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**Report of the centralized in-depth review of
the fourth national communication of Portugal**

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a fourth national communication by 1 January 2006. This report reflects the results of the in-depth review of the fourth national communication of Portugal conducted by an expert review team in accordance with relevant provisions of the Convention and Article 8 of the Kyoto Protocol.

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I. Introduction and summary

A. Introduction

1. Portugal has been a Party to the Convention since 1993 and to its Kyoto Protocol since 2002. Under the Kyoto Protocol, Portugal committed itself to limiting the growth in its greenhouse gas (GHG) emissions to 27 per cent in relation to the base year level during the first commitment period from 2008 to 2012. The base year is 1995 for fluorinated gases and 1990 for all other gases.

2. This report covers the centralized in-depth review (IDR) of the fourth national communication (NC4) of Portugal, coordinated by the UNFCCC secretariat, in accordance with decision 7/CP.11. The review took place from 12 to 17 May 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Marko Aunedi (Croatia), Mr. Daniel Bouille (Argentina), Mr. Mustafa Coskun (Turkey), Mr. Javier Gonzales (Bolivia), Mr. Bernd Gugele (European Community), Ms. Ashley King (United States of America) and Mr. Daniel Martino (Uruguay). Mr. Gugele and Mr. Martino were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each part of the NC4. The ERT also evaluated the information contained in Portugal's report demonstrating progress (RDP) in achieving its commitments under the Kyoto Protocol, and the supplementary information provided by Portugal under Article 7, paragraph 2, of the Kyoto Protocol.

4. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), a draft version of this report was communicated to the Government of Portugal, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Summary

5. The ERT noted that Portugal's NC4 complies in general with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications" (hereinafter referred to as the UNFCCC reporting guidelines). As required by decisions 22/CP.7 and 25/CP.8, the RDP provides information on the progress made by Portugal in achieving its commitments under the Kyoto Protocol. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol¹ is provided in both the NC4 and the RDP. The ERT commended Portugal for its coherent and consistent reporting.

1. Completeness

6. The ERT noted that the NC4 covers all sections required by the UNFCCC reporting guidelines. The ERT also noted that Portugal's RDP contains all parts stipulated by decisions 22/CP.7 and 25/CP.8. Furthermore, the ERT noted that Portugal has provided the supplementary information required under Article 7, paragraph 2, except for one reporting element (see chapter III B below).

2. Timeliness

7. The NC4 was submitted on 26 July 2006 and the RDP on 22 June 2006. Decision 4/CP.8 requested Parties to submit their NC4 by 1 January 2006. Decision 22/CP.7 set the same date for Parties to submit their RDP.

¹ Decision 15/CMP.1, annex, chapter II.

3. Transparency

8. The ERT acknowledged that Portugal's NC4 is well structured and concise. The NC4 provides clear information on all aspects of implementation. It is structured following the outline contained in the annex to the UNFCCC reporting guidelines. In the course of the review, the ERT formulated a number of recommendations that could help Portugal to further increase the transparency of its reporting, such as a recommendation to develop adequate descriptions of the models and drivers used for the estimation of mitigation effects of policies and measures (PaMs) in the energy and non-energy sectors. The review team noted that the information contained in the NC4 is generally consistent with that contained in the RDP.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals

9. In its NC4, Portugal has provided a description of its national circumstances, how these national circumstances affect GHG emissions and removals in Portugal, and how national circumstances and changes in national circumstances affect GHG emissions and removals over time. The ERT noted that the main drivers of emission trends in Portugal include overall economic activity and increasing energy demand, traffic volume and distances covered by road transport (supported by the development of road infrastructure and an increase in the number of private vehicles). Meteorological parameters (such as precipitation), which have a high inter-annual variability, also have a significant influence on hydroelectric power production and, consequently, on GHG emissions from electricity production. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

Table 1. Indicators relevant to greenhouse gas emissions and removals for Portugal

	1990	1995	2000	2006	Change 1990–2000 (%)	Change 2000–2006 (%)	Change 1990–2006 (%)
Population (million)	10.00	10.03	10.23	10.55	2.3	3.1	5.5
GDP (billion USD 2000 using PPP)	131.30	142.88	174.53	181.98	32.9	4.3	38.6
TPES (Mtoe)	17.25	20.71	25.25	27.16	46.4	7.5	57.4
GDP per capita (thousand USD 2000 using PPP)	13.13	14.25	17.06	17.25	29.9	1.1	31.4
TPES per capita (toe)	1.73	2.07	2.47	2.57	43.1	4.3	49.2
GHG emissions without LULUCF (Tg CO ₂ eq)	59.11	70.25	81.51	82.73	37.9	1.5	40.0
GHG emissions with LULUCF (Tg CO ₂ eq)	60.65	66.42	75.54	78.56	24.5	4.0	29.5
CO ₂ emissions per capita (Mg)	4.34	5.30	6.20	6.07	42.7	-2.1	39.6
CO ₂ emissions per GDP unit (kg per USD 2000 using PPP)	0.33	0.37	0.36	0.35	9.8	-3.2	6.3
GHG emissions per capita (Mg CO ₂ eq)	5.91	7.00	7.97	7.84	34.8	-1.6	32.7
GHG emissions per GDP unit (kg CO ₂ eq per USD 2000 using PPP)	0.45	0.49	0.47	0.45	3.7	-2.7	1.0

Data sources: GHG emissions data are from Portugal's 2008 inventory submission; population, GDP and TPES data are from the International Energy Agency.

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

10. Portugal has provided a summary of information on GHG emission trends for the period 1990–2004. This information is consistent with the 2006 national GHG inventory submission. Summary tables, including trend tables for emissions in carbon dioxide equivalent (CO₂ eq) (given in the common reporting format), are also provided in an annex to the NC4.

11. Total GHG emissions excluding emissions and removals from land use, land-use change and forestry (LULUCF) increased by 40.0 per cent between 1990 and 2006, whereas total GHG emissions including net emissions or removals from LULUCF increased by 29.5 per cent (see table 2). This was mainly attributed to CO₂ emissions, which increased by 20.1 per cent over this period. Emissions of methane (CH₄) also increased by 16.3 per cent, while emissions of nitrous oxide (N₂O) increased by 8.1 per cent. A major part of these increases was experienced after 1996 (trends for 1996–2006: CO₂ +27.3 per cent, CH₄ +4.3 per cent, N₂O –1.5 per cent, total GHGs +21.9 per cent). Emissions of fluorinated gases accounted for about 0.1 per cent of total GHG emissions in 1995 and 1.0 per cent in 2006. Table 2 provides an overview of GHG emissions by sector from 1990 to 2006 (see also discussion of sectoral trends in chapter II B).

Table 2. Greenhouse gas emissions by sector in Portugal, 1990–2006

	GHG emissions (Tg CO ₂ eq)					Change (%)		Shares ^a by sector (%)	
	1990	1995	2000	2005	2006	1990–2006	2005–2006	1990	2006
1. Energy	40.26	48.96	59.08	63.92	59.24	47.1	–7.3	68.1	71.6
A1. Energy industries	16.01	19.35	20.71	24.95	21.89	36.7	–12.3	27.1	26.5
A2. Manufacturing industries and construction	9.26	10.25	11.88	10.37	9.97	7.7	–3.8	15.7	12.1
A3. Transport	10.05	13.46	19.38	19.86	19.90	97.9	0.2	17.0	24.1
A4.– A5. Other	4.71	5.32	6.42	7.14	5.99	27.1	–16.1	8.0	7.2
B. Fugitive emissions	0.23	0.58	0.68	1.59	1.49	562.8	–6.4	0.4	1.8
2. Industrial processes	4.61	5.81	6.19	7.73	7.91	71.6	2.4	7.8	9.6
3. Solvent and other product use	0.22	0.26	0.29	0.33	0.34	54.3	2.1	0.4	0.4
4. Agriculture	8.09	8.17	8.80	8.08	8.43	4.3	4.4	13.7	10.2
5. LULUCF	1.54	–3.83	–5.97	–2.98	–4.16	–369.8	39.9	2.6	–5.0
6. Waste	5.93	7.06	7.15	7.15	6.80	14.7	–4.9	10.0	8.2
7. Other	NA	NA	NA	NA	NA				
GHG total with LULUCF	60.65	66.42	75.54	84.23	78.56	29.5	–6.7	102.6	95.0
GHG total without LULUCF	59.11	70.25	81.51	87.21	82.73	40.0	–5.1	100.0	100.0

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable.

Note: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

^a The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions which was offset by GHG removals through LULUCF.

12. Between 1990 and 2006, total emissions per capita and per unit of gross domestic produce (GDP) increased by 32.7 and 1.0 per cent, respectively. The NC4 states that although per capita carbon emissions are among the lowest in the European Union (EU), the carbon intensity of Portugal's economy is far from being as low as it should be. There is, as such, an opportunity for gains in efficiency and sustainability.

13. The energy sector's share of total GHG emissions increased from 68 per cent in 1990 to nearly 72 per cent in 2006. This was due to an increase in the consumption of oil and gas for electricity generation and fuel use in transport. The latter is the result of a marked increase in car ownership and a drop in rail transport and collective road transport. Emissions from the transport sector grew by 98 per cent between 1990 and 2006.

B. Policies and measures

14. As required by the UNFCCC reporting guidelines, Portugal has provided in its NC4 well-organized information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention and its Kyoto Protocol. Each sector has its own textual description of the principal PaMs, supplemented by summary tables on PaMs by sector. Portugal has also provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals consistent with the objective of the Convention.

15. The ERT noted the efforts made by Portugal to identify and propose several policies, actions and instruments to fulfil its commitment to reduce GHG emissions. More than 35 actions are proposed in the energy sector, addressing the key sub-sectors that are responsible for increased emissions (energy industries, energy use in industry and transport). Measures in the energy sector are complemented by eight PaMs in the non-energy sectors. Table 3 provides a summary of the reported information on the PaMs of Portugal.

Table 3. Summary of information on policies and measures

Major policies and measures	Examples/comments
Framework policies and cross-sectoral measures	
Integrated climate change programme	National Climate Change Programme (PNAC 2004); the fluorinated gases directive; the Green Public Procurement System
Energy/electricity/emissions taxation	Realignment of the tax burden on diesel fuel for heating (73 kt); increase in industrial fuel tax (78 kt)
Emissions trading	European Union emissions trading scheme
Energy	
Environmentally friendly power generation	
Combined heat and power generation	Increased electricity generation from cogeneration systems (200 kt); incentives for the substitution of fuel oil cogeneration by natural gas generation (189 kt)
Renewable energy sources	Promotion and increased electricity generation from renewable energy sources (RES), in order to meet a 39% target of gross electricity consumption from RES by 2010 (1 135 kt); promotion of water heating by solar energy (101 kt)
Energy efficiency improvements	40% increase in energy efficiency in buildings through the adoption of new regulation(s) on acclimatization and thermal behaviour of buildings (90 kt); reduction of the rate of energy losses in the energy transport and distribution to 8.6% by 2010 (146 kt); reduction of electricity consumption of about 1 000 GWh by 2010 (795 kt)
Transport	
Integrated transport planning	Promotion of modal transfer (483.1 kt); biofuel directives (1 243 kt)
Agreements/partnerships	Auto-Oil Programme – voluntary agreement with the vehicle manufacturing associations (European Automobile Manufacturers Association, Japanese Automobile Manufacturers Association and Korean Automobile Manufacturers Association) (175 kt)
Vehicle and fuel taxes	Review of the current tax regime on private vehicles to factor out CO ₂ emission tax (7.7 kt)
Industrial processes	
Pollution prevention and control	Implementation of the Integrated Pollution Prevention and Control (IPPC) Directive
Agriculture	
	Adoption of cropland management and grazing land management activities under Article 3, paragraph 4, of the Kyoto Protocol (500 kt); treatment of, and energy recovery from, livestock waste (429 kt)
Waste management	
	Directive on packaging and packaging waste (900 kt); landfill directive (363 kt); IPPC Directive
Forestry	
	Programme for the sustainable development of Portuguese forests through financial support and incentives for new tree plantations (3 743 kt); promotion of carbon sink capacity of forests through the improvement of forestry management (800 kt)

Note: The greenhouse gas reduction estimates, given for some measures (in parentheses), are reductions in CO₂ or CO₂ eq for the year 2010.

1. Policy framework and cross-sectoral measures

16. The Climate Change Committee (CAC), an inter-ministerial body, was created in 1998 in order to integrate environmental issues with government policy. The CAC prepared the National Strategy on Climate Change and its implementation document, the National Climate Change Programme (PNAC), in 2001. The PNAC, updated in 2004, is the main strategic instrument towards meeting the targets under the Kyoto Protocol and the EU burden-sharing agreement and entrusts the Ministry for Environment, Spatial Planning and Regional Development (MAOTDR) with the responsibility of spearheading and coordinating the development of programmes and actions to limit GHG emissions, at the governmental level. The Institute for the Environment (IA) oversees and coordinates all issues relating to climate change on behalf of the MAOTDR. The IA assumes the role of focal point to the Convention, the competent authority in the European Union emissions trading system (EU ETS) and the responsible entity for the National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants (SNIERPA).

17. The proposed PaMs implemented or adopted up to 2005 are included in the reference scenario; additional measures for ensuring achievement of the GHG emission targets are defined at a later stage. The NC4 makes reference to the transposition of EU directives to national legislation and the application of other types of EU instruments in the context of the European Climate Change Programme, as well as measures specifically developed by Portugal. The cross-sectoral policy framework includes the EU ETS, the EU directive on fluorinated gases and the Green Public Procurement System.

18. The ERT noted that the NC4 and the RDP do not include any reference to financial aspects or the national allocation of climate-related funds to the measures identified above.

2. Policies and measures in the energy sector

19. Between 1990 and 2006, GHG emissions from the energy sector increased by 47.1 per cent (18.98 Tg CO₂ eq), mainly driven by a 36.7 per cent increase in emissions from energy industries (resulting in a 31 per cent increase in total GHG emissions) and a 98 per cent increase in emissions from transport (resulting in a 51.9 per cent increase in total GHG emissions). The high dependency on fossil fuels for power generation and the expansion observed in vehicle fleet and total road transport were key drivers of the increased GHG emissions. Between 1990 and 2004, there were observed increases in GDP per capita (3 per cent per year), energy consumption per capita (from 1.78 toe in 1990 to 2.51 toe in 2004), energy intensity and road transport (240 per cent increase in passenger-kilometres) and air transport (130 per cent).

20. Energy PaMs are included in the PNAC 2004, provisionally approved by Council of Ministers Resolution 119/2004 on June 2004. In addition to the policies included in the PNAC, the Party reported in its NC4 other measures such as the penetration of natural gas in combined-cycle gas turbines and in cogeneration units, improved energy efficiency in industrial processes and improved fuel quality.

21. **Power production.** The key measures reported by Portugal are the penetration of renewable energy sources (RES) to a target of 39 per cent of gross national electricity consumption by 2010, the penetration of cogeneration up to 18 per cent of gross national electricity consumption in 2010, and a 5,100 MW increase in installed wind power capacity. The ERT noted that progress toward those targets has been slow considering that the share of RES in electricity production has not increased since 2000 (standing at 27 per cent, the average for the period 2000–2005) and that the installed capacity of wind power stood at 1,700 MW in 2006.

22. **Energy efficiency.** The key actions proposed are a reduction of the power losses in the transmission and distribution network, an increase in energy efficiency in buildings and a reduction of electricity consumption by about 1,000 GWh by 2010.

23. **Transport.** The relevant actions in this sub-sector are: the development of higher-efficiency vehicles (to reach a 120 g CO₂ per kilometre target by 2010); the expansion of the Lisbon “Metro” light rail network; the promotion of modal transfer in key transit corridors; the penetration of natural gas in public transport (buses and taxis); and the penetration of biofuels (10 per cent goal to be reached by 2010). The ERT noted that the European Commission has recently indicated that the CO₂ targets for cars are unlikely to be reached, and encourages the Party to revise the estimated effect of this measure accordingly.

24. The ERT noted that certain emission targets appear to reflect ambitious programmes (particularly the targets that are to be reached by 2010), and encourages the Party to provide a more detailed presentation of the PaMs and their estimated effects in order to establish clear objectives and to establish relationships between targets and expected results. The ERT further noted that in some cases there is an overlap between objectives and PaMs (see for example the description of PaMs ‘Mar1’, ‘Mas1’, ‘Mai1’, ‘Mai3’ or ‘Mat3’ in the NC4) and encourages the Party to provide definitions of objectives and targets

that are clearly separate from PaMs. The ERT also encourages the Party to increase the transparency of its presentation of estimated mitigation effects of PaMs.²

3. Policies and measures in other sectors

25. Between 1990 and 2006, GHG emissions from industrial processes (including solvent and other product use), agriculture and waste increased by 24 per cent, mainly driven by increased emissions from (in decreasing order of magnitude): chemical industries (ammonia production), solid waste disposal on land, mineral products, enteric fermentation, fluorinated gases, waste incineration and N₂O from agricultural soils. The trend in GHG emissions from the non-energy sectors was partly compensated for by the forestry sector, which was a net source of emissions in 1990 (1.54 Tg CO₂ eq) and became a net sink in 2006 (-4.16 Tg CO₂ eq).

26. **Industrial processes.** GHG emissions from this sector grew by 40 per cent between 1990 and 2006 (from 4.6 to 7.9 Tg CO₂ eq), driven primarily by increases in CO₂ emissions from the production of ammonia, cement and lime, and increased emissions of fluorinated gases. Despite its being responsible for a large share of the observed increase in non-energy emissions from 1990 to 2006 (73 per cent of the increase), the ERT noted that no PaMs have been proposed for this sector. The adoption of the EU directive on fluorinated gases is mentioned in the NC4 as a cross-cutting measure, but an estimated mitigation effect has not been provided. The ERT noted that Portugal has provided only a limited discussion of PaMs in industry and encouraged the Party to provide more contextual information on these PaMs in its next national communication.

27. **Agriculture.** Emissions in the agriculture sector increased by 4.2 per cent between 1990 and 2006, the result of increases in CH₄ from enteric fermentation and N₂O from agricultural soils, and decreases in CH₄ from rice production and non-CO₂ gases from burning of agricultural residues. The reference scenario projects a 10 per cent increase in agricultural emissions by 2010 from 1990 levels. Additional PaMs proposed – chiefly carbon sequestration in soils through activities elected by Portugal under Article 3, paragraph 4, of the Kyoto Protocol, and management of animal waste – would reduce emissions by 0.929 Tg CO₂ eq in 2010, an amount equivalent to nearly 12 per cent of agricultural emissions in 1990.

28. **Forestry.** The forestry sector accounted for a net removal of nearly 4.0 Tg CO₂ eq in 2006, equivalent to 5 per cent of total GHG emissions, due to the extensive conversion of land to forest since 1985. For 2010, the Party has projected an increase in the size of the carbon sink as a result of a reforestation plan (3.743 Tg CO₂ eq in 2010) and forest management practices (0.8 Tg CO₂ eq in 2010), although no details on the implementation of these practices (e.g. timing of establishment of new plantations) are provided in the NC4.

29. Forest fires have increased over time, both in the number of annual events and in the area of affected land. GHG emissions from forest fires in 2003 amounted to 10.0 Tg CO₂ eq, equivalent to nearly 15 per cent of total GHG emissions in that year. As stated in the NC4, Portugal is planning to implement the National Plan of Forest Fire Protection. However, this has not been identified as a mitigation measure and the GHG mitigation effect of the plan has not been estimated. Given that Portugal has elected to account for forest management under Article 3, paragraph 4, of the Kyoto Protocol, the ERT noted that this potential source of significant net emissions could become relevant for

² For example, MAe3 is estimated to reduce energy consumption by 1,000 GWh, and to reduce emissions by 795 kt CO₂ eq. MAe4 involves the installation of 5,100 MW of wind power, with an estimated mitigation effect of 855 kt CO₂ eq. Given the proposed wind power capacity (5,100 MW), the factor of use of the proposed wind farm would be only 2.4 per cent, which seems to be too small.

accounting under the Kyoto Protocol, and the ERT encourages the Party to implement mitigation measures and to estimate the GHG mitigation effects of such measures.

30. **Waste.** Emissions in the waste sector increased by 15 per cent between 1990 and 2006, and currently account for about 8 per cent of total GHG emissions. The main drivers of these trends are large increases of emissions from solid waste disposal on land and waste incineration, and a reduction of emissions from wastewater handling. The reference scenario projects a nearly 50 per cent reduction of emissions from solid waste disposal on land by 2020 due to increased composting, recycling and energy recovery from waste, in spite of an increasing trend in emissions from the disposal of packaging materials. Portugal is currently in the process of implementing the EU directives that relate to the flow of waste and has set quantifiable near-term targets for increased waste recovery and reduced municipal biodegradable waste. The implementation of the EU directive on packaging and packaging waste is expected to have the largest effect in 2010, with an estimated GHG mitigation of 0.9 Tg CO₂ eq. Portugal expects a 50 per cent reduction in emissions from solid waste disposal on land by 2020.

31. The estimates of effects of PaMs in the non-energy sectors on projected GHG emissions were derived from the comparison of scenarios 'with measures' and 'with additional measures', as reported in both the NC4 and RDP. However, the Party did not provide a description of the models and drivers used to build these scenarios, thus impairing the necessary transparency of reporting. The ERT encourages Portugal to develop adequate descriptions of the models and drivers used in its next national communication.

C. Projections and the total effect of policies and measures

1. Projections

32. The GHG emission projections provided by Portugal in the NC4 include a 'with measures' and a 'with additional measures' scenario for 2010 and 2020, and are presented relative to actual inventory data for 1990–2004. Projections are presented on a sectoral (and sub-sectoral) basis, using the same sectoral categories used in the PaMs section of the NC4, and on a gas-by-gas basis for all GHGs. The projections also included an aggregated total for each sector as well as for a national total, using global warming potential values. However, the ERT noted that Portugal did not provide emission projections related to fuel sold to ships and aircraft engaged in international transport reported separately and not included in the totals, which is a reporting element required by the UNFCCC reporting guidelines (para. 36). Table 4 and the figure below provide a summary of GHG emission projections for Portugal.

33. In order to develop the NC4 projections, an elaborate bottom-up model was used, with methodology and input parameters (macroeconomic indicators, demand growth, sectoral activity, energy intensity, etc.) presented in detail. In order to account for the uncertainty of the projections, two scenarios were used in terms of forecast GDP growth after 2010 ("High" and "Low"), and they are also depicted in the figure below.

Table 4. Summary of greenhouse gas emission projections for Portugal

	Greenhouse gas emissions (Tg CO ₂ eq per year)	Changes in relation to base year level (%)
Inventory data 1990 ^a	59.1	NA
Inventory data 2006 ^a	82.7	37.7
Kyoto Protocol base year ^b	60.1	NA
Kyoto Protocol target	76.3	27.0
'With measures' projections for 2010 ^c	88.0	46.4
'With additional measures' projections for 2010 ^c	85.6	42.4

Abbreviation: NA = not applicable.

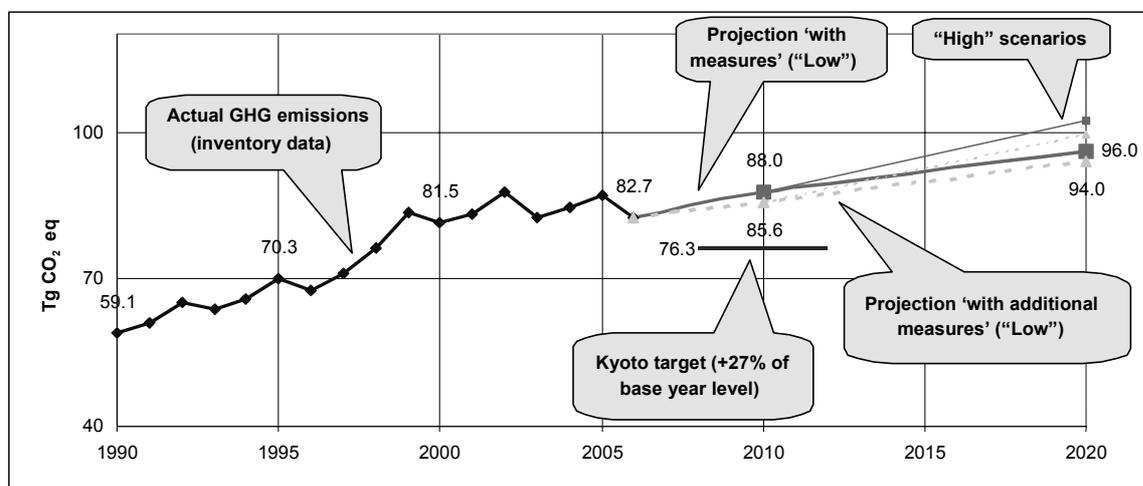
^a Data source: Portugal's 2008 greenhouse gas (GHG) inventory submission; the emissions are without land use, land-use change and forestry (LULUCF).

^b 'Base year' data include emissions from deforestation in 1990, in accordance with Article 3, paragraph 7, of the Kyoto Protocol.

^c Data source: Portugal's fourth national communication; the projections are for GHG emissions without LULUCF.

34. Total GHG emissions have been growing steadily in the past, but the growth trend has slowed down considerably since 2000, presumably due to a slowdown in economic activity (oscillations during this period appear to be correlated with the natural variation in output from hydropower plants). The ERT noted that NC4 projections clearly indicate that total GHG emissions will exceed the Kyoto Protocol target level in 2010, as total national emissions under the 'with measures' scenario are projected to be 11.7 Tg CO₂ eq above this level. Implementing additional measures would reduce this gap by 2.4 Tg CO₂ eq. Key contributors to the increase in projected emissions between 1990 and 2010 include road transport (116 per cent increase), the commercial sector (481 per cent increase), industrial processes (56 per cent increase) and electricity and heat production (42 per cent increase). In addition to domestic measures, the NC4 suggests that Portugal would make use of flexible mechanisms under the Kyoto Protocol and the EU ETS to close the remaining gap.³

Greenhouse gas emission projections



Data sources: Portugal's fourth national communication and Portugal's 2008 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry.

35. In Portugal's 2007 Monitoring Mechanism Submission (MMS) to the European Environment Agency (EEA) (EEA, 2007), the same projection scenarios were used as in the NC4, but some additional information was provided on ways to close the gap between projected emissions and the Kyoto Protocol

³ In the NC4, this gap is smaller because of the use of older inventory information and the inclusion of LULUCF in the calculation of projected emissions.

target. In addition to implemented and planned domestic measures, a further reduction of 4.7 Tg CO₂ eq in 2010 would be obtained by using carbon sinks, while an additional reduction of 5.8 Tg CO₂ eq would result from making use of flexible mechanisms under the Kyoto Protocol. This would reduce Portugal's 2010 emissions to around 75 Tg CO₂ eq, slightly below the Kyoto Protocol target level.

36. Because of many uncertainties related to future economic trends, sector activities, use of flexible mechanisms, implementation of additional measures, and so on, the ERT gained the impression that reaching the Kyoto Protocol target will pose a challenge to Portugal. The level of ambition of this objective is further emphasized by the assumed decrease in GHG emissions per unit of GDP between 2005 and 2010. The intensity of GHG emissions per unit of GDP is expected to decrease by 9.8 per cent under the 'with measures' scenario (12.3 per cent under the 'with additional measures' scenario), while the actual value of this parameter increased by 2 per cent between 2000 and 2004. During the review, the Party clarified that, despite the uncertainties related to future economic trends, sector activities, implementation of additional measures, and so on, Portugal will make all possible efforts to meet its target, including the use of the flexible mechanisms of the Kyoto Protocol, by investing EUR 350 million allocated in the Portuguese Carbon Fund; the level of ambition is acknowledged by the Party, and therefore Portugal is already taking the necessary actions to fulfil its commitments.

37. The ERT noted that the level of information on emission projections is comprehensive, and its presentation is detailed and systematic. It encourages Portugal to retain a similar level of reporting in its forthcoming national communication. Also, for the sake of completeness, the ERT recommends that Portugal prepare GHG emission projections relating to fuel sold for use by ships and aircraft engaged in international transport, and include them in its next national communication.

2. Total effect of policies and measures

38. Within Portugal's NC4, the estimate of the total effect of planned PaMs for the year 2010 is implicitly reported as the difference between the 'with measures' and 'with additional measures' scenarios. Since there is no 'without measures' scenario reported in the NC4, a similar estimated and expected total effect of implemented and adopted PaMs is not available. On the other hand, an estimate of the total effect of implemented or planned PaMs can be obtained by summing the estimated effects of individual PaMs. Finally, an updated estimate of the total effect of PaMs is provided in Portugal's 2007 MMS, for planned, implemented and adopted measures. However, the ERT noted that Portugal did not provide the following reporting elements required by the UNFCCC reporting guidelines: an (explicit) estimate of the total effect of its PaMs, in accordance with the 'with measures' definition, compared with a situation without such PaMs, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis), in 1995 and 2000 (para. 40); and relevant information on factors and activities for each sector for the years 1990 to 2020 (para. 48). Table 5 provides an overview on the total effect of PaMs as reported by Portugal.

Table 5. Projected effects of planned, implemented and adopted policies and measures in 2010

<i>Source</i>	Difference between 'with measures' and 'with additional measures' scenarios (Tg CO ₂ eq)	Total effect of implemented and adopted measures (Tg CO ₂ eq) ^a	Total effect of planned measures (Tg CO ₂ eq) ^a	Total effect of policies and measures under 'with measures' scenario (Tg CO ₂ eq)	Total effect of policies and measures under 'with additional measures' scenario (Tg CO ₂ eq)
	<i>NC4</i>	<i>NC4</i>			<i>MMS</i>
Energy (without CO ₂ from transport)	1.4	1.5	1.3	0.4	1.4
Transport – CO ₂	0.6	1.6	0.6	0.0	0.6
Industrial processes	0.0	0.0	0.0	0.0	0.0
Agriculture	0.4	0.4	0.5	0.0	0.4
Land-use change and forestry	1.3	3.7	0.8	NR	NR
Waste management	0.0	0.9	0.4	0.0	0.0
Total	3.7	8.2	3.6	0.4	2.5

Abbreviations: MMS = Monitoring Mechanism Submission; NC4 = fourth national communication; NR = not reported.

Data sources: Portugal's fourth national communication and Portugal's 2007 Monitoring Mechanism Submission (MMS) to the European Environment Agency (EEA, 2007. *Greenhouse Gas Emission Trends and Projections in Europe 2007 – Country Profile: Portugal*).

^a The total effect is defined as the sum of the estimated effects of individual policies and measures.

39. The total effect of planned PaMs in 2010 (as reported in the NC4) that is derived from the difference between the 'with measures' and 'with additional measures' scenarios is broadly consistent with the total effect derived from the sum of individual PaMs (discrepancies occur in the waste and LULUCF sectors). When implemented and adopted PaMs are considered, only an estimate of the effect of individual PaMs is available, amounting to 8.2 Tg CO₂ eq in comparison with a hypothetical scenario in which no measures are implemented. In Portugal's 2007 MMS, the estimated mitigation effects for planned PaMs are generally consistent with the NC4 scenarios (excluding LULUCF), but the estimates for implemented PaMs in the energy sector differ substantially from the estimates of the effects of the NC4 PaMs. The ERT gained the impression that this might result from the large number of PaMs with a status of implementation reported as 'other' (neither existing nor planned) in the MMS.

40. In addition to the information presented in table 5, Portugal has provided the ERT with an additional set of planned measures, mainly related to power generation (stronger penetration of RES and natural gas) and transport. The estimated average effect of these measures for 2008–2012 is 1.56 Tg CO₂ eq, in relation to the 'with additional measures' scenario, which would lower the 2010 emissions by another 1.8 per cent. This suggests that the gap between the projections and the Kyoto Protocol target would be reduced to 7.7 Tg CO₂ eq using domestic measures.

41. The ERT acknowledged Portugal's effort to draft the NC4 emission projection scenarios and encouraged the Party to improve transparency by eliminating the disagreement between the total effects of PaMs originating from scenario results and the sum of estimated effects of individual PaMs as contained in the NC4 section on PaMs.

D. Vulnerability assessment, climate change impacts and adaptation measures

42. In its NC4, Portugal has provided the required information on the expected impacts of climate change in the country. However, the ERT noted that Portugal did not provide an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation (UNFCCC reporting guidelines, para. 49). Table 6 summarizes the information on vulnerability and adaptation to climate change presented in the NC4.

Table 6. Summary of information on vulnerability and adaptation to climate change

Vulnerability area	Examples/comments/adaptation measures reported
Water resources	Vulnerability: Change in the seasonal distribution of river flows and possible reduction of the mean annual flow; increase in the magnitude and frequency of floods, particularly in the north; diminished water quality, particularly in the south; sinking groundwater tables in near-subsurface aquifers; degradation of river ecosystems; a reduction in freshwater intake and an increase in saline contamination in coastal areas due to sea-level rise Adaptation: The fourth national communication (NC4) suggests the need to intensify public awareness campaigns to save water
Coastal zones	Vulnerability: Increased coastal erosion; readjustment of river ecosystems; increased marine influence on tidal basins Adaptation: There are no adaptation measures suggested
Energy	Vulnerability: Positive impact of greater hydroelectric potential in the north and reduced energy needs for water heating, however, negative impact of increased energy demand from air conditioning and higher energy consumption Adaptation: There is no adaptation measure suggested
Human health	Vulnerability: Rise in discomfort, morbidity and mortality associated with heat; increase in the prevalence of respiratory and cardiovascular disease; increase in disease transmission through water and food due to extreme events and natural disasters; changes in the frequency and distribution of vector-borne and rodent-borne diseases Adaptation: Contingency plans for heat waves that include a prediction, warning and surveillance system
Agriculture	Vulnerability: A decrease in all crop yields except for pasture and forage crops Adaptation: There is no adaptation measure suggested
Forests and biodiversity	Vulnerability: Displacement of current species by those that are more tolerant to drought, from south to north and from inland to coastal areas; species such as cork oak and pine prosper at higher altitudes, expanding their potential distribution; increased biomass productivity in the north; greater risk of fires Adaptation: NC4 suggests the need to intensify public awareness campaigns to reduce the risk of forest fires

43. According to the different scenarios as provided in the NC4, the Portuguese climate is projected to change significantly. A systematic increase in temperature on the order of 3 to 7° C is estimated for the summer in continental Portugal and a more moderate increase in the Azores and Madeira. Annual rainfall over the continent is expected to decrease by 20 to 40 per cent and in Madeira by 30 per cent; for the Azores, changes are predicted in the annual rainfall cycle but without any substantial impact on total precipitation.

44. As indicated in table 6 above, Portugal has identified six vulnerable areas (water resources, coastal zones, energy, human health, agriculture, and forests and biodiversity). The main impacts and vulnerabilities identified by Portugal are: changes in flood and drought regimes and in the availability and quality of water; increased risk of fire hazards; ecosystem disturbances which might lead to changes in infectious disease transmission; and increased soil erosion and the reduction of agricultural yields. The NC4 does not outline actions taken to implement Article 4 of the Convention, in particular those concerning the integrated management of coastal areas, water resources and the protection and rehabilitation of land areas affected by drought and desertification.

45. There is limited discussion of adaptation and vulnerability reduction measures in the NC4. The ERT encourages the Party to include additional information on such measures in its future national communication.

E. Financial resources and transfer of technology

1. Financial resources

46. In its NC4, Portugal has provided details of measures taken to give effect to its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention and has expressed difficulty reporting progress made in the context of technology transfer. It indicates what “new and additional” financial resources it has provided pursuant to Article 4, paragraph 3, and clarifies how it has determined such resources as

being “new and additional”. Portugal has also provided detailed information on the funding provided for the purpose of assisting developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them meet the costs of adaptation to those adverse effects. Furthermore, Portugal has provided information on other financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels. However, the ERT noted that Portugal did not provide the following reporting elements required by the UNFCCC reporting guidelines: detailed information on the funding provided for the purpose of technology transfer and assisting developing country Parties that are particularly vulnerable to the adverse effects of climate change, in textual format and with reference to the table “Bilateral and regional financial contributions related to the implementation of the Convention, 2007”; similar tables for 1998, 1999 and for 2000 (UNFCCC reporting guidelines, para. 52, and note below table 5 of these guidelines); and any information on any financial resources related to the implementation of the Convention provided through bilateral, regional and other multilateral channels (para. 53). Table 7 summarizes information on financial resources.

Table 7. Summary of information on financial resources

Official development assistance (ODA)	EUR 1.75 billion for the period 2001–2004
Climate-related aid in bilateral ODA	EUR 6.62 million for the period 2001–2005
Climate-related support programmes	Portugal supports capacity-building activities of the Portuguese Speaking Countries Climate Change Network (RELAC) and the Ibero-American Network of Climate Change Offices (RIOCC)
Contributions to GEF (USD million)	USD 6.08 million in the period 2001–2004
Pledge for third GEF replenishment	No information provided
Other (bilateral/multilateral)	USD 686 million in the period 2001–2004
New and additional financial resources	EUR 1.19 million in 2005

Abbreviations: CDM = clean development mechanism, GEF = Global Environment Facility, JI = joint implementation.

47. In the context of Article 4, paragraphs 3, 4 and 5, of the Convention, Portugal has provided financial resources for the capacity-building activities of the Portuguese Speaking Countries Climate Change Network and the Ibero-American Network of Climate Change Offices. Portugal classifies its contributions to the Special Climate Change Fund, the Kyoto Protocol Adaptation Fund and the Least Developed Countries Fund under “new and additional resources”.

2. Transfer of technology

48. In its NC4, Portugal has expressed difficulty in providing detailed information on technology transfer according to the UNFCCC reporting guidelines. Considering the importance of this mechanism in the promotion of climate change adaptation, the ERT encourages Portugal to report on technology transfer in its future national communication.

F. Research and systematic observation

49. Portugal has provided information on its actions relating to research and systematic observation and has provided detailed information about its general policy on, and funding of, research and systematic observation on climate change. It has also addressed both domestic and international activities, including the Global Climate Observing System (GCOS) and other programmes based on observations made from space. The NC4 also reflects action taken to support related capacity-building in developing countries. Furthermore, Portugal has provided a summary of information on GCOS activities (in accordance with para. 64 of the UNFCCC reporting guidelines).

50. Research on climate change in Portugal has been financed exclusively by the Government through the Foundation for Science and Technology; detailed information on research activities has been provided in the NC4. Portugal has reported its participation and contribution to Earth observation programmes and its promotion of research activities in collaboration with developing countries, in particular Portuguese-speaking countries.

51. The ERT noted that research and systematic observation carried out and supported by Portugal will serve to increase the level of knowledge and understanding of climate change; however, the NC4 does not provide details of any action taken as a result of that research, in either a national or an international context (para. 60 of the UNFCCC reporting guidelines). The ERT encourages Portugal to report on action taken to promote adaptation, capacity-building (particularly in developing countries), technology research and the transfer of environmentally sound technologies, in its future national communication.

G. Education, training and public awareness

52. In its NC4, Portugal has provided comprehensive information on its actions relating to education, training and public awareness, as required by the UNFCCC reporting guidelines (para. 65).

53. In Portugal, climate change and other environmental issues are cross-sectoral. The NC4 provides detailed information on how climate change has been introduced in primary and secondary educational curricula, teacher training initiatives and public-awareness projects carried out at the level of municipalities and in collaboration with non-governmental organizations.

III. Evaluation of information contained in the report demonstrating progress and of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

A. Information contained in the report demonstrating progress

54. Portugal's RDP includes three chapters, which contain most of the information required by decisions 22/CP.7 and 25/CP.8. The ERT found the information contained in the RDP to be consistent with that provided in the NC4.

55. The RDP provides an adequate description of the legal and institutional framework related to compliance with commitments under the Convention and its Kyoto Protocol. In 1998, Portugal established the CAC, composed of representatives from several relevant ministries, to promote and facilitate climate change policy across government agencies, and to ensure that climate change issues are given due consideration in sectoral policies. The CAC is the designated national authority for the flexibility mechanisms of the Kyoto Protocol. The MAOTDR coordinates the CAC and is in charge of implementing the National Strategy on Climate Change, approved in 2001. The IA is the agency within the MAOTDR with leading authority on climate change issues. Portugal's main instruments for compliance include the PNAC, the Monitoring and Assessment Programme of the PNAC, SNIERPA, participation in the EU ETS as defined by the National Allocation Plan, and the Portuguese Carbon Fund.

56. The ERT noted that limiting the increase in GHG emissions during the period 2008–2012 to 27 per cent above the base year level is a challenge for Portugal, given that GDP and energy consumption – the main drivers of growth in emissions – have grown by nearly 40 and 50 per cent, respectively, during the period 1990–2006, causing emissions to increase by more than 40 per cent. The set of PaMs included in the PNAC adopted in 2001 aim to decouple the growth in GHG emissions from the growth in emissions per unit GDP and the growth in emissions from energy use. In fact, there has been a decrease in the carbon intensity of the economy during the past few years. The ERT encourages the Party to give

high priority to the timely implementation of the PaMs included in the PNAC and to update this programme.

57. According to the RDP, GHG emissions under the reference (or 'business as usual') scenario are projected to amount to 84.6 Tg CO₂ eq in 2010, which is 7.4 Tg CO₂ eq above the target level. Additional domestic measures proposed by the Party would result in a reduction in emissions of 3.7 Tg CO₂ eq in 2010, meaning that another 3.7 Tg CO₂ eq per year will be procured through the flexibility mechanisms of the Kyoto Protocol and the EU ETS. These estimates are based on the assumption that emissions under the reference scenario would be only 10 per cent above the target level in 2010, while emissions in 2006 were already 15 per cent above the target level. The ERT noted that monitoring the implementation and effectiveness of domestic PaMs is essential in order to ensure that the proposed targets are achieved in a timely manner.

58. The Party did not provide a definition of supplementarity as mandated by decision 15/CMP.1. Based on the information provided in section 2.3 of the RDP, the ERT inferred that Portugal's definition of supplementarity implies that at least 50 per cent of the necessary emissions reductions have to be achieved domestically. The ERT recommends that Portugal provide a definition of supplementarity in its next national communication.

B. Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

59. Portugal has provided most of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in its NC4 and RDP. This information reflects the steps taken by Portugal to implement the relevant provisions of the Kyoto Protocol. The supplementary information is placed in different sections of the NC4 and RDP. Table 8 provides references to the NC4 and RDP chapters in which supplementary information is provided.

Table 8. Overview of supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

Supplementary information	Reference
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	NC4 chapters 3.11, 3.12 RDP chapters 1.6, 2.3
Policies and measures in accordance with Article 2	NC4 chapters 3.1–3.6 RDP chapters 1.2–1.5
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	NC4 chapters 3.7–3.8 RDP chapter 1.1
Information under Article 10	NC4 chapter 2 RDP chapter 3.1
Financial resources	NC4 chapter 6 RDP chapter 3.4

60. Portugal has not provided a description of the national registry, which is a required element of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. The ERT recommends that Portugal include this reporting element in its next national communication.

IV. Conclusions

61. Total GHG emissions in Portugal increased by 40.0 per cent between 1990 and 2006. This increase has been largely driven by increases in population (6 per cent), GDP per capita (53 per cent) and energy consumption (50 per cent). The energy sector was responsible for 71.6 per cent of 2006 emissions and most of the PaMs implemented or planned by Portugal to reduce emissions focus on this sector. A number of mostly non-climate sectoral policies already implemented, or planned to be implemented, would also result in reduced emissions, as communicated by the Party in its NC4.

62. In the NC4 and RDP, Portugal presents projections of GHG emissions for the period from 1990 to 2010. Two scenarios are included: (a) 'with measures' (including the effect of currently implemented and adopted PaMs); and (b) 'with additional measures'. The projected increases in GHG emissions under the 'with measures' and 'with additional measures' scenarios, in relation to the base year, are 46.4 and 42.4 per cent, respectively. Based on these projections, the ERT noted that in order to meet its Kyoto Protocol target (which is a 27 per cent increase in GHG emissions in relation to the base year level), Portugal would need to develop further additional measures and/or increase its planned use of the flexibility mechanisms of the Kyoto Protocol.

63. In the course of the IDR, the ERT formulated a number of recommendations relating to the completeness and transparency of Portugal's reporting under the Convention and its Kyoto Protocol. The key recommendations⁴ are that Portugal:

- Develop adequate descriptions of the models and drivers used for the estimation of mitigation effects of PaMs in the energy and non-energy sectors;
- Improve completeness by preparing GHG projections relating to fuel sold for use by ships and aircraft engaged in international transport, and include them in its next national communication;
- Improve the completeness of reporting of financial resources devoted to implementation of the Convention and of technology transfer according to the UNFCCC reporting guidelines;
- Report on action taken to promote adaptation, capacity-building (particularly in developing countries), technology research and transfer of environmentally sound technologies;
- Provide a definition of complementarity.

⁴ The recommendations are given in full in the relevant sections of this report.

Annex

Documents and information used during the review

A. Reference documents

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>>.

“Guidelines for review under Article 8 of the Kyoto Protocol”. Decision 22/CMP.1. Available at <<http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>>.

FCCC/IDR.3/PRT. Report on the in-depth review of the third national communication of Portugal. Available at <<http://unfccc.int/resource/docs/idr/eng/prt03>>.

FCCC/SBI/2006/INF.2. Synthesis of reports demonstrating progress in accordance with Article 3, paragraph 2, of the Kyoto Protocol. Available at <<http://unfccc.int/resource/docs/2006/sbi/eng/inf02.pdf>>.

FCCC/SBI/2007/INF.6. Compilation and synthesis of fourth national communications. Available at <<http://unfccc.int/resource/docs/2007/sbi/eng/inf06.pdf>>.

FCCC/SBI/2007/INF.7. Compilation and synthesis of supplementary information incorporated in fourth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol. Available at <<http://unfccc.int/resource/docs/2007/sbi/eng/inf07.pdf>>.

FCCC/ARR/2005/PRT. Report of the individual review of the greenhouse gas inventory of Portugal submitted in 2005. Available at <<http://unfccc.int/resource/docs/2006/arr/prt.pdf>>.

Fourth national communication of Portugal. Available at <<http://unfccc.int/resource/docs/natc/prtnc4.pdf>>.

Report demonstrating progress of Portugal. Available at <<http://unfccc.int/resource/docs/dpr/prt1.pdf>>.

2008 GHG emission submission of Portugal. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4303.php>.

EEA (European Environment Agency). 2007. *Greenhouse Gas Emission Trends and Projections in Europe 2007 - Country Profile: Portugal*. Available at <http://reports.eea.europa.eu/eea_report_2007_5/en/Portugal.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Ana Teresa Perez (Institute for the Environment).
