysis which clearly indicated that climate change was one of the most dynamically evolving policy areas in Portugal and that there were many actions and policy interventions which could directly or indirectly bring a positive change in current and future emission trends, including the recent developments in the waste management and transport policies.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

11. In the NC2, Portugal presented greenhouse gas (GHG) inventory results for the main GHGs, including CO_2, methane (CH_4) and nitrous oxide (N_2O), and precursors for the 1990-1994 period covering all important sources as well as land-use change and forestry, which was a net sink. The estimates of emissions were reported using the 1995 IPCC Guidelines, as the IPCC 1996 Revised Guidelines were not available at the time of preparation of inventory. The IPCC standard data tables were given in the NC2, while the worksheets on energy, agriculture and land-use change and forestry (LUCF) were absent. Detailed information on the methodology used by the sector was also missing, which made reconstruction of the inventory difficult. Even so, the review team believed that, in general, Portugal had respected the IPCC guidelines in reporting its annual GHG inventory results. The new information provided to the team during and after the visit significantly augmented the information on the GHG inventory presented in the NC2.

12. Portugal did not submit its annual inventory for 1995 and 1996, but the team was informed that experts have been working on these inventories using the IPCC1996 Revised Guidelines and simultaneously have been preparing the background document on the inventory. During the visit, the team was provided with updated estimates of the emissions already presented in the NC2 for 1990-1994, with minor changes resulting from the elimination of some small errors discovered in the previous estimates. Therefore, all the analysis in this section of the report is based on both the information contained in the NC2 and the updated GHG emission estimates.

13. The Portuguese GHG inventory was prepared by the Institute of Meteorology of the Ministry of Environment. The team found that there were just a few experts involved in the process and capacity constraints have already become a bottleneck in producing the annual GHG inventory and in updating the historical emission trends. As to the methodology used, the team learned that for the inventory given in the NC1 mainly the CORINAIR was used to compile the inventory and the results obtained were subsequently transformed to the IPCC formats. In contrast, in the NC2, both IPCC and CORINAIR methodologies were applied. In particular, the IPCC methodology was found to be more suitable to estimate the emissions from agriculture, solid waste, industrial process some combustion activities, and land-use change and forestry in Portugal.

14. The majority of activity data for the GHG inventory came from official statistics, mainly from the National Statistical Institute and the Directorate-General for Energy, which was responsible for the energy balances. Another set of activity data came from the Ministry of Agriculture, Rural Development and Fisheries and the Waste Institute. As CORINAIR was chiefly used for estimates of emissions from energy sources, the core activity data from central statistics were supplemented by information from large combustion sources, such as electric power plants, refineries, petrochemical plant, iron and steel plant, pulp and paper plant and other sources such as cement plants. Among activity data for energy, the most difficult task was to obtain accurate data on biomass. In industry, these data were collected by using annual surveys on commercial use of biomass conducted by the National Institute of Statistics. In households such surveys were not conducted on a regular basis, and to improve the situation, in 1998 a new survey was conducted on the energy consumption pattern in this sector with special emphasis on commercial biomass use. Data for bunker fuel were taken directly from airports and it was found difficult to split the data between national and international fuel use. In regard to fertilizer use, estimates for Portugal of the Food and Agriculture Organization of the United Nations were used, since there was no statistics on the export and import of fertilizers. The source of other data in agriculture was the national census on animals, which is conducted annually. The national forestry inventory served as a source of data for the forests, the most recent one having been conducted in 1995. Efforts have been made to improve the quality of these data by launching a pilot project for use of satellite images of the forest for the years between two consecutive inventories. In the transport sector, the data for car mileage on highways were available on an annual basis, which made it possible to split all the fuel used for road transport into two parts, one part used by cars on highways and the rest.

15. The team noted the efforts of the inventory team to improve the quality of emission factors, although some gaps still remained. These factors come mainly from international sources, such as the IPCC Guidelines, CORINAIR/EMEP, publications of the United States Environmental Protection Agency and the Netherlands Institute for Public Health and Environment. Expert judgment was used to select the most appropriate values for Portuguese conditions and technologies from the sources listed above. Most of the emission factors used in the NC2 were taken from CORINAIR 94, in contrast to the NC1 where most of the factors were taken from CORINAIR 90, because the host country experts believed that the former gave a better approximation to the country conditions. Finally, country-specific emission factors used included a nitrogen oxides (NO_x) emission factor for power plants, emission factors for the transport sector and a factor for the forest growth rate. The team noted the efforts to come up with more precise emission factors for industrial processes in the pulp and paper industry, and the iron and steel industry.

16. The team noted that for some sectors and gases there was a sizeable difference between the 1990 inventory figures reported in the NC1 and NC2, with the updated emission estimates being very close to those reported in the NC2. Thus, the total estimates of CH_4 emissions were revised upward more than fifteen times, primarily to account for emissions from waste, and the estimates of carbon sink were revised downward dramatically. The team found that these changes were due mainly to the improvements in methodology, data quality and emission factors.

17. The team was informed that all the forest in Portugal was managed and about 80 per cent was used for commercial purposes with the remaining part being preserved. The in-depth review of the NC1 noted that the value of 70,000 Gg reported in the NC1 for the annual removal of CO_2 in 1990 was extremely high and it was revised during that review visit to 29,718 Gg using the IPCC Guidelines. This value was further reduced to 1,152 Gg in the NC2 owing to the use of the IPCC Revised Guidelines and a revision of emission factors, because it was found that the emission factors used in the former estimates were not appropriate for the conditions of Portugal.

18. The team noted that no emissions were reported in the land-use change and forestry sector for “forest and grass land conversion, and “abandonment of agricultural land”. Although available from CORINAIR estimates, GHG emissions from forest fires were not reported, under the assumption that the existing regulations required the area after the fire to be replanted within two years. Even so, the team advocated that the emissions from forest fires to be reported, together with the estimates of regrowth rates for reforested areas. The figure of 11, 432 Gg CO_2 emissions from forest fires in 1990 was given to the team from CORINAIR sources. The team also noted that only the commercial part of the forest was accounted for in estimating the forest growth rate, as the assumption was that the removal values also applied only to the commercial part. This assumption cannot be regarded as a valid one, as the expansion rate should be applied to both the growth rate and removal quantity to account for the limbs, roots and small trees that store carbon and represent an emission source when cut and left to decay.

19. The CH_4 emissions from waste for 1990 were also substantially revised from 35 Gg in the NC1 to 578 Gg in the NC2. The team learned that the first reason for the change was that the estimates in the NC1 were based on a per capita approach for activity data and an emission factor of 15 kg/tonne taken from CORINAIR. In the NC2, the IPCC Guidelines and methodology were used with more precise estimates for activity data in terms of both the waste deposition rates and change of the emission factor. The latter was more than three times higher in the NC2 than the one used in the NC1. A new source, namely industrial solid waste, was included in the inventory, with an assumption that the percentage of organic content was the same as in the municipal solid waste from urban areas. The review team noted that the new estimates from the waste sector seemed to be too high, which called for further careful examination. Emissions from solvent use constituted another area where the host country believed more precise estimates were provided in the NC2 compared to the NC1, mainly thanks to the improvement of activity data by using the mass balance for their estimates.

20. Estimates of CH_4 and N_2O emissions from agriculture for 1990 have been revised upwards by about 25 and 100 per cent respectively, because of the use of IPCC methodology in the NC2 and CORINAIR in the NC1. The team was also informed that the lack of reporting for some subsectors of agriculture, such as "burning of agricultural residues", was due to the fact that this practice was limited in Portugal and forbidden for the period from March to October.

21. No emissions of the new gases, such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), or emissions of sulphur oxides (SO_x) were reported in the NC2. The team was informed that estimates of the SO_x were available, while no assessment of the emissions of the new gases has been done because of capacity constraints and lack of statistical data. The team encouraged preparation of such emission estimates using the IPCC Guidelines and the change-in-stock approach for the products containing HFCs and SF_6, while for PFCs activity data from the aluminium smelters should be used.

22. Emissions associated with international bunker fuel were estimated in the NC2 and not included in the national totals, as required by the IPCC Guidelines. Activity data were based on the sales of fuel to foreign airlines and ships only. The team noted that such an approach may introduce some errors, as the emissions from international bunker fuel use should be attributed to the international flights, even in cases where these flights are performed by the national carrier.

23. The team found that the comparison of the GHG inventory results with the IPCC reference approach required by the IPCC Guidelines was missing, and strongly recommended that such a comparison be done to improve the transparency of estimates and to avoid possible errors. The team also noted that, in the information on the time series, the estimates for several sectors remained constant, including emissions from industrial processes, from some agricultural activities and the forest sink. The explanation was found in the lack of activity data for the entire 1990-1994 period at the time when the NC2 was prepared, but the team stressed that the updating of these estimates using the actual activity data needs to be done.

24. In regard to the uncertainty estimates, a table with qualitative information based on expert estimates was presented in the NC2. Deliberations during the visit revealed that the estimates of CH_4 emissions from waste were regarded by the host country experts as an area with the highest uncertainty, in contrast to the CO_2 emission estimates which had high confidence and estimates of all other gases and sources, which were accorded medium confidence. The review team found that estimates of some other categories, such as land-use change and forestry and some agricultural subsectors could be regarded as highly uncertain too.

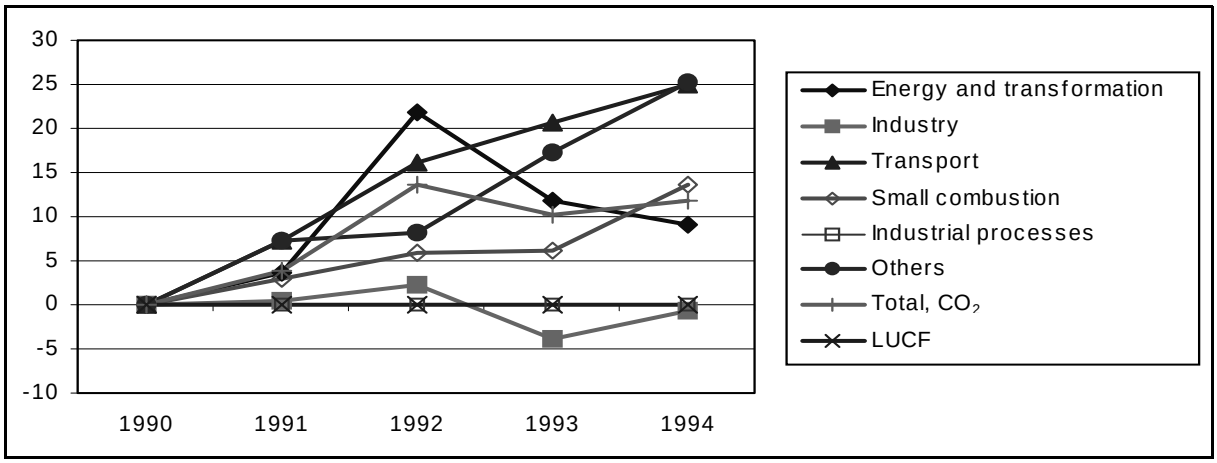
25. The total CO_2 emissions in Portugal in 1994 amounted to 51,340 Gg, with 91 per cent arising from all energy activities (37 per cent from energy and transformation, 30 per cent from transport, 14 per cent from industry, and 10 per cent from the residential, institutional and commercial sector) followed by 7 per cent from industrial processes and 2 per cent from others. LUCF was a net sink estimated at 1,152 Gg CO_2 in 1994. Transport was the fastest growing sector with an increase in emissions of 3,000 Gg CO_2, or 24 per cent over the 1990-1994 period, followed by 14 per cent growth of emissions from the residential, institutional and commercial sector and 9 per cent growth of emissions from energy and transformation (table 1 and figure 1).

Table 1. CO_2 emissions by sector, 1990-1994 (Gg)

	1990	1991	1992	1993	1994
Energy and transformation	17,219	17,859	20,964	19,255	18,801
Industry	7,225	7,253	7,397	6,939	7,179
Transport	11,998	12,869	13,923	14,470	15,009
Small combustion	4,468	4,601	4,734	4,743	5,074
Industrial processes	3,421	3,421	3,421	3,421	3,421
Others*	933	1,000	1,010	1,094	1,168
Total, CO_2	**45,264**	**47,003**	**51,449**	**49,922**	**50,652**
LUCF	-1,152	-1,152	-1,152	-1,152	-1,152

* Others include emissions from other energy combustion, fugitive emissions and solvents

Figure 1. Percentage change in CO_2 emissions, by sector relative to 1990

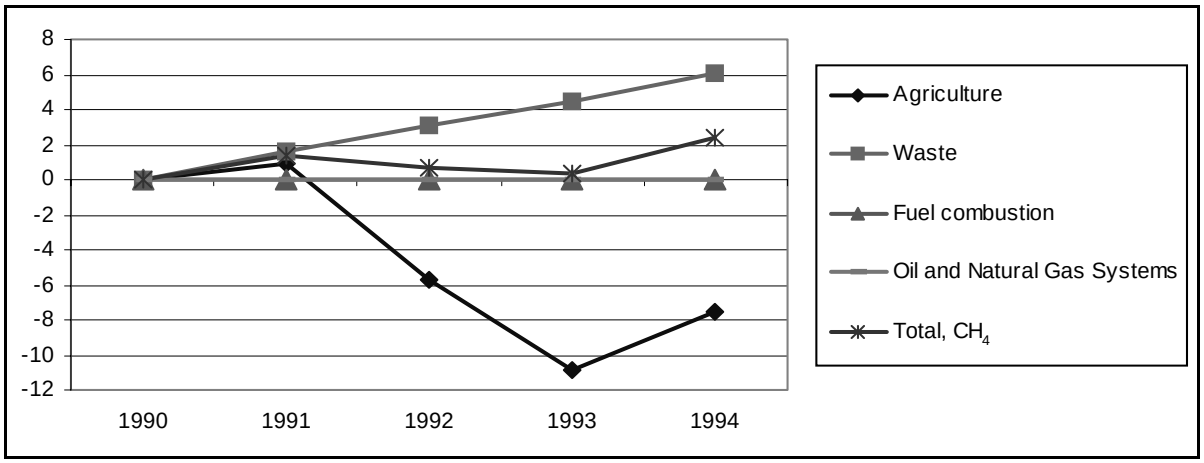


26. CH_4 emissions reached 830 Gg in 1994. The major sources of emissions remained waste with 74 per cent, and agriculture with 24 per cent, the remainder coming from the energy sector. A slight 2 per cent increase in total CH_4 emissions for the 1990-1994 period was attributed primarily to waste (table 2 and figure 2).

Table 2. CH_4 emissions by sector, 1990-1994 (Gg)

	1990	1991	1992	1993	1994
Agriculture	211	213	199	188	195
Waste	578	587	596	604	613
Fuel combustion	15	15	15	15	15
Oil and natural gas systems	4	4	4	4	4
Total, CH_4	**808**	**819**	**814**	**811**	**827**

Figure 2. Percentage change in CH_4 emissions, by sector relative to 1990

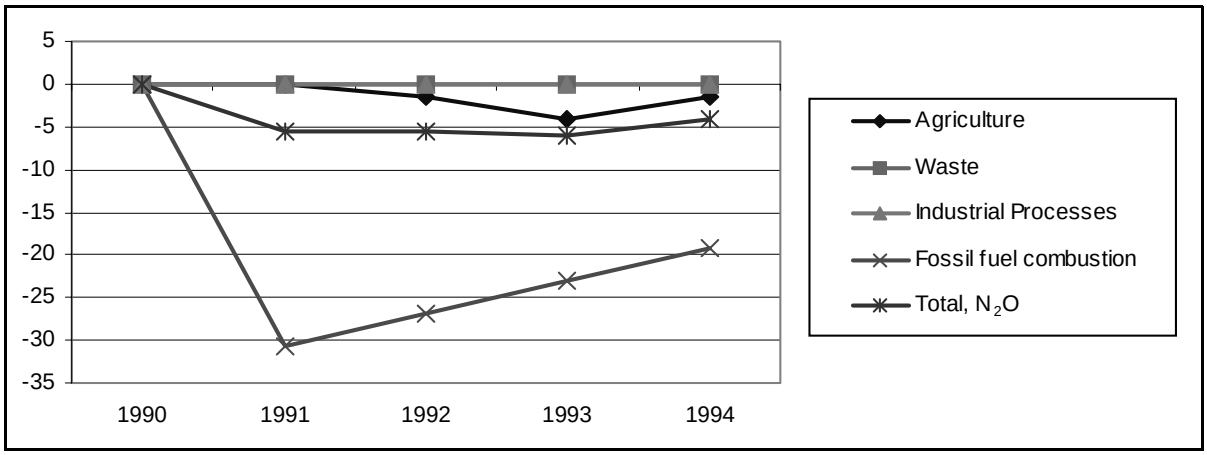


27. N_2O emissions in 1994 were estimated at 14 Gg, originating primarily from agriculture 51 per cent, waste 21 per cent, fossil fuel combustion 15 per cent and industrial processes 13 per cent. N_2O emissions remained relatively stable in the period in question (table 3 and figure 3).

Table 3. N_2O emissions by sector, 1990-1994 (Gg)

	1990	1991	1992	1993	1994
Agriculture	7.3	7.3	7.2	7	7.2
Waste	2.9	2.9	2.9	2.9	2.9
Industrial processes	1.9	1.9	1.9	1.9	1.9
Fossil fuel combustion	2.6	1.8	1.9	2	2.1
Total, N_2O	**14.7**	**13.9**	**13.9**	**13.8**	**14.1**

Figure 3. Percentage change in N_2O emissions, by sector relative to 1990



III. POLICIES AND MEASURES

28. Portugal provided limited information in the NC2 on the policies and measures to mitigate climate change. In the course of the visit, however, the team was extensively briefed on a number of such policies and measures, as well as individual projects, which directly or indirectly related to climate change. Nevertheless, it appeared to the team that so far there was no integrated climate change policy. The Portuguese National Environmental Plan, under implementation as of 1998, could be regarded as an important step towards formulation and implementation of integrated environmental and climate policy. Furthermore, at the end of 1998, Portugal was planning to draw up a national plan for the implementation of Portugal's commitments under the Kyoto Protocol and the EC Burden-Sharing Agreement.

29. With regard to the role of institutions in supporting the policy-making process, the team noted the close cooperation between the National Institute of Engineering and Industrial Technology (INETI) and the Directorate-General for Energy of the Ministry of Economic Affairs for policies in the energy sector, the role of the Waste Institute established in 1996 under the Ministry of Environment to address policies in the waste sector, and support received by the Ministry of Agriculture, Rural development and Fisheries from the National Research Institute for Forestry.

30. The review revealed that monitoring and evaluation of the effect of measures did take place, but only at the level of individual projects, which was due to EC requirements for financing projects. Two examples given in this regard were the evaluation of projects under the Energy Programme and the system of monitoring in the forestry sector. Even so, the team advocated a stronger role for integrated monitoring on a sectoral and national level, which was lacking at the time of the visit. The lack of monitoring may become a bottleneck for effective implementation of commitments, also taking into consideration the fact that collection of emission data for previous years was rather a complicated process.

31. In general, the team concluded that Portugal had met the reporting requirements in the policies and measures section of the NC2. The information in the NC2 was, however, presented only by sector, not by sector and by gas, with reference to the type of policy instrument used, status of implementation and estimates of effects. As to the measures targeting non-CO_2 gases, in the NC2 they were limited only to agriculture.

A. Carbon dioxide

1. Energy supply

32. Portuguese policy in the energy sector was geared towards ensuring diversity and security of energy supply, increased efficiency and market liberalization, while meeting the environmental protection objectives in all subsectors, including electricity, oil, gas and renewables.

33. The national electricity sector has been transformed in recent years as a result of the liberalization of the electricity market driven mainly by the EC and particularly by the requirement to implement the 1997 directive on the EC electricity market in the national legislation by 1999. The objective of this policy was to introduce competition in electricity generation and private financing for electricity system expansion, to reduce electricity costs and to further diversify energy sources. The process of deregulation in Portugal started in 1988, when a law ended the exclusive rights conferred on the national electric utility, Electricidade de Portugal (EdP), and the power generating sector was opened to other economic agents. Further restructuring of EdP took place in 1991-1994, resulting in a new structure called Grupo EdP, which consisted of a holding company; a production company, a grid company, four distribution companies operating on a regional basis and ten service companies.

34. In 1995 and 1997 new legislation was introduced to regulate the electricity sector, framing in a single concept of the National Electric System (SEN) all the players of the sector. The SEN consists of two different systems: the Public Service Electric System (SEP), also called the Binding System, and the Independent Electricity System (SEI). The SEP is responsible for ensuring the security of electricity supply and is obliged to supply with electricity every consumer who so requests. The SEI, on the other hand, does not have to comply with the public service requirements; it is oriented towards the electricity generation activities regulated by specific legislation and to the Non-binding System (SENV). These activities include combined heat and power plants (CHP), small hydro up to 10 MW and other renewable energy sources.

35. Electricity prices in Portugal have been relatively high compared to the average EC level. Until 1998 electricity tariffs had to be agreed between the Grupo EdP and the Directorate-General of Competition and Prices in collaboration with Directorate-General for Energy. As of 1999 the new regulatory authority set up in 1996 by the Council of Ministers will establish and publish the new electricity tariff based on the 1998 Tariffs Code. In general, Portugal regarded introduction of a CO_2/energy tax as not equitable for the countries with low

values of indicators, such as CO_2 per capita and GDP per capita, compared to the other EC member States.

36. The diversification of energy supply by introducing natural gas and steadily increasing its share was stressed in the NC2 as the policy with a major impact on CO_2 emissions. During the visit the team was briefed on the latest developments with respect to both policy and projects to introduce natural gas. The supply of natural gas started very recently in Portugal. The first 900 MW combined cycle gas turbine plant, owned by private shareholders, was commissioned in 1998 and there are plans to construct a second pipeline in the interior of the country, parallel to the existing one along the coast. As the Portuguese natural gas market is a recent creation, with only one pipeline and one single supplier as of 1998, there are no concrete plans for the introduction of competition there.

37. The energy legislation was changed in 1995 to give more incentives to CHP. Thus, the supply companies were obliged to purchase excess electricity from industrial CHP at premium rates. Furthermore, under the Energy Programme, 10 cogeneration plants with an average installed capacity of 2-3 MW each were subsidized to switch from oil to natural gas. The results obtained were indicative of the success of the policy, as the installed capacity of CHP, rose from 700 MW in 1990 to 1,110 MW in 1996.

38. The team was informed that coal was likely to remain an important energy source, as coal-fired power plants were rather new. In 1993 a new coal-fired power plant, with two 300 MW units was commissioned, operated by a private consortium, Tejo Energia. The coal used was imported, since the only two coal mines in Portugal were closed down in 1995. One power station on oil was recently converted to dual fired also allowing use of natural gas.

39. As of 1993, Portugal liberalized its oil sector; fixed market shares were abolished and oil product prices were freed. In contrast to the situation in the past, when excise tax used to vary, eliminating the price fluctuation of oil products, the tax rates were fixed in 1994 and fluctuations passed on to the end-users. Maintaining the production capacity of the two oil refineries was regarded as an integral part of the national policy to ensure energy security.

40. The policy to promote renewables in Portugal is geared to maintain their current level of approximately 6 per cent in the TPES by 2010, excluding hydro energy and 11 per cent including it. The promotion of renewables was supported by the national energy and municipal plans, by the research programmes on renewables conducted by INETI and national universities, by demonstration projects supported by the EC Thermie Programme and by the implementation of concrete projects under the Energy Programme. Examples of the last-mentioned were a project to establish 25 mini-hydro projects with a total installed capacity of about 10 MW and another project to bring 10 wind farms into operation, with a total capacity of 72 MW. The installed wind power capacity grew rapidly from 1 MW in 1990 to about 20 MW in 1996. Furthermore, two biomass projects using forest residues and pulp waste were under construction in 1998. The total contribution of the Energy Programme to promoting renewables was US$ 100 million in the form of zero interest loans, which covered about 50 per cent of the total investment. The team

was concerned as to how the renewables will be handled after 1999, when the support provided under the Energy Programme will have expired and no other instruments will be in place except for the "green tariff" described below.

41. In order to focus the interest of local authorities on renewables and to initiate specific projects, the scope of the Energy Programme and the financial support provided was extended to the municipal level and an Action Plan for Municipalities was set up in 1997. Moreover, a sum of 1.5 billion contos (US$ 7.5 million) was provided to enhance renewables penetration on the demand side, mainly for solar panels and biogas. Finally, the Ministry of Economic Affairs was considering the introduction of a "green tariff" based on the concept of avoided costs in order to promote the use of renewables by independent power producers. As of 1998, these producers could deliver electricity to the national grid at a premium price, provided they complied with certain technical rules.

2. Industry

42. The team was briefed on structural and technological changes in the Portuguese economy, and their effects on Portugal's current and future CO_2 emission trends. These changes were exemplified in the analysis presented by the Ministry of Economic Affairs, which indicated the current and expected future decrease in the share of the petrochemical and textile sector by 2010. Another example was the steel sector, in which the major steel plant is expected to close soon in order to be replaced by a new one using electricity.

43. Portugal used the instrument of voluntary agreements with industry, focusing on the reduction of air pollutants amongst other things. Since 1995, the system of voluntary agreements has been strengthened, with agreed milestones, to be monitored by the Ministry of Environment. The team was informed that, while the energy efficiency and climate change components were absent from the current voluntary agreements, there were plans to include these aspects in the new agreements.

44. The team was briefed on the projects in industry under the Energy Programme, which represented the major part of the measures in this sector. So far, about 150 projects had been approved in industry under the Energy Programme, mainly in the field of energy conservation. In order to apply for support from this programme, industrial companies with an annual energy consumption of more than 1,000 toe had to undertake energy audits every five years. They also had to make changes in the production processes in order to realize the mandatory 5 per cent energy reduction (in terms of specific energy consumption per unit of the output). The team was of the opinion, that the introduction of natural gas, and subsequently further promotion of industrial CHP, would make further reductions in specific energy consumption possible.

3. Transport

45. Although the NC2 did not contain information on policies and measures in the transport sector, the team was provided with information on recent developments in this sector related to climate policy. The team recognized that Portugal faced two major problems in the transport sector which were related to good planning of infrastructure and efficient management of transport systems. Most of the measures addressing these two problems were under implementation and had an impact on CO_2 emissions, which was, however often unclear.

46. The team was informed that, as Portugal has not yet reached the average EC level of infrastructure, substantial efforts have been made in recent years to build highways and motorways to replace the old national and municipal roads, as well as to improve the railway system. It is considered by Portugal that the country still has an outdated road network, which in part explains the high accident rate, traffic jams and increased air pollution. Therefore, even from an environmental point of view, Portugal considered it justifiable to continue extending the road network as projected in the 1996 Road Infrastructure Plan. At the same time there has been a reorganization of all systems of commercial transport with the objective of achieving better coordination and rationalization, and finding a synergy between the different modes of transport.

47. As a significant share of GHG emissions comes from urban traffic, many measures targeted this subsector, especially commuter traffic. These measures, coordinated between the central administration and local authorities, were primarily designed to achieve a shift from private to public transport. In this context, measures were aimed at the exclusion of polluting vehicles from city centres and the promotion of alternative and less polluting vehicles. The team was briefed on a plan to make city centres more accessible, by improving public transport and providing large-scale parking facilities outside the city centres. Particular reference was made to the railway across the Tagus River, providing alternative transport for a large number of people commuting to Lisbon daily. The team also learned of the improvement of the fleet of ferryboats and the opening of the new Vasco da Gama bridge. Furthermore, other measures to encourage the shift away from private transport were rapid tram systems, introduced in Lisbon, the “light metro” projects to be launched in Lisbon on the south bank of the Tagus River and at Mirandela, and an extension of the Lisbon metro.

48. Another measure in this subsector introduced mainly following the EC regulation, was the annual inspection of private cars older than four years, mainly focusing on local air pollution. In 1997 more than 3 million vehicles out of a total of 3.6 million were inspected, and 15 per cent of them were found to have higher exhaust emissions than allowed.

49. Transport within Portugal, especially that of goods, was predominantly road transport, owing to the characteristics of the territory and the lack of effective intermodal transport services for goods and passengers. Legal measures, accompanied by governmental funding, have been introduced to encourage the shift from private road freight transport to railway and sea transport. About 400 projects have been approved for funding since 1995 to foster such a shift, including projects to develop further the railway system. Moreover, the taxes on heavy vehicles were

increased as of April 1998. Finally, a project has been launched recently to stimulate container transport by train instead of by road.

4. Residential, commercial and institutional sector

50. The measures in the residential sector focused mainly on building codes, energy efficiency improvement and appliance standards. Since 1990, new buildings have been subject to building codes aimed at improving energy efficiency, amongst other things. According to a recent survey, 50 per cent of newly built houses indeed comply with these codes. No plans existed for retrofitting the existing building stock, partly because of the limited emission reduction potential in the mild climate of Portugal.

51. With respect to household appliances, in 1994 Portugal enforced the 1992 EC directive on appliances for the first group of appliances, including washing machines, dishwashers and lighting equipment. Further efforts to improve energy efficiency in this sector were exemplified by the public awareness campaign to stimulate the sales of energy-saving equipment launched by the Ministry of Economic Affairs and the ongoing pilot projects to introduce energy-saving lighting in the Algarve region

5. Agricultural and forestry sector

52. The NC2 stressed that the reduction of GHG emissions from the agricultural sector and increasing of the forest sink capacity was to a large extent an indirect effect of the EC Common Agricultural Policy (CAP) and that not much room existed for national initiatives in this area. Simultaneously, it recognized the forestry sector as an important sink for Portugal. Two afforestation programmes were launched in Portugal with the support of the EC. The first one based on the Portuguese Programme of Forestry has been aimed at afforestation of agriculture land under the CAP and the second one envisaged under the Portuguese Programme of Support for Modernization of Agriculture and Forestry has been aimed at afforestation of non-agricultural land.

53. In 1996, the Basic Law on Forest Policy was published, providing a legislative framework for the national forest policy. It defined the main principles and objectives of this policy, and identified both the instruments to achieve them and the measures to be taken. The law stipulated that the policy to increase production should include forest expansion and increased productivity. Furthermore, silvicultural practices should respect maintenance of the forest and contribute to the carbon cycle. The National Forestry Plan, the Regional Forest Management Plans and the Forest Operational Plans envisaged under the law will provide basic tools for effective forest management.

54. Portugal has been involved in afforestation since the beginning of this century. As of 1998, about 87 per cent of all forest area was private property, of which 96 per cent was made up of properties of less than 5 ha. Between 1990 and 1997, about 170,000 ha were afforested, including about 111,000 ha in the period between 1994 and 1997 alone. The new target set by

the Government was to increase the area under afforestation to 25,000 ha per year and several instruments in place to achieve this target were discussed during the visit. In this context, the team was informed about the preparation of the National Forestry Plan, which defines the strategic goals, specific targets and policy instruments for the development of the national forestry sector. A target of a 2 per cent annual increase of the area under afforestation was also considered under the plan. The improvement of both the forestry management practices and the tree species composition were seen as effective approaches to achieve an increase of forest productivity. The EC funds and the national investment fund, which is yet to be established, were considered as financial sources to support measures envisaged under the plan. In particular, the national investment fund was expected to finance reforestation of areas damaged by forest fires, to compensate forest owners for the loss of income incurred because of the restrictions imposed by environmental conservation objectives, to finance special research and to support low-interest loans for silvicultural operations. The final goal of the National Forestry Plan was to have new afforestation of 400,000 ha by 2010.

6. Waste

55. While no information was provided in the NC2 on policies and measures in the waste sector, the team was extensively briefed on such policies during the visit. However, no estimates existed on the impact of these policies on the GHG emission level. In 1997, Portugal started implementation of a National Solid Waste Strategy, which included the setting up of a Waste Institute under the Ministry of Environment. This strategy included three major activities, such as construction of new infrastructure for waste management, closing of the existing uncontrolled landfills and development of a network for selective collection of materials for recovery. It has set targets by the years 2000 and 2005 for waste prevention and waste minimization, as well as for waste composting, anaerobic digestion, recycling and incineration. By 2005, in line with the targets set, the shares of solid waste to go for biological treatment (composting and anaerobic digestion), recycling, incineration and confinement were expected to be almost equal.

56. As of 1998, no incineration plants existed in Portugal, but the team learned of the plans to install such plants, partly funded by the EC. The first incineration plant will be commissioned in 1999 for Lisbon and surroundings, with a capacity of 600,000 tonnes a year, and the second in 2000 in Porto with a capacity of 400,000 tonnes a year. These plants are to use heat from waste burning to produce electricity, which will be delivered to the national grid.

57. Recycling policies were based upon EC management guidelines in order to minimize the amount of waste to be sent to landfills. The team was informed that fees for sewage and waste treatment were still low compared to the real costs. Pilot projects on the gasification of waste and recycling of tyres were referred to.

B. Methane

58. As in the case of CO_2 emissions, the reduction of CH_4 emissions from agriculture was essentially seen as an indirect impact of the CAP. Recent changes in the CAP and the

progressive implementation thereof have led to less intensive agriculture, less use of fertilizers and smaller herds of cattle, thus reducing both CH_4 and N_2O emissions. Simultaneously, strong emphasis was placed on the synergy among the extensive agricultural policies, rural development, support for the less developed regions and reforestation of marginal lands. The team gathered that no significant intensification of Portuguese agriculture would occur and that traditional production patterns will continue to be used in the future, which will result in a maintaining or decreasing of the current level of CH_4 emissions from agriculture.

59. Several measures, supported financially by both the Portuguese Government and the EC, have been taken in this sector to limit CH_4 emissions. This included, but was not limited to, a construction of sewage treatment plants and manure storage facilities for livestock, especially for pig and poultry farms. Finally, a national regulation existed with respect to manure spreading on agricultural lands.

60. Implementation of the National Solid Waste Strategy discussed above, which envisaged waste treatment (incineration, composting, anaerobic digestion), would reduce CH_4 emissions among other things. It also envisaged that the new landfills would include CH_4 recovery equipment. With respect to old landfills (about 13) and dumps (about 300), a case-by-case analysis is performed to assess the potential for biogas production, collection and flaring.

C. Nitrous oxide

61. While N_2O emissions in Portugal originated both from industry and from agriculture, the team found that no attention was given to the N_2O emissions from industry. In the agricultural sector, public awareness was emphasized as a main N_2O mitigation measure. Additionally, the Code of Good Agricultural Practices for protection of water from contamination by fertilizer use in agriculture was adopted in 1998 in line with the EC directive on nitrate use, which should contribute to the further reduction of N_2O emissions from agriculture. This code was extensively discussed with stakeholders, including the fertilizer industry, farmers and environmental Non-Governmental Organizations (NGO), and was agreed upon between the Ministry of Agriculture, Rural Development and Fisheries and the Ministry of Environment.

D. HFCs, PFCs and SF_6

62. With respect to SF_6 the team was informed of a very recent initiative by the power sector to estimate SF_6 emissions in that sector. However, no policies were known yet. With respect to PFCs, the in-depth review of the NC1, mentioned the existence of aluminium smelters in Portugal, but no emission reduction measures were described during the visit in this regard. There were also no policies on the use of HFCs in car air-conditioning systems or other products.

IV. PROJECTIONS AND ESTIMATES OF THE EFFECTS OF MEASURES

63. In the NC2 Portugal presented emission projections for one CO_2 scenario for the years 2000, 2005 and 2010 in tabular form, for one NO_x scenario by the year 2020 and for both CH_4

and N_2O for one scenario by the year 2010 only in chart form. There were no projections given in the NC2 for the forest sink, for precursors other than NO_x, and for the new gases, including HFCs, PFCs and SF_6. Estimates of the possible future trend of sink capacity were made available to the team during the visit.

64. The team noted that the reporting on projections and the effects of policies and measures was the most problematic area, as far as compliance with the guidelines was concerned. While the presentation of information on projections in the NC2 was a significant step forward compared to the NC1, this section of the report was still lacking detail and transparency, especially on the methodology used, explanation of the key assumptions, provision of information on a by-sector and by-gas basis and interpretation of the results. Additionally, no projection of emissions associated with bunker fuels was provided. During the visit, the team gained a thorough understanding of the approach adopted in preparing the GHG emission projections and associated methodological issues.

65. Projections of the GHG emissions were the fruit of concerted efforts by several institutions, coordinated by the Directorate-General for Energy of the Ministry of Economic Affairs and were based mainly on the energy sector projections given in the 1995 Energy Sector Strategy for 1995-2015. Thus, the Ministry of Planning and Territorial Administration worked out socio-economic scenarios, the Institute of Statistics was responsible for the demographic projections and the Ministry of Industry was responsible for projections for industrial sectors, including estimates for new technology penetration. The electricity system plan included in the Energy Sector Strategy was drawn up by the National Grid Company.

66. The methodology used for projections of the CO_2 emissions was a bottom-up one and was basically the same as that used for projections in the NC1. It relied on two models, namely, the MEDEE model, which is a model used to project energy demand as a function of socio-economic development, and the ENPEP model, which is an energy supply equilibrium model. The ENPEP model projects the energy supply to meet the growth of energy demand at a minimal level of energy prices. For the electricity sector in particular, two modules from the ENPEP package were used to produce the least-cost plan for the new unit commitment. One of these modules was developed with the participation of the energy planners from Portugal to reflect the characteristics of the electricity system, with a dominant share of hydro capacity. The GHG emissions were calculated using the results of the modelling exercise in terms of consumption of different fuels over time, and the same emission factors, as were used for the GHG inventory.

67. In addition to the formalized models and procedures used to obtain the future emission trend, expert estimates were used for assessment of some specific parameters related to it. For example, the useful energy demand in industry was estimated based on the information obtained from the questionnaires sent to different industrial sectors and subsectors, examining the link between manufacturing technologies now and in the future and corresponding useful energy demand.

68. It was stressed to the team that, while the methodology did throw some indirect light on certain policies to mitigate the GHG emissions, such as the new, more stricter standards for buildings, it was, in general, found difficult to study directly the impact of the different policy decisions on the emission trend. The methodology did not account directly also for the impact of changes in electricity prices at the level of the useful energy demand, which narrowed even more its areas of use. The team was informed that there are plans to use in the future another model for projections which would not have the limitations discussed above.

69. Projections for other greenhouse gases were produced basically by extrapolating the current trends of emissions into the future and allowing for expert estimates of the possible effects of the measures under implementation. The approach to projecting the forest sink capacity was consistent with the IPCC methodology for inventory of forest sinks, taking into consideration the impact of afforestation programmes already launched.

70. Information on the key assumptions influencing the future emission trend was provided in tabular format in the NC2 and additional information on this issue was provided during the visit. The assumption of the average annual GDP growth for 1990-2010 was revised downwards from 4.9 per cent in the NC1 to 3.7 per cent in the NC2 to reflect the actual economic trend. The team noted that the economic performance in 1996 and 1997, when the annual GDP growth rate was 2.5 per cent and 2.7 per cent, respectively, suggested that further adjustment of this important variable might be necessary. The team learned that, to project the domestic energy prices, information from international sources was used, since more than 75 per cent of the TPES is imported. Accordingly, further adjustments to the energy prices assumed in the projections might also be necessary to reflect their recent downward trend.

71. The key driving variable for industry was the index of industrial output, which was expected to increase at about half of the GDP growth rate. This in turn reflected a continuation in the future of the current shift from industry to services. As to the electricity sector, it was assumed that the capacity of supply would increase steadily to meet the demand, and no electricity import was foreseen after 2010. There were no assumptions on the likely impact of the electricity market liberalization.

72. In the residential sector, the demand for useful energy for lighting, cooking and heating was projected as a function of demographic parameters taken from the scenario for population growth and an assumption regarding the change in the average household size. A similar approach was used for the service and commercial sector, where the same categories of useful energy demand plus demand for cooling were projected as a function of the value added by sector, number of employees and increase in floor space of buildings.

73. In the transport sector, several assumptions were made concerning the modal shift and vehicle efficiency improvement. It was believed that the demand for freight transport would grow slowly compared to GDP, reflecting again the shift from industry to services. At a later stage a higher share of rail freight was assumed due to upgrading of the existing network. Finally, it was expected that in cities public transport would replace private vehicles to a large

extent. While the team considered that the assumptions in the transport sector were, in general, realistic, some of them were too optimistic. For instance, the average annual mileage of cars was expected to increase very slightly by the year 2000 and to decrease thereafter. This would suggest implementation of an aggressive policy in the transport sector, which was not the case in Portugal.

74. All three major components of the forestry policy were considered in the scenario for forest sink increase, including improvement of the forest productivity, extension of the forest area, and increased recycling and reuse of the forestry products. Forest productivity improvement was expected to be achieved mainly through increasing the productivity of eucalyptus, by reallocation of stands to more suitable sites, which altogether could result in an increase of productivity by 1 m^3/ha/year. The extension of the forest area would lead to 400,000 ha of new forest in 2010. As to the recycling and reuse of forest products, it was emphasized that no expansion of the demand for forestry products was assumed, but rather a shift from import to local sources of such products. The team noted that the policy to achieve such a shift was at a very conceptual stage.

75. As stated earlier, projections from the 1995 Energy Sector Strategy for 1995-2015 were used to construct the GHG emission scenarios. Broadly, three scenarios for socio-economic development were discussed in this strategy, which assumed 2.5, 3.3 and 3.7 per cent annual GDP growth for the1995-2015 period. It was found that the scenarios with 3.3 and 3.7 per cent growth led basically to the same GHG emission level, because in the scenario with the higher GDP growth, higher awareness of environmental and climate change issues was assumed, with associated higher public expenditures to address these issues. This is why the scenario with 3.7 per cent GDP growth was chosen for further analysis of climate change policy.

76. While the NC2 presented quantitative information for CO_2 emissions only for a "with measures" scenario, the team learned that a baseline scenario was also considered in preparing the NC2, which was identical to the scenario with 3.7 per cent GDP growth from the 1995 Energy Sector Strategy for 1995-2015. The baseline and "with measures" scenarios both used the same assumptions of socio-economic development, GDP growth, technology evolution and living standards. The difference was that the baseline scenario did not account for policy to introduce natural gas, as well as for policy to promote renewables, CHP and energy efficiency beyond the level, achieved in 1995. In contrast, the "with measures" scenario included the effects of these policies which were implemented or were under implementation in 1998, and in this sense the baseline scenario served as a reference against which to measure the effect of different mitigation policies. The team found that the approach to scenario definition, was, in general, consistent with the guidelines. However, it remained unclear to the team how the effect of autonomous energy efficiency was considered and how the double counting of the effects of measures was avoided.

77. According to the "with measures" scenario, CO_2 emissions in Portugal were expected to be 59,120 Gg in 2000 and 74,910 Gg in 2010, representing a growth of 33 and 69 per cent respectively compared to 1990. This growth was considered very high by the team, but it was, in

fact, much lower than the growth of 43 and 98 per cent estimated in the baseline scenario for the same years. The team noted that such growth of emissions in the baseline scenario vis-a-vis the assumed GDP growth rate of 3.7 per cent would imply very conservative assumptions about the autonomous energy efficiency improvement. The team also noted the lack of correspondence of the GHG emissions by sectors in 1990 presented in the inventory of GHG emissions and in the section on projections of the NC2.

78. While the growth of GHG emissions from different sectors was similar, the growth from the industrial sector was the smallest, which fitted well with the assumption of a lower growth rate of industry compared to services. In contrast, the emissions from the transport sector were expected to grow at the fastest pace, which somehow contradicted the assumption of a relatively stable annual mileage of vehicles and a shift to public transport and railways.

79. The only scenario for the forest sink discussed during the visit envisaged a sequestration of about 3,500 Gg CO_2 in 2010 against about 1,100 Gg CO_2 for the 1990-1994 period, which the team found very high.

80. The only scenario for CH_4 emissions given in the NC2 projected a 20 per cent decrease of emissions in the 1995-2000 period. The explanation given during the visit was that the reduction was expected as a result of the active waste management policy, while the emissions from other sectors, such as agriculture and energy, were assumed to remain relatively constant.

81. In contrast, the only scenario for N_2O emissions presented in the NC2 showed a steady upward tendency, the increase being attributed to the assumed penetration of cars with catalytic convertors. The team learned that the expected increase in N_2O emissions from transport was much higher than it appeared in projections, but this higher growth was assumed to be partly offset by the measures implemented to reduce fertilizer use in agriculture.

82. Estimation of the effects of policies and measures was one of the most difficult areas with respect to the adherence to the Guidelines. In fact, the NC2 contains a table which gives an integrated assessment of three main measures having a major impact on the CO_2 emission level, namely, the introduction of natural gas, energy efficiency and renewables. The team learned that the Ministry of Economic Affairs planned to publish by the end of 1998 a study prepared by INETI with more detailed estimates of the CO_2 reduction potential of measures.

83. The policy to introduce natural gas was the most important one and was expected to result in savings of 11,200 Gg CO_2 in 2010 when fully implemented. The savings would be due primarily to the commissioning of new 900 MW combined cycle gas plant in 1998, the introduction of natural gas in all sectors and adapting of the existing oil-fired generators to operate in dual mode. The policy to promote energy efficiency in all sectors would save 1,200 Gg CO_2 in 2010, which could be attributed to CHP, energy efficiency programmes in industry, households and services, upgrading of manufacturing processes in industry, development of combined freight transport and a shift to public transport. The policy of promoting of renewables would result in savings of 800 Gg CO_2 in 2010, thanks to the

development of wind projects with a total capacity of 70 MW, 100 MW of mini-hydro projects and 700 MW of large hydro projects (more than 10 MW each).

84. In the context of the projection exercise, the review team shared the view expressed by the host country officials that the current portfolio of mitigation policies and measures would not allow Portugal to meet its current target of limiting the CO_2 emission growth to 40 per cent by the year 2010, unless new measures are implemented and the implementation process strengthened. The most recent development trend with lower-than-expected economic growth and lower-than-expected energy prices does not suggest any substantial change in the future trend of GHG emissions in Portugal if no additional measures are implemented.

V. EXPECTED IMPACTS AND ADAPTATION MEASURES

85. From both the NC2 and the information provided to the team during the visit, it became clear that vulnerability and potential effects of climate change were considered by Portugal as an important area of policy intervention, which was related to the problems Portugal faced already. These problems were related to extreme events, such as droughts and floods, which with some degree of certainty could be correlated with possible effects of climate change.

86. In regard to impact assessment, the team learned that scientific work had been undertaken in Portugal on regional climate models, but no systematic research has yet been done on possible climate scenarios using Portuguese meteorological time series. Furthermore, the team noted that a basis existed in Portugal for possible future study in the Institute on Tropical Diseases of climate change impacts on human health.

87. An overview was provided in the NC2 of possible adaptation measures, with the majority of measures still being under consideration. A system for monitoring and flood alert, was commissioned in the nineties after large-scale flooding in the Tagus basin and there is an intention to establish also an alert system for droughts. During the visit, the team was provided with information on the national coastal zone management strategy of Portugal, formulated by the Water Institute of the Ministry of Environment. The strategy was backed up by a plan which was still under consideration during the visit, but it was expected that the plan would be approved by the Government by the end of 1988. The budget allocated to the implementation of the plan was US$ 30 million. The main objectives of the plan were: (a) to organize the different uses and activities specific to the coastal border; (b) to classify the beaches and bathing waters and improve beaches considered strategic for environmental reasons; (c) to develop activities on coastal zones; and (d) to preserve and protect nature. In order to realize these objectives several projects were launched.

88. With respect to agriculture and forestry it is obvious that for reasons other than climate change, including the need to combat desertification, a number of measures were in the process of implementation or were under consideration, involving different stakeholders. Some of these measures, which can also be considered as part of a climate change adaptation strategy, included promoting reforestation with tree species able to thrive in a warmer and drier climate, better

management of agricultural soils, control of erosion, more rational use of fertilizers and pesticides and more efficient use of irrigation.

VI. FINANCIAL ASSISTANCE AND TRANSFER OF TECHNOLOGY

89. The team noted that, while a lot of information was presented in the NC2 on financial support and technology transfer, the tables recommended by the guidelines were used only to a limited extent. Portugal reported assistance related to general environmental problems, rather than to climate change. The Portuguese Institute for Cooperation was the state agency coordinating efforts in the field of international cooperation, while other ministries were dealing with technical aspects of such cooperation. One important institutional change was the setting up in 1997 of a new Agency for the Portuguese-speaking African countries for Climate and Associated Environmental Impacts, established under the umbrella of the Ministry of Environment and with the support of the World Meteorological Organization. Technology transfer, climate science, climate change modelling and adaptation to climate change were the main areas of its activities.

90. Portugal conducted bilateral cooperation with various least developed countries, the majority of which were members of the Commonwealth of Portuguese-Speaking Countries. This explained why economic and social development, improvement of infrastructure, training, education and capacity building were among the priorities in the international cooperation, but not environment and climate change. Examples of projects relating to environment and climate change were the project in Cape Verde for training on environmental issues, the project in Mozambique to create infrastructure to address climate change, the project in Guinea-Bissau to protect parks and natural reserves, and the project for integrated use of the water of the river Cunen.

91. The team was briefed on the outcome of the First Interministerial Conference on the Environment of the Commonwealth of Portuguese-Speaking Countries held in Lisbon in February 1997. The Conference adopted the Lisbon Declaration, which reaffirmed the principles of the 1992 Rio Declaration, institutionalized the Conference as a forum for exchange of information and experience on climate change issues among others, and called for the strengthening of links and instruments for international cooperation in the field of the environment. The team was informed of the initiative resulting from the Lisbon Declaration to organize a conference in June 1998 in Mozambique with the participation of the Portuguese-speaking countries, focusing on coastal zone management.

92. The amount of official development assistance (ODA), which had decreased in the 1994-1996 period from US$ 308 million in 1994 to US$ 270 million in 1995 and US$ 218 million in 1996, rose in 1997 to US$ 250 million (the data for 1997 being preliminary). This corresponded respectively to 0.29 per cent, 0.26 per cent, 0.21 per cent and 0.25 per cent of the gross national product. The team recognized that the share of ODA allocated to environmental projects increased from 0.6 per cent in 1995 to 1 per cent in 1996 and 0.7 per cent in 1997. The disbursement to the Global Environment Facility for 1995, 1996 and 1997

amounted to US$ 2.5 million, US$ 1.22 million, and US$ 1.07 million, respectively. The contribution to the Facility was classified as a part of the ODA.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

93. The NC2 provided a comprehensive description of the activities Portugal has pursued in the areas of research and systematic observation. The team learned that three institutions were active in climate-related research and systematic observation, the University of Lisbon, the Institute of Meteorology and the University of Evora, while INETI dealt with climate technology research. Portugal participated actively in the EC climate research programmes and in other international programmes such as the World Weather Watch, the World Climate Research Programme and the Global Climate Observing System.

94. Two areas of climate-related research were accorded priority in Portugal namely, studies on the impact of the oceans on the climate and establishment of the climate change scenarios by downscaling of the global circulation models, such as the United Kingdom model, to the local conditions. Based on these global models, efforts were aimed at developing a weather generator model for temperature and precipitation for Portugal.

95. The activities of Portugal under several EU programmes are worth mentioning here. The work by the University of Lisbon under the MEDALUS programme (US$ 440,000 million for three years) focused on assessment of desertification and formulation of relevant adaptation and mitigation measures. The impact of climate change on water resources was also studied by the University of Lisbon under the EC WRINKLE programme (US$ 100,000 for three years). Nine projects were launched under the EC PRAXIS XXI programme with part of the funding provided by the programme (US$ 1.7 million) and part provided by the government. Only two of these projects focused exclusively on local climate change, namely, The Effect of Local Climate Change on the North Atlantic and Iberia (US$ 300,000), coordinated by the University of Aveiro and The Air Composition and Monitoring Network (US$ 500,000), coordinated by the Institute of Meteorology.

96. With respect to technology-related research, the team noted that the budget had undergone significant downsizing in the 1990-1993 period and remained relatively stable thereafter, the level being US$ 3.1 million 1998. The negative effect of budget reductions was partly compensated by shifting the focus from nuclear research in the nineties to renewables in recent years, covering solar energy (which alone accounted for about 30 per cent of the whole budget), energy conservation and new fossil fuel technologies. The team was impressed by the work of INETI, especially by the wide range of projects on practically all forms of renewables, and the good cooperation between the INETI researchers and the government officials.

VIII. EDUCATION, TRAINING, AND PUBLIC AWARENESS

97. The review team recognized education, training and public awareness as an area where notable progress was made in the period between the NC1 and the NC2, which to a large extent

was due to the good coordination between the Ministry of Environment and the Ministry of Education. The team was informed that the focus of the environmental educational programmes recently was on problems related to the oceans, waters and waste, rather than on climate change. The third session of the Conference of the Parties brought change to the situation, as climate change problems became an issue of much public discussion.

98. At high school level, a special subject on environment, including climate change, was introduced and special training courses and workshops were organized for the teachers and the school administration. Additionally, the Institute for Environmental Promotion of the Ministry of Environment ensured support for small environmental projects at schools and the team learned that US$ 0.5 million had been allocated in 1998 for 200 projects. At university level, a new course 'environmental engineering', was created with the objective of training experts in the field of environmental, water and waste management, as well as climate change. The team took note of the grant schemes for training in the new technologies at universities for both new graduates and engineers with experience.

99. As to the raising of public awareness on climate change issues, the team was informed of the project under implementation by the Institute for Environmental Promotion of the Ministry of Environment to conduct a sociological survey on the knowledge of environmental problems, awareness and behaviour. The Ministry of Agriculture, Rural Development and Fisheries and the Ministry of Labour were also active in raising awareness on climate change in their relevant fields of activity. Finally, the review team emphasized that the National Strategy for Sustainable Development could be used, amongst others, to raise awareness of the impact of climate change and the level of GHG emissions from different sectors.

IX. CONCLUSIONS

100. In general, the outcome of discussions during the visit allowed the team to acknowledge that the NC2 reflected adequately Portugal's climate change policy at the time it was published. Much more information was made available to the team on all sections of the NC2 and especially on specific policies and measures, the GHG inventory and projections. The team's visit generated significant discussion on present and future climate policies in Portugal, and in this respect it was considered very useful by the host country.

101. The team recognized the substantial step forward made by Portugal in improving its GHG inventory, which clearly indicated the priority of this issue in the national climate change agenda. The key area of improvement was the estimates of emissions from waste, agriculture, land-use change and forestry and fuel combustion. While the lack of a detailed description of methodology, primary data and the required IPCC worksheets in the NC2 did not enhance transparency, the information provided to the team during the visit considerably augmented the team's understanding of the whole process of the GHG inventory preparation. The team believed that the involvement of other government agencies in the compilation of the GHG inventory would help to broaden the scope of work, by including the estimates of emissions of

the new gases, amongst others, to overcome some of the existing problems of data availability and quality, and to improve further the emission factors.

102. In the electricity sector many developments were ongoing which made it difficult to report on policies and measures in a very concrete manner. Nevertheless, the team formed an impression that the existence of a national electricity plan, in which all policy-relevant elements of the electricity sector were laid down, would increase the transparency of Portugal's energy policy and would facilitate the development of national climate change policy. The energy-saving strategy in the industry seemed to rely heavily on the EC Energy Programmes and consisted rather of a series of individual projects. The same was true for the transport sector with the policy geared mainly to spatial planning and reduction of air pollution and traffic congestion.

103. From the perspective of developing an integral policy strategy in which climate change considerations were clearly taken into account, the waste sector and the forestry sector seemed to be rather ahead of other policy sectors, although it had to be understood that no decision has been taken yet on the National Forestry Plan. Therefore, with respect to the policy making on non-CO_2 greenhouse gases there were clear contributions from these two sectors. Unfortunately, other sources of emissions have received nearly no attention.

104. The review of the key data points, assumptions, methodologies and results of the projection exercise led the team to conclude that even the current target of Portugal under the UNFCCC may not be achieved unless more stringent climate policy is introduced. The team acknowledged the awareness among the decision makers about the gap between the current "with measures" scenario and the target, but even more important was the political will to bring changes to the situation by introducing additional measures. What is more, the new institutional setting, related to establishing of the National Climate Commission, will help to improve political and institutional coordination and strengthen the implementation.

- - - - -