PORTUGAL´S DEMONSTRABLE PROGRESS REPORT

UNDER ARTICLE 3(2) OF THE KYOTO PROTOCOL

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Author: Institute for the Environment with the collaboration of Ecoprogresso - Consultores em Ambiente e Desenvolvimento, SA

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The following bodies, part of the Working Group on Reporting which was created by the Climate Change Commission at its 14th July 2005 session, have collaborated in the preparation of this document:

Department of Prospective and Planning of the Ministry of the Environment, Spatial Planning and Regional Development
Directorate-General for Curriculum Development and Innovation
Directorate-General for Driver Licensing
Directorate-General for Enterprise
Directorate-General for European Community Affairs
Directorate-General for Geology and Energy
Directorate-General for Multilateral Affairs
Directorate-General of Forestry
Environmental Audit of the Ministry of Agriculture, Rural Development and Fisheries
Environmental Audit of the Ministry of Public Works, Transports and Communications
Faculty of Sciences of the University of Lisbon
Institute for Waste Management
International Relations Office of the Ministry of the Environment, Spatial Planning and Regional Development
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National Statistics Institute
Office of the Secretary of State for Internal Administration
Port and Sea Transport Institute
Portuguese Institute for Development Support
Regional Environment Directorate - Azores
Regional Environment Directorate - Madeira
Science and Technology Foundation

Foreword

By the Secretary of State for Environment

This report is one of the many obligations of Portugal in the context of the Kyoto Protocol, namely with regard to demonstration of progress on limiting greenhouse gas emissions.

The report is a clear demonstration of the effort undertaken in recent years by the different sectors in Portugal to rise to the challenge posed by one of the most concerning global environmental problems – climate change – and to honour Portugal's international commitments.

This has been a multi-faceted effort, which has resulted in an improved understanding of the national situation regarding emissions, a better perception of related causes and effects, as well as the development of means of dealing with the problem, both in terms of mitigation and adaptation.

Various steps have been undertaken, most recently the preparation of a new and more robust National Climate Change Programme (PNAC 2006); the decision to utilise sinks potential under the Protocol's rules; a significant improvement in inventories; the EU emissions trading National Allocation Plan for 2008-2012; the establishment of the Portuguese Carbon Fund; and the appointment of the Climate Change Commission as Designated National Authority for the flexibility mechanisms foreseen in the Kyoto Protocol. More than simply satisfying commitments, the momentum in this field has "decarbonisation" of the economy as a principal objective, with benefits in efficiency, innovation and competitiveness.

Portugal's task in meeting its Kyoto commitments is a demanding one, but it also presents opportunities. Although *per capita* carbon emissions are among the lowest in the European Union, 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 for enhancing sustainability.

This report provides an opportunity to better understand the recent Portuguese context in relation to climate change, and steps taken to effectively decrease emissions. The decarbonisation of economy and society must involve all sectors, not just business or government. Our climatic future, as well as our ability to comply with national, European and international commitments, is played out by our day-to-day choices at our work places, at home, when shopping or through our transport and mobility. We do, effectively, control Climate Change.

H.E. the Secretary of State for Environment Humberto Rosa

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Summary

Portugal signed and ratified the Kyoto Protocol on April 29, 1998, and 31 May, 2002, respectively, and, in the context of this Protocol and the European Union Burden Sharing Agreement, committed to limit, by 2008-2012, its emissions growth to 27% relative to 1990 levels.

Portugal's GHG emissions grew at about 3% per annum throughout the period 1990-2004, closely tracking the growth of the national economy, which also averaged 3%. The rate of emissions growth has decreased since 2000 towards a stabilisation path, after discounting the effects of inter-annual variability (emissions levels in recent years have been affected by significant fluctuations in hydroelectric power generation, which is highly dependent on annual precipitation levels). In combination with the slowing of economic growth, this trend can also be attributed to the implementation of some important policies and measures such as the introduction of natural gas in 1997, which enabled the diversification of the energy supply structure and a reduction in external dependence on oil (though oil retains an essential role in the national supply structure, representing approximately 58% of total primary energy consumption in 2004).

Dependence on fossil fuels has a significant influence on GHG emissions: of the primary energy consumed in Portugal in the period 1990-2004, 84% was produced from fossil fuels. In 2004, 72% of GHG emissions derived from the energy sector. The generation of electricity from Renewable Energy Sources (RES) is directly linked to fluctuations in large hydropower production, accounting for approximately 87% of the total RES output. This is an important consideration as Portugal has been regularly subject to periods of severe or extreme drought. Measures foreseen in the National Climate Change Programme (PNAC) such as incentives for energy efficiency and diversification of RES will contribute to reducing the dependency on fossil fuels and consequently limit GHG emissions. In particular, electricity generation from wind has grown significantly, especially in 2004 and 2005 (in 2005 Portugal was ranked worldwide on 5th place in terms of new installed wind power capacity).

The first version of the National Climate Change Programme (PNAC) was adopted in 2000 and has had several updates, the last of which was provisionally approved by the Council of Ministers on the 1st June 2006, and which results are reflected in this report. The PNAC, which was subject to extensive public consultation and participation, is the product of a shared effort between the various sectors of the economy.

The set of policies and measures included in the PNAC, some of which derive from the transposition of European Community Directives to national legislation, will contribute to slowing down the growth in emissions relative to the reference scenario projected for 2010 and 2020.

The overall reduction potential of the set of measures included in the reference scenario and in the 2006 package of additional measures totals about 11 Mt CO_2e by 2010. Portugal would thus have an estimated deficit of 3.7 Mt CO_2e relative to the amount attributed annually (approximately 77,2 Mt CO_2e). To fill this gap, Portugal will resort, in equal proportions, to the European Union Emissions Trading Scheme (EU-ETS) and to the acquisition of credits from the flexibility mechanisms of the Kyoto Protocol. In addition, the use of the Quioto market-based instruments will contribute to improving the economic efficiency of domestic compliance efforts, as well as strengthen climate and energy cooperation with third countries, in particular those of the Community of Portuguese Speaking Countries (CPLP).

To this end, Government established recently the Designated National Authority for the Kyoto Protocol's flexibility mechanisms and the Portuguese Carbon Fund under the auspices of the interministerial Climate Change Commission.

Meeting national objectives in the context of the Kyoto Protocol presents a set of challenges that Portugal sees as opportunities to promote a more efficient use of resources in an economically sound way, which, in turn and among other benefits, contribute to the reduction of external energy dependence and increase energy security; a reduction in

energy payments and associated improvement in competitiveness of the Portuguese economy, as well as a reduction of the trade balance deficit.

1 Domestic Policies and Measures and the Use of the Flexibility Mechanisms

1.1 Decision-Making Process

In the context of Portugal's global responsibility and the need to ensure its compliance with international commitments under the United Nations Framework Convention on Climate Change (the Convention) and the Kyoto Protocol, and given the transversal nature of issues related to climate change, Government established in 1998 the Climate Change Commission[1] (CAC). The CAC is tasked with promoting and facilitating climate change policy across the range of Government bodies with relevant competencies, as well as to ensure that such issues are duly considered in the full range of sectoral policies.

In 2001, Government approved the National Strategy on Climate Change[2], which entrusts the Ministry for Environment, Spatial Planning and Regional Development (MAOTDR) the responsibility for spearheading and co-ordinating at Government level the development of programmes and actions to limit GHG emissions growth.

According to the organisational structure of MAOTDR, climate change affairs fall directly under the Secretariat of State for Environment (SEA). The line agency with leading competences on climate change policy is the Institute for the Environment (IA). The IA's responsibilities include promotion, co-ordination and support to the various issues related to climate change. Thus, the IA assumes the role of Focal Point to the Convention, competent authority in the context of the European Union Emissions Trading Scheme (EU-ETS), and responsible entity for the National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants (SNIERPA).

The CAC is co-ordinated by the MAOTDR and includes representatives from the Ministry of Internal Administration (MAI), Ministry of Foreign Affairs (MNE), Ministry of Finance and Public Administration (MFAP), Ministry of Economy and Innovation (including energy and industry) (MEI), Ministry of Agriculture, Rural Development and Fisheries (including forests) (MADRP), Ministry of Public Works, Transports and Communications (MOPTC), Ministry of Education (ME), Ministry of Science, Technology and Higher Education (MCTES), as well as representatives from the Autonomous Regions of Azores and Madeira.

Technical options and adequate policies are discussed within the remit of the CAC. Programmes, plans and legal instruments pertinent to the national policy framework on climate change are proposed for adoption by the Council of Ministers with the objective of complying with Portugal's commitments under the Kyoto Protocol and the European Union Burden Sharing Agreement.

The CAC was recently appointed Designated National Authority for the Kyoto Protocol flexibility mechanisms, responsible for, among other functions, promoting Portuguese investments in these mechanisms.

The main instruments geared towards compliance with the national GHG emissions target and, more broadly, the implementation of the Kyoto Protocol include the National Climate Change Programme[3] (PNAC), the Monitoring and Assessment Programme of PNAC[4] (PNACm), the National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants[5] (SNIERPA), participation in the EU-ETS as defined by the National Allocation Plan[6] (PNALE) and the Portuguese Carbon Fund[7].

[1] Council of Ministers Resolution 72/1998, of 29 June, altered by the Council of Ministers Resolution 59/2001, of 30 May.

[2] Council of Ministers Resolution 59/2001, of 30 May.

[3] Approved by the Council of ministers Resolution 119/2004 of 31 July.

[4] Council of ministers Resolution 59/2005, of 8 July.

[5] Council of ministers Resolution 68/2005, of 17 March.

Policies and measures included in the PNAC are pursuant to European Community (EC) Directives transposed into national legislation and the application of other types of EU instruments, namely in the context of the European Climate Change Programme (ECCP), as well as measures specifically developed by Portugal. Both the framework programmes and the specific instruments for the limitation of national GHG emissions have been approved by Government and duly published in the *Diário da República*[8].

Additional information on the institutional procedures and instruments adopted by Portugal in the context of climate change policy can be consulted in Chapter 1 of Portugal's Fourth National Communication to the United Nations Framework Convention on Climate Change, First National Communication in the context of the Kyoto Protocol (Fourth National Communication).

1.2 Sectoral Policies and Measures

In the context of the PNAC, Portugal implemented a wide range of policies and measures aimed at achieving the objectives of the United Nations Framework Convention on Climate Change and its Kyoto Protocol through cost-effective means and improving economic competitiveness. Policy instruments cover therefore a broad intervention in various sectors of the economy.

Preparatory work for the National Climate Change Programme (PNAC 2004) started in 2000, and has since been developed in close cooperation with stakeholders, in particular economic agents of the relevant sectors of activity. Competent sectoral public administration departments were also engaged and the draft version was subject to public discussion at two stages of the process (in 2001 and 2003/2004). In the second semester of 2005, the CAC decided to start a review process of PNAC 2004, given that a set of relevant underlying assumptions had in the meantime changed, namely with regard to macroeconomic information and activity variables of the various sectors. The resulting document (PNAC 2006), which was provisionally approved by the Council of Ministers on the 1st June 2006, evaluates Portugal's path towards meeting its first commitment period target under the Kyoto Protocol. Taking into account the afore-mentioned changes, as well as the assessment of the implementation of policies and measures in force, PNAC 2006 develops a new framework of policies and measures which are more in line with current data.

PNAC 2006 contains a set of measures defined for the sectors of the economy with an impact on GHG emissions: Energy (demand and supply, including the sub-sectors Transport, Residential and Services, and Industry), Agriculture and Livestock, Forestry and Waste. The reference scenario under PNAC 2006 integrates policies and measures (MR) with an impact on GHG emissions reduction implemented or adopted by the 1st January 2005 (including the activities of afforestation, reforestation and deforestation under art. 3(3) of the Kyoto Protocol). Additional policies and measures (MA), adopted or at the planning stage after that date, were also considered, including forest management, cropland management and grazing land management activities, under art. 3(4) of the Kyoto Protocol.

The measures included in the reference scenario result in an estimated reduction potential of about 7.3 Mt CO_2e during the first commitment period of the Kyoto Protocol. Additional measures contribute a further emissions reduction potential of about 3.7 Mt CO_2e. The overall package of policies and measures defined in PNAC 2006 are expected to have an impact of about 11 Mt CO_2e.

[6] Council of ministers Resolution 53/2005, of 3 March.

[7] Decree-Law 71/2006, of 24 March.

[8] Official Gazette.

This set of policies and measures is complemented by the positive benefits of the introduction of natural gas, the entering into operation of combined cycle gas turbines and the progressive installation of co-generation units, improvements in the energy and technology efficiency of industrial processes and improvements in the quality of fuels.

The information herein presented is, therefore, the latest update (June 2006) of the estimates of the GHG emissions reduction potential of a vast set of policies and measures under implementation, adopted and planned for all sectors of activity with relevant contribution to the emissions balance.

The following sub-chapters provide a summarised description of the main sectoral policies and measures. More detailed information on all relevant policies and measures referred in the PNAC, as well as information on the respective status of implementation, can be found in Chapter 3 of the Fourth National Communication.

1.3 Policies and Measures for the Energy Sector

1.3.1 Energy Supply, Industry, Construction and Public Works, and Other Sub-sectors (Combustion in the Residential and Services Sub-sectors as well as Agriculture, Forestry and Fisheries)

The National Energy Strategy approved by the Portuguese Government[9] in 2005 defines the main guidelines for action on energy policy and promotes the coordination of initiatives implemented, adopted or under planning, namely:

- to ensure security of energy supply, through the diversification of primary resources and energy services, as well as the promotion of energy efficiency in the energy demand and supply chain;
- to stimulate and support competition in order to promote and safeguard consumer interests, as well as the competitiveness and efficiency of enterprise, from the energy sector as well as all other sectors of the economy;
- to ensure environmental integrity of the whole energy process, reducing environmental impacts at the local, regional and global scales, namely with regard to the carbon intensity of the economy.

Accordingly, Government is strongly committed to reducing external energy dependence by reducing the share of fossil fuels in primary energy sources and by acting on the demand side, influencing consumer choice. This is achieved by increasing the capacity for endogenous energy production and energy efficiency

There has been a significant boost of investment in renewable energy. The annual rate of installation of renewable energy technologies for electricity generation increased significantly in 2004 and 2005, demonstrating Portugal's determination in diversifying its energy sources and decreasing its carbon impact. This is particularly the case for the wind energy sector, reference targets for which have been raised from 3750 MW to 5100 MW by the current Government. For this purpose, a public tender for allocating licenses for wind parks with up to 1800 MW total capacity was conducted in 2005.

The policies and measures foreseen in PNAC 2006 for the Energy sector are in line with the defined strategy. GHG emissions reduction potential from the reference scenario accounts for an estimated 846 kt CO_2e and additional measures for 1350 kt CO_2e.

[9] Council of Ministers Resolution 169/2005, of 24 October

The overall reduction potential totals about 2196 kt CO_2e, of which the following policies and measures for GHG emissions reduction are highlighted:

- **"E4, E-FER" Programme (MRe1).** Compliance with Directive 2001/77/EC of the European Parliament and of the Council of 27 September, leading to a reduction of GHG emissions from electricity production through renewable energy sources with the objective of meeting 39% of gross electricity consumption from RES.
- **Demand-side Energy Efficiency Improvements (MAe3).** Reduction of 1000 GWh in energy consumption by 2010.
- **Promotion of electricity produced from renewable energy sources (MAe4).** Increase the installed capacity for generation of electricity from wind to 5100 MW.
- **Incentives to the substitution of fuel oil co-generation by natural gas generation (MAi3).** Reduction or phasing-out of the tariffs for fuel oil co-generation.

1.3.2 Transport Sub-sector

The policies and measures identified for this sub-sector have the objective of reducing the carbon intensity of passenger and freight transport, namely through the promotion of modal shifts and the introduction of alternative fuel sources.

Total emissions reductions are estimated at 2165,4 kt CO_2e (about 1557,4 kt CO_2e in the reference scenario and a further 608 kt CO_2e from additional policies and measures).

Measures in the transport sector with greatest reduction potential are:

- **Auto-Oil Programme–Voluntary agreement with the car manufacturing associations (ACEA, JAMA, KAMA) (MRt1).** Reduction in carbon intensity of transport by light passenger vehicles through the manufacture and selling of new vehicles with increasingly restrictive consumption (and CO_2 emissions) standards, with the objective of reaching a target of 120g/km by 2010.
- **Implementation of the Biofuels Directive (MRt10).** Reduction in consumption of fuels responsible for GHG emissions through promotion and use of biofuels in the transport sector (a market share of at least 5.75% in the overall transport fuel supply by 2010).
- **Integration of the Sea Port System on Sea Routes (MAt10).** Transfer of 20% of the international road transport of freight to sea transport.

1.4 Policies and Measures in the Agriculture and Livestock, and Land Use, Land Use Change and Forestry Sectors

The policies and measures considered for these sectors result primarily from Portugal's option to consider forest management, cropland management and grazing land management activities under art. 3(4) of the Kyoto Protocol. As such, sinks capacity from these activities is estimated at about 1300 kt CO_2e. On the other hand, one must also consider the expected increase in the sinks capacity of national forests by about 3743 kt CO_2e as a result of the Programme for the Sustainable Development of Portuguese Forests.

1.5 Policies and Measures in the Waste Management Sector

The principal policies and measures in this sector result from the transposition to national legislation and subsequent implementation of EC guidelines on solid waste management. The reduction potential of the following policies and measures is estimated to be approximately 1263 kt CO_2e:

- **Implementation of the Directive on Packaging and Packaging Waste (MRr1).** The Decree-law 366-A/97, of 20th December transposed these EC Directives (Directive 94/62/EC of the European Parliament and of the Council, of 20th December, altered by Directive 2004/12/CE of the European Parliament and of the Council, of 11th February), imposing objectives for packaging waste recovery and recycling.
- **Implementation of the Landfill Directive (MRr2).** The Decree-Law 152/2002, of 23rd May, which transposes Council Directive 1999/31/EC, of 26th April, regarding the disposal of waste in landfills, establishes the need for a national strategy for the reduction of biodegradable municipal waste sent to landfills.

Table 1 summarises the full range of sectoral measures considered in PNAC 2006, the GHG affected and their emission reduction potential.

Table 1. Designation, affected gas and impact of measures on emissions reduction in 2010 (reference scenario and with additional measures)

Policies and Measures	GHG	Emission reduction potential (kt CO2e) by 2010
Energy		
MRe1. "E4, E-FER" Programme	CO_2, CH_4, N_2O	280
MRe2. Energy Efficiency in Buildings	CO_2, CH_4, N_2O	90
MRe3. Solar Hot Water for Portugal Programme (AQSpP)	CO_2, CH_4, N_2O	101
MAe1. Energy efficiency improvement in the electricity generation sector	CO_2, CH_4, N_2O	146
MAe2. Energy efficiency improvement in the energy supply systems, considering electricity generation from co-generation	CO_2, CH_4, N_2O	200
MAe3. Improvement in energy efficiency from the electricity demand-side	CO_2, CH_4, N_2O	795
MAe4. Promotion of electricity produced from renewable energy sources	CO_2, CH_4, N_2O	855
MAe5. Introduction of natural gas in the Autonomous Region of Madeira	CO_2, CH_4, N_2O	5
MAr1. Realignment of the tax burden on diesel fuel for heating (residential sub-sector)	CO_2, CH_4, N_2O	14
MAs1 Realignment of the tax burden on diesel fuel for heating (services sub-sector)	CO_2, CH_4, N_2O	59
MAi1: Increase in tax on industrial fuels	CO_2, CH_4, N_2O	78
MAi2: Review of the Regulation on the Management of Energy Consumption (RGCE)	CO_2, CH_4, N_2O	32
MAi3: Incentives to the substitution of fuel oil co-generation by natural gas generation	CO_2, CH_4, N_2O	189

Policies and Measures	GHG	Emission reduction potential (kt CO2e) by 2010
Transport		
MRt1. Auto-Oil Programme – Voluntary agreement with the car manufacturing associations (ACEA, JAMA, KAMA)	CO_2, CH_4, N_2O	175
MRt2. Expansion of the Lisbon Metro (ML)- extension of the Blue Line; extension of the Yellow Line; Red Line	CO_2, CH_4, N_2O	15
MRt3. Construction of the South of the Tagus River Metro (MST)	CO_2, CH_4, N_2O	13
MRt4. Construction of the Oporto Metro (MP)	CO_2, CH_4, N_2O	30
MRt5. Construction of the Mondego Light Metro (MLM)	CO_2, CH_4, N_2O	NA
MRt6. Supply changes (reduction in travel time) between Lisbon-Oporto; Lisbon-Castelo Branco; Lisbon-Algarve	CO_2, CH_4, N_2O	78
MRt7. Enlargement of the fleet of vehicles powered by natural gas of CARRIS and of the STCP	CO_2, CH_4, N_2O	1
MRt8. Incentive Programme for the dismantling of End-of-Life Vehicles	CO_2, CH_4, N_2O	3
MRt9. Reduction of motorway speeds	CO_2, CH_4, N_2O	0.6
MRt10. Biofuels Directive	CO_2, CH_4, N_2O	1243
MAt1. Reduction of Taxis´ service days	CO_2, CH_4, N_2O	4
MAt2. Enlargement of the fleet of taxi vehicles powered by natural gas	CO_2, CH_4, N_2O	0.2
MAt3. Review of the current tax regime on private vehicles	CO_2, CH_4, N_2O	8
MAt4. Metropolitan Authority of Lisbon Transports	CO_2, CH_4, N_2O	245
MAt5. Metropolitan Authority of Oporto Transports	CO_2, CH_4, N_2O	101
MAt6. Incentive Programme for the dismantling of End-of-Life Vehicles (further objectives)	CO_2, CH_4, N_2O	0.4
MAt7. Regulation on Energy Management in the Transport Sector	CO_2, CH_4, N_2O	18
MAt8. Railway connection to Aveiro Sea Port	CO_2, CH_4, N_2O	40
MAt9. Shipping routes	CO_2, CH_4, N_2O	150
MAt10. Logistical Platforms	CO_2, CH_4, N_2O	Planning
MAt11. Restructuring of supply of CP (national railway) service	CO_2, CH_4, N_2O	44
Agriculture		
MRg1. IPPC Directive (Integrated Prevention and Pollution Control)	-	NA
MAg1. Evaluation and promotion of carbon sequestration in agricultural soil	CO_2	500
MAg2. Treatment and energy recovery of livestock waste	CH_4, N_2O	429
Land Use, Land Use Change and Forestry		
MRf1. Programme for the Sustainable Development of Portuguese Forests (in the context of IIIFSP)	CO_2	3743
MAf1. Promotion of carbon sink capacity of forests	CO_2	800
Waste		
MRr1. Directive on Packaging and Packaging Waste	CO_2, CH_4, N_2O	900
MRr2. Landfill Directive	CH_4	363
MRr3. IPPC Directive (Integrated Prevention and Pollution Control)	CO_2, CH_4	NA

NA: Not available

Source: IAa, 2006

1.5.1 European Union Emissions Trading Scheme

The EU-ETS was established by Directive 2003/87/EC of the European Parliament and of the Council, of 13th October, and transposed to national legislation by Decree-Law 233/2004, of 14th December, which was later altered by Decree-Laws 243-A/2004 of 31st December and 230/2005, of 29th December. The Council of Ministers Resolution 53/2005, of 3rd March, approved the National Allocation Plan (PNALE I) for the period from 2005 to 2007. Decree-Law 72/2006, of

24th January, alters Decree-Law 233/2004 and transposes to national legislation the Linking Directive[10] that allows EU-ETS operators to use emission credits generated through eligible project activities under the Kyoto Protocol.

The total amount of emissions allowances awarded to Portugal in the 2005-2007 period is of 38.16 Mt CO_2 (representing approximately 47% of national emissions), of which 36.90 Mt CO_2 corresponds to the 244 installations listed in PNALE, and the remainder 1.26 Mt CO_2 is set aside as a reserve for new entrants. This reserve amount will be cancelled in case it is not used.

Draft PNALE II[11] for the period 2008-2012 stipulates a limit value of 33.93 Mt CO_2e/year to existing installations covered under the EU ETS, corresponding to a total of 169.65 Mt CO_2e.

Further information on the EU-ETS can be found in the Fourth National Communication and the European Union's Demonstrable Progress Report.

1.6 Use of the Flexibility Mechanisms

Further to the emissions reductions achieved domestically, Portugal will resort to the flexibility mechanisms foreseen in the Kyoto Protocol in order to meet the emissions target defined in the context of the Protocol and the EU Burden Sharing Agreement.

As such, Government entrusted the Climate Change Commission to act as the Designated National Authority (DNA) for the flexibility mechanisms, and created the Portuguese Carbon Fund to acquire credits for those mechanisms. An Executive Committee was created to manage the Portuguese Carbon Fund including:

- acquisition of GHG emissions credits, at competitive prices, through direct investments in the flexibility mechanisms of the Kyoto Protocol (Emissions Trading, Joint Implementation and Clean Development Mechanism projects);
- acquisition of GHG emissions credits, at competitive prices, through direct investments in funds managed by third parties or in other carbon market instruments;
- support to projects, in Portugal, which lead to a GHG emissions reduction, namely in the areas of energy efficiency, renewable energy, carbon sinks, CO2 capture and geological sequestration, and adoption of new technologies, as justified by the return in avoided emissions.
- promoting the participation of public and private bodies in the flexibility mechanisms of the Kyoto Protocol.

Finally, a series of memoranda of understanding on climate change and flexibility mechanisms with several parties have either been signed or are currently under negotiation. These memoranda will form a platform for dialogue, particularly through the sharing of experience among the private sector.

[10] Directive 2004/101/EC of the European Parliament and of the Council, of 27 October.

[11] June 2006 version, presently under public consultation.

2 Emissions Trends and Projections

2.1 Historical Emissions Trends

Portugal's GHG emissions grew at about 3% per annum throughout the period 1990-2004, closely tracking the growth of the national economy, which also averaged 3%. The rate of emissions growth has decreased since 2000 towards stabilisation, after discounting the effects of inter-annual variability (emissions levels in recent years have been affected by significant fluctuations relating to variability of hydroelectric power generation, which is highly dependent on annual precipitation levels). This can be attributed to the implementation of some important policies and measures, in combination with the slowing of economic growth.

In accordance with the Kyoto Protocol and the EU Burden Sharing Agreement, Portugal has committed to limit, by 2008-2012, its emissions growth to 27% relative to 1990 levels (corresponding to 77.2 Mt CO_2e, according to data reported to the European Commission regarding its Assigned Amount). In 2004, total GHG emissions estimates, without Land Use, Land Use Change and Forestry (LULUCF), accounted for 84.6 Mt CO_2e, approximately 9.6% above the Kyoto target.

The key drivers explaining the increase in national emissions for this period are, among others, economic growth and increase in energy demand, traffic volume and distances covered by road transport. Meteorological parameters, such as precipitation, which have a high inter-annual variability, also have a significant influence on hydroelectric power production, thus influencing in a very significant manner the fluctuations in emissions.

Portugal registered rapid economic growth in the 1990s, with GDP increasing by 38.6% between 1990 and 2004, an annual variation of 2.8%. The most significant growth was observed between 1993 and 2000, with an average annual growth of 4.4% during the period. This economic growth was followed by a 5% annual average increase in primary energy consumption, such that n 2004, energy consumption was about 1.5 times higher than that recorded in 1990 (Figure 1).

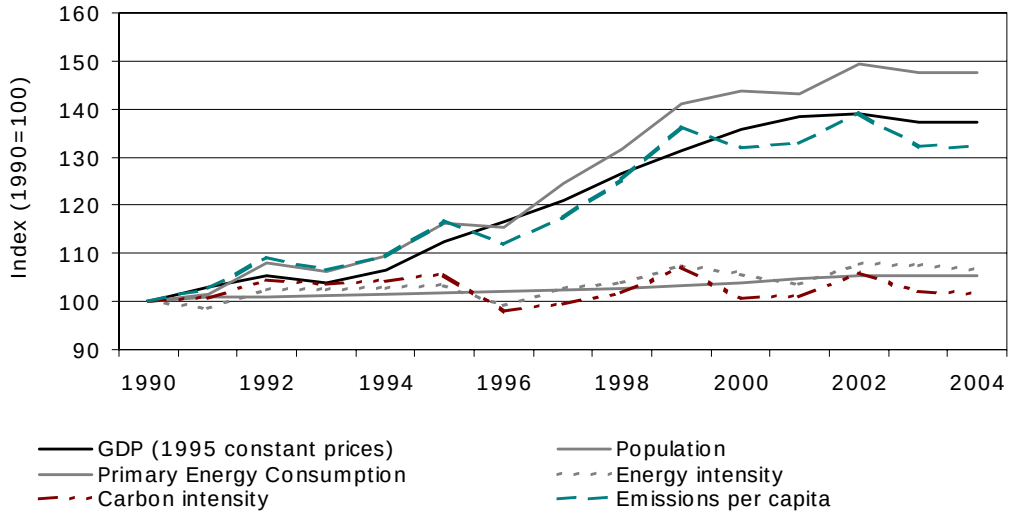

Figure 1. GHG emissions per capita, per unit GDP and relative to energy consumption
Source: INE and DGGE, 2005

Throughout this period, Portugal did not manage to decouple emissions growth from economic growth. However, there was a decrease in carbon intensity in recent years, a fact that may be explained by the implementation of some policies and measures with positive effects on GHG emissions such as the introduction of natural gas, the introduction of combined cycle gas thermal electric plants, the progressive installation of co-generation units, energy and technology efficiency improvements in industrial processes and improvements in fuel quality. However, energy intensity is still growing moderately, reflecting sustained growth in both the Transport a and the Residential and Services sub-sectors (the latter registering an increase in electricity demand).

2.1.1 Analysis by Sector

All sectors have experienced growth in emissions in the period from 2000 to 2004, with the exception of LULUCF, which has been increasing its sinks capacity (Figure 2). The abnormal value registered in 2003 in this sector (about 8 Mt CO_2e) is due to forest fires induced by a heat wave, which resulted in a burnt area of 425 000 ha, approximately 13% of the national total forested area. The amount of burnt area was substantially reduced (129 000 ha) the following year, closer to the 1990-2004 average, though this still had an impact on the sink capacity of the sector relative to the trend from previous years.

GHG emissions trends for all sectors of activity are shown in Figure 2 for the period 1990-2004.

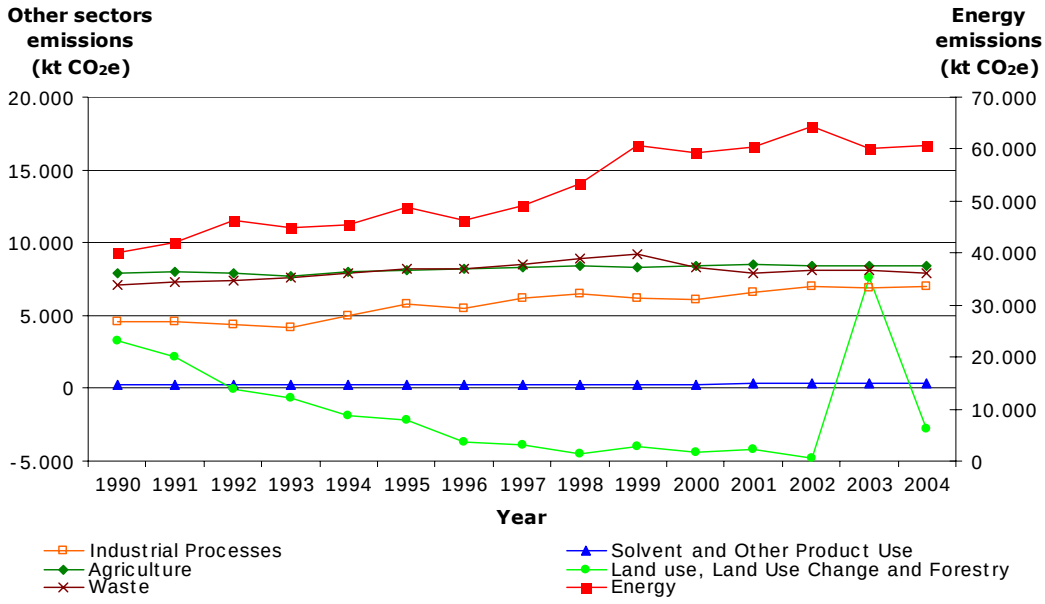

Figure 2. GHG emissions and removals (1990–2004)

Source: IAb, 2006

Table 2 summarises emissions by principal sectors, in 1990 and 2004.

Table 2. Emissions by principal sectors and variation between 1990 and 2004

IPCC Sector	Historical Emissions (kt CO_2e)				
	1990	% of 1990 total	2004	% of 2004 total	Δ 1990-2004
Total (without LULUCF[12])	**59 961**	**-**	**84 546**	**-**	**41,0%**
1. Energy	**40 169**	**67.0%**	**60 803**	**71.9%**	**51.4%**
A. Combustion Fuel	39 944	66.6%	59 554	70.4%	49.1%
1. Energy industries	16 010	26.7%	21 370	25.3%	33.5%
Electricity and heat	14 014	23.4%	18 872	22.3%	34.7%
Refining	1920	3.2%	2499	3.0%	30.1%
Manufacturing of solid fuels	75	0.1%	0	0.0%	-100.0%
2. Manufacturing industry[13] and construction	9263	15.5%	10 821	12.8%	16.8%
3. Transport	10 052	16.8%	20 043	23.7%	99.4%
Civil aviation	167	0.3%	405	0.5%	143.0%
Road	9459	15.8%	19 333	22.9%	104.4%
Railway	185	0.3%	92	0.1%	-50.1%
Maritime	242	0.4%	213	0.3%	-12.1%
4. Other sectors	4610	7.7%	7320	8.7%	58.8%
Commerce/ Tertiary sector	747	1.2%	3510	4.2%	370.0%
Domestic	2050	3.4%	2665	3.2%	30.0%
Agriculture/Forestry/Fisheries	1814	3.0%	1144	1.4%	-36.9%
B. Fugitive emissions from fuels: oil and natural gas products	225	0.0%	1249	1.5%	455.0%
2. Industrial Processes	**4626**	**7.7%**	**7035**	**8.3%**	**52.1%**
A. Mineral products	3385	5.6%	4184	4.9%	23.6%
B. Chemical industry	1209	2.0%	2453	2.9%	102.9%
C. Metal production	29	0.0%	38	0.0%	29.5%
F. F-gases consumption SF6, HFC, PFC)	2	0.0%	358	0.4%	19 607.4%
3. Solvents and Other Product Use	**220**	**0.4%**	**320**	**0.4%**	**45.7%**
4. Agriculture	**7878**	**13.1%**	**8445**	**10.0%**	**7.2%**
A. Enteric fermentation	2622	4.4%	3012	3.6%	14.9%
B. Manure management	1740	2.9%	1735	2.1%	-0.3%
C. Rice culture	256	0.4%	194	0.2%	-24.1%
D. Agricultural soils	3225	5.4%	3472	4.1%	7.7%
F. Burning of agricultural residues	35	0.1%	32	0.0%	-8.3%
5. Land Use, Land Use Change and Forestry	**3531**	**5.9%**	**-2742**	**-3.2%**	**-177.7%**
6. Waste	**7061**	**11.8%**	**7944**	**9.4%**	**12.5%**
A. Solid waste disposal on land	3892	6.5%	4756	5.6%	22.2%
B. Wastewater handling	3158	5.3%	2829	3.3%	-10.4%
C. Waste incineration	10	0.0%	357	0.4%	3312.8%
D. Others	1	0.0%	1	0.0%	0.0%

Source: IAb, 2006

[12] Sector 5: Land Use, Land Use Change and Forestry.

[13] Includes processing and combustion emissions

The energy sector is responsible for the most significant share of emissions, representing about 72% of the emissions total in 2004, a 52% increase from 1990. Within this sector, the Energy industries and Transports sub-sectors are the most relevant, accounting for 25% and 24%, respectively, of the total national emissions in 2004. This demonstrates the extent of Portugal's dependency on fossil fuels for power generation and, in particular, for transport. Despite important progress in renewable energy penetration, dependency on fossil fuels is likely to remain due to growth in electricity demand by the Residential and Services sub-sector as well as to increased mobility needs; total final energy consumption increased about 58% between 1990 and 2003.

As such, with growth in household income and the investment in road infra-structures during the 90s, emissions from the Transport sub-sector increased about 99% from 1990 to 2004 due to expansion in the vehicle fleet (particularly with more powerful engines) and road travel. The increase in road traffic also has an indirect effect in increasing emissions from storage, handling and distribution of fossil fuels. Emissions from the Industry and Construction sub-sectors have increased at the relatively lower rate of 17% from 1990 to 2004, while those from the Residential and Services sub-sector grew by over 100% relative to 1990.

The emissions from Agriculture, Waste and Industrial Processes sectors represented in 1990 about 13%, 12% and 8%, respectively, of the national emissions (excluding the LULUCF sector). Despite the increase in absolute emissions from the Agriculture and Waste sectors in 2004 relative to 1990, the share of these sectors in national emissions has fallen to about 10% and 9%, respectively.

The Industrial Processes sector, which emissions are generated as sub-products of non-energy activities, represented roughly 8% of national emissions in 2004, increasing by 52% since 1990. Such growth is related to increases in the production of cement, road pavements, use of limestone and dolomite, production of lime, glass and ammonia.

The use of solvents represents less than 1% of total emissions (without LULUCF) and is highly associated with emissions of non-methanic Volatile Organic Compounds (NMVOC).

2.1.2 Analysis by Gas

The main GHG sources are listed in Table 3.

Table 3. Main GHG sources in Portugal

GHG	Source
CO_2	Burning of fossil fuels in energy-related activities
	Production processes not related to energy, such as cement production (category 2A)
CH_4	Anaerobic decomposition of organic matter in biological systems, such as urban and livestock waste, wastewater treatment plants, or enteric fermentation in animals
	Burning of biomass
	Natural gas and oil distribution
	Incomplete combustion of fossil fuels
N_2O	Direct and indirect emissions from agricultural soils, related particularly with the use of synthetic fertilisers and manure; deposition of manures by cattle
	Nitrogen fixation by leguminous crops and the incorporation of agricultural residues in soils
	Chemical industry (production of nitric acid)
	Wastewater treatment
	Burning of fossil fuels (especially in the transport sector)
	Burning of biomass (forest fires, agricultural residues, burning of biomass in the residential sector and waste incineration)
HFC	Leaks in production, operation and decommissioning of air conditioning equipment
	Foam blowing
	Fire retardants
	Inhalers
SF_6	Losses in the electricity distribution systems, circuit breakers and metal-clad substations

All GHG emissions increased in the period from 1990 to 2004 (Figure 3).

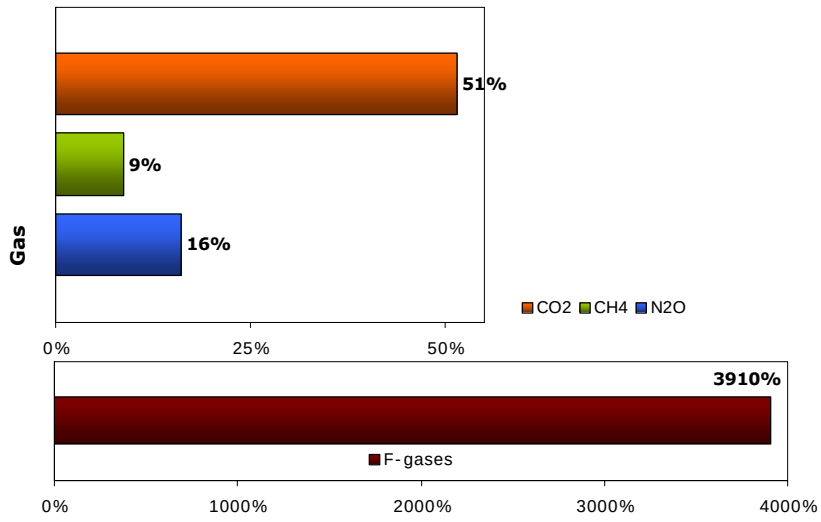

Figure 3.GHG emissions increase between 1990 and 2004 (by gas)

Source: IAb, 2006

Figure 4 illustrates the relative contribution of each of the GHG to the emissions total for the base year (1990 for all GHG, except 1995 for fluorinated gases) and 2004. Representing 78% of the total 2004 emissions weighed by GWP[14], CO_2 is the gas emitted in largest amounts, 89.6% of which result from the energy sector.

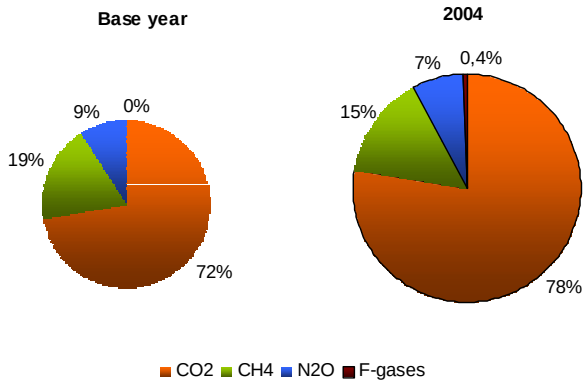

Figure 4. Relative contribution of each GHG to the total emissions (base year and 2004)[15]
Source: IAb, 2006

Further information can be obtained from Chapter 2 of the Fourth National Communication, as well as from the national inventories reports submitted annually to the Convention Secretariat.

2.2 Emissions Projections

Emissions projections for 2010 (assumed as the average year for the period 2008-2012) and 2020 are presented in the PNAC 2006. For the purpose of this report, the main focus will be on projections for 2010.

Projection estimates for national anthropogenic GHG emissions are organised according to Intergovernmental Panel on Climate Change (IPCC)[16] sectors, with fugitive emissions presented together with emissions of the Energy Supply sub-sector. These estimates are supported by the following:

- expected emissions in the reference scenario, estimated on the basis of energy demand forecasts derived from macro-economic indicators, as well as from the implementation of sectoral policies and measures, adopted or in force on the 1st January 2005 (thus excluding the EU Emissions Trading Scheme) which bear an impact on GHG emissions reduction (including afforestation, reforestation and deforestation under art. 3(3) of the Kyoto Protocol); and
- GHG emissions reductions expected from the adoption of additional policies and measures undertaken with the objective of reducing GHG emissions (including forest management, cropland management and grazing land management activities under art. 3(4) of the Kyoto Protocol).

The review of macro-economic and sectoral scenarios was supported by updated information, namely (i) new data on the national accounts for the period 2000-2005 (INE, 2006) (ii) GDP growth rate forecasts for the period 2005 to 2010 (Stability and Growth Programme 2005-2009, December 2005 version).

[14] Global Warming Potential.

[15] Portugal elected 1995 as base year for fluorinated gases.

[16] In the Energy sector, Transport sub-sector is presented separately.

The integration of these new macro-economic and sectoral variables revises downward the GDP growth rates for the period 2005 to 2010 and also changes the structure of intra and intersectoral Gross Value Added (GVA) considered for the purpose of simulating energy demand in the various final consumption sectors.

Relative to the national GHG projections, the following should be noted:

- Figures for the period 2000-2005 are based on historical data, namely the preliminary annual national accounts (Base year 2000) (INE 2006).
- Projections for the period 2005-2010 are based on the annual GDP growth rates provided in the Stability and Growth Programme 2005-2009 (December 2005 version). The growth rate for 2010 was maintained at the same level of 2009 (the last year covered in the Programme).
- Projections for the period 2010-2020 are based on the annual GDP growth rates considered in the PNAC 2004 scenarios, which, in turn, are based on CISEP (CISEP, 2001) estimates, for two scenarios (high and low).

2.2.1 Projections by Sector

Table 4 and Figure 5, below, show the GHG emissions estimated and projected for the period 1990-2010, for the reference scenario and with additional measures.

According to the projections for the reference scenario, it is estimated that, by 2010, Portugal's emissions will total to 84 608 kt CO_2e. The sector with most significant representation is Energy, with 65 741 kt CO_2e. The Energy industries and Transport sub-sectors have the largest contributions, with 23 146 kt CO_2e and 21 151 kt CO_2e, respectively, corresponding to approximately 53% of the national total.

The trend of the "diffuse" sectors is noteworthy: the Transport sub-sector is estimated to grow by over 100%, and the Residential and Services sub-sector, by 75% compared to 1990. The Waste sector contribution is expected to decrease by 14% compared to the base year, due to improved management standards of municipal solid waste (Landfill and Packaging Directives), as well as management of domestic and industrial wastewater.

The weight of each sector in the national GHG emissions balance is also expected to change between 1990 and 2010, with the Energy sector's share growing from 67% to 75%, while the share for Industrial Processes sector are estimated to remain at 8%. The Agriculture sector's contribution is expected to decrease from 13% to 10% and the Waste sector from 12% in 1990 to 7% by 2010.

GHG emissions reduction potential from additional measures totals 3687 kt CO_2e/year, resulting in estimated total emissions of 80 920 kt CO_2e by 2010, under the "with additional measures" scenario. This estimated value is 5% higher than the assigned amount under the Kyoto target (77 194 kt CO_2e).

The general emissions trend described for the reference scenario remains consistent under the with additional measures scenario, with policies and measures affecting the Energy industries and Transport sub-sectors and Agriculture sector resulting in estimated emissions reductions of 4%, 3% and 5%, respectively, in relation to the reference scenario. Furthermore, the national sinks capacity, relative to the reference scenario, is expected to increase by 39%.

Systematisation of additional measures according to 2010 objectives as well as respective GHG emissions reduction potential is presented in the previous chapter.

Table 4. GHG emissions in the reference scenario and with additional measures

IPCC Sector	Historical Emissions (kt CO_2e)			Reference Scenario (kt CO_2e)			Δ Base year-2010 (Reference Scenario)	With Additional Measures (kt CO_2e)			Δ Base year-2010 (with Additional Measures)
					Low	High			Low	High	
	Base Year[17]	2000	2004	2010	2020	2020		2010	2020	2020	
Total	**60 783**	**82 178**	**84 546**	**84 608**	**95 995**	**102 381**	**39.2%**	**80 920**	**94 013**	**99 709**	**33.1%**
Kyoto Target[18]	**77 194**	**-**	**-**	**84 608**	**-**	**-**	**9.6%[19]**	**80 920**	**-**	**-**	**4.8%[20]**
1. Energy	**40 169**	**59 189**	**60 803**	**65 741**	**73 837**	**80 223**	**63.7%**	**63 761**	**72 363**	**78 059**	**58.7%**
A. Combustion Fuel	39 944	58 461	59 554	64 302	72 070	78 211	61.0%	62 336	70 488	76 056	56.1%
1. Energy industries	16 010	20 864	21 370	23 146	24 990	28 209	44.6%	22 161	25 260	28 036	38.4%
Electricity and heat	14 014	18 404	18 872	19 879	21 547	24 766	41.9%	18 894	21 852	24 593	34.8%
Refining	1920	2404	2499	3267	3443	3443	70.1%	3267	3408	3443	70.1%
Manufacturing of solid fuels	75	56	0	0	0	0	-100.0%	0	0	0	-100.0%
2. Manufacturing industry[21] and construction	9263	11 884	10 821	11 902	13 693	15 155	28.5%	11 602	13 354	14 797	25.2%
3. Transport	10 052	19 383	20 043	21 151	24 213	24 860	110.4%	20 543	23 605	24 251	104.4%
Civil aviation	167	367	405	462	620	632	177.3%	462	620	632	177.3%
Road	9459	18 671	19 333	20 397	23 310	23 944	115.6%	19 789	22 702	23 336	109.2%
Railway	185	141	92	85	75	76	-54.0%	85	75	76	-54.0%
Maritime	242	204	213	207	207	207	-14.4%	207	207	207	-14.4%
4. Other sectors	4610	6329	7320	8104	9174	9988	75.8%	8031	8270	8970	74.2%
Commerce/ Tertiary sector	747	2208	3510	4343	5354	6073	481.5%	4284	4521	5128	473.6%
Domestic	2050	2745	2665	2863	2768	2829	39.7%	2849	2697	2756	39.0%
Agriculture/Forestry/Fisheries	1814	1376	1144	897	1052	1086	-50.5%	897	1052	1086	-50.5%
B. Fugitive emissions from fuels: oil and natural gas products	225	728	1249	1438	1768	2012	539%	1425	1875	2004	533.0%
2. Industrial Processes	**4626**	**6038**	**7035**	**7204**	**7881**	**7881**	**55.5%**	**7204**	**7881**	**7881**	**55.5%**
A. Mineral products	3385	4360	4184	4087	4184	4184	20.7%	4087	4184	4184	20.7%
B. Chemical industry	1209	1485	2453	2347	2347	2347	94.1%	2347	2347	2347	94.1%
C. Metal production	29	52	38	21	21	21	-29.4%	21	21	21	-29.4%
D. Others	0	0	0	1	1	1	16.2%	1	1	1	16.2%

[17] 1990, except for "F. F-gases consumption SF6, HFC, PFC)" from 1995.

[18] In accordance with the report submitted to the European Commission on April 2006 (IAc, 2006), calculated following Art. 3(7) of the Kyoto Protocol.

[19] Distance to target.

[20] Distance to target.

[21] Includes processing and combustion emissions.

IPCC Sector	Historical Emissions (kt CO_2e)			Reference Scenario (kt CO_2e)			Δ Base year-2010 (Reference Scenario)	With Additional Measures (kt CO_2e)			Δ Base year-2010 (with Additional Measures)
					Low	High			Low	High	
	Base Year[17]	2000	2004	2010	2020	2020		2010	2020	2020	
F. F-gases consumption SF6, HFC, PFC)	9	140	358	748	1328	1328	7968.7%	748	1328	1328	7968.7%
3. Solvents and Other Product Use	**220**	**290**	**320**	**290**	**290**	**290**	**32.0%**	**290**	**290**	**290**	**32.0%**
4. Agriculture	**7878**	**8387**	**8445**	**8649**	**8372**	**8372**	**9.8%**	**8220**	**7865**	**7865**	**4.3%**
A. Enteric fermentation	2622	2996	3012	3119	2927	2927	19.0%	3119	2927	2927	19.0%
B. Manure management	1740	1796	1735	2099	2032	2032	20.7%	1671	1525	1525	-4.0%
C. Rice culture	256	180	194	179	203	203	-29.9%	179	203	203	-29.9%
D. Agricultural soils	3225	3383	3472	3217	3175	3175	-0.2%	3217	3175	3175	-0.2%
F. Burning of agricultural residues	35	32	32	33	34	34	-6.0%	33	34	34	-6.0%
5. Land Use, Land Use Change and Forestry[22]	**822**	**-**	**-**	**-3355**	**ND**	**ND**	**-**	**-4655**	**ND**	**ND**	**-**
Deforestation (Art. 3(7) of Kyoto Protocol)	822	-	-	-	-	-	-	-	-	-	-
Art. 3(3) of Kyoto Protocol	-	-	-	-3355	ND	ND	ND	-3355	ND	ND	ND
Deforestation	-	-	-	388	ND	ND	ND	388	ND	ND	ND
Afforestation / Reforestation	-	-	-	-3743	ND	ND	ND	-3743	ND	ND	ND
Art.º 3(4) of Kyoto Protocol	-	-	-	ND	ND	ND	ND	-1300	ND	ND	ND
Forest management	-	-	-	ND	ND	ND	ND	-800	ND	ND	ND
Cropland management / Grazing land management	-	-	-	ND	ND	ND	ND	-500	ND	ND	ND
6. Waste	**7061**	**8274**	**7944**	**6080**	**5614**	**5614**	**-13.9%**	**6080**	**5614**	**5614**	**-13.9%**
A. Solid waste disposal on land	3892	4788	4756	3009	2411	2411	-22.7%	3009	2411	2411	-22.7%
B. Wastewater handling	3158	3095	2829	2548	2745	2745	-19.3%	2548	2745	2745	-19.3%
C. Waste incineration	10	390	357	523	459	459	4899.9%	523	459	459	4899.9%
D. Others	1	0	1	0	0	0	-100.0%	0	0	0	-100.0%

NA: Not available

Source: IAa, 2006 and IAb, 2006

[22] Only relevant values for the purpose of assessing compliance with the Kyoto target are shown.

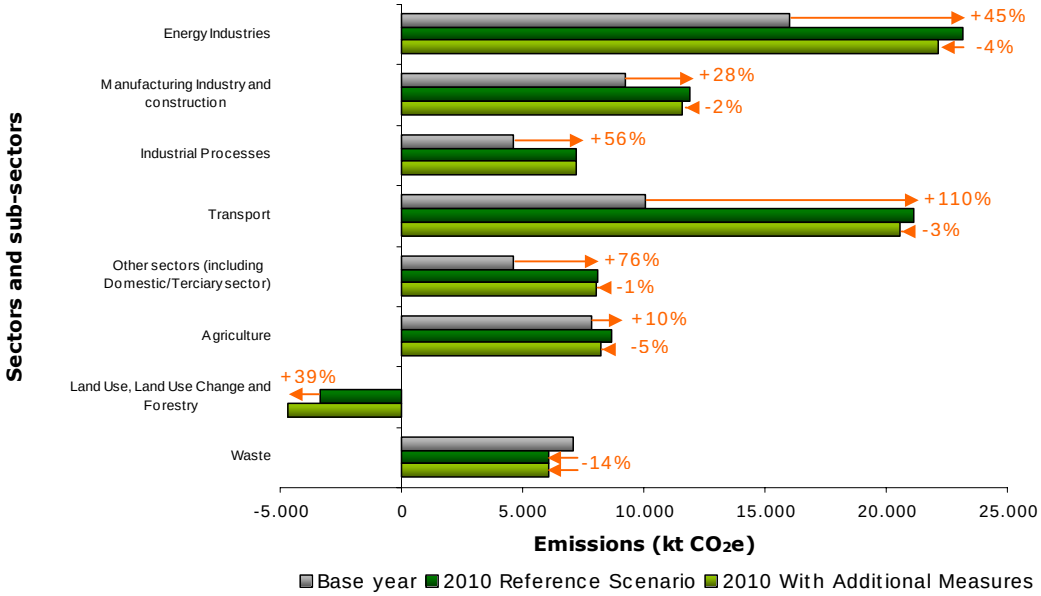

Figure 5.Trend in GHG (1990-2010) estimated for the reference scenario and with additional measures
Source: IAb, 2006

Figure 6 shows the disaggregated sectoral structure for the Energy sector, in 1990 and in the reference scenario.

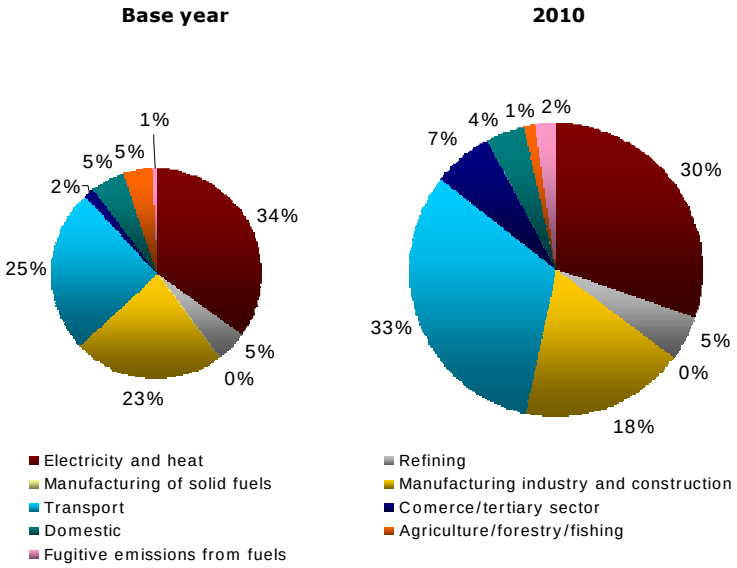

Figure 6. Sectoral structure of GHG emissions in 1990 and in 2010, disaggregated for the Energy sector[23]
Source: IAb, 2006

[23] No alterations are observed in the sectoral structure of GHG emissions under the with additional measures scenario, relative to the reference scenario.

2.2.2 Projections by Gas

Table 5, Table 6, Table 7 and Table 8 systematise the trend in emissions for each of the GHG in the reference scenario and with additional measures.

The Energy sector has the largest contribution to CO_2 emissions, with a maximum of 63 842 kt CO_2 by 2010 in the reference scenario. Emissions are reduced by 2.5% with additional measures.

The Waste and Agriculture sectors are the main sources of CH_4. From its maximum value in 2000 (349 kt CH_4), Waste sector emissions will decrease to a minimum of 213 kt CH_4 in 2020 under both scenarios. A slight decrease in emissions was observed in the period from 2000 to 2004. This trend is expected to continue and intensify beyond 2010 (emissions reductions of 9% and 12% under the reference scenario and with additional measures, respectively) to 2020 due to reductions from the Agriculture and Waste sectors and in spite of an expected increase from the Energy sector.

The Agriculture sector is the principal source of N_2O. No significant variation is expected between the reference scenario and with additional measures for this gas, which emissions show a growth trend in particular due to the Energy and Waste sectors.

Additional information can be obtained from Chapter 4 of the Fourth National Communication and the National Climate Change Programme.

Table 5. Historical and projected emissions of CO_2 in the reference scenario and with additional measures

IPCC Sector	Historical Emissions (kt CO_2)			Reference Scenario (kt CO_2)			Δ 1990-2010 (Reference Scenario)	With Additional Measures (kt CO_2)			Δ 1990-2010 (with Additional Measures)
					Low	High			Low	High	
	1990	2000	2004	2010	2020	2020		2010	2020	2020	
Total (com LULUCF)	**46 727**	**59 533**	**62 842**	**66 721**	**73 804**	**79 881**	**43%**	**65 120**	**72 593**	**78 124**	**39%**
Total (sem LULUCF)	**43 366**	**63 763**	**65 705**	**70 464**	**78 130**	**84 207**	**62%**	**68 863**	**76 918**	**82 450**	**59%**
1. Energy	39 087	57 660	58 996	63 842	71 471	77 548	63%	62 241	70 259	75 791	59%
2. Industrial Processes	4049	5452	6059	5848	5945	5945	44%	5848	5945	5945	44%
3. Solvents and Other Product Use	220	290	320	290	290	290	32%	290	290	290	32%
4. Agriculture	0	0	0	0	0	0	0%	0	0	0	0%
5. Land Use, Land Use Change and Forestry	3362	-4230	-2863	-3743	-4325	-4325	-	-3743	-4325	-4325	-
6. Waste	10	361	330	484	424	424	4840%	484	424	424	4840%

Source: IAa, 2006 and IAb, 2006

Table 6. Historical and projected emissions of CH_4 in the reference scenario and with additional measures

IPCC Sector	Historical Emissions (kt CH_4)			Reference Scenario (kt CH_4)			Δ 1990-2010 (Reference Scenario)	With Additional Measures (kt CH_4)			Δ 1990-2010 (with Additional Measures)
					Low	High			Low	High	
	1990	2000	2004	2010	2020	2020		2010	2020	2020	
Total (com LULUCF)	**541.87**	**593.21**	**588.85**	**495.42**	**478.09**	**489.88**	**9%**	**475.26**	**460.23**	**466.08**	**12%**
Total (sem LULUCF)	**534.56**	**586.89**	**583.64**	**495.42**	**478.09**	**489.88**	**7%**	**475.26**	**460.23**	**466.08**	**11%**
1. Energy	26.88	29.97	40.83	38.1	50.89	62.73	-42%	37.56	56.31	62.16	-40%
2. Industrial Processes	0.43	0.54	0.62	0.52	0.52	0.52	-21%	0.52	0.52	0.52	-21%
3. Solvents and Other Product Use	0.00	0.00	0.00	0.0	0.0	0.0	00%	0.00	0.00	0.00	0%
4. Agriculture	193.89	207.56	208.58	221.576	213.216	213.162	-14%	201.96	189.94	189.94	-4%
5. Land Use, Land Use Change and Forestry	7.31	6.31	5.22	0.00	0.00	0.00	-	0.00	0.00	0.00	-
6. Waste	313.36	348.82	333.61	235.22	213.465	213.465	25%	235.22	213.46	213.46	25%

Source: IAa, 2006 and IAb, 2006

Table 7. Historical and projected emissions of N_2O in the reference scenario and with additional measures

IPCC Sector	Historical Emissions (kt N_2O)			Reference Scenario (kt N_2O)			Δ 1990-2010 (Reference Scenario)	With Additional Measures (kt N_2O)			Δ 2010 Additional Measures Scenario vs 1990
					Low	High			Low	High	
	1990	2000	2004	2010	2020	2020		2010	2020	2020	
Total (com LULUCF)	**17.34**	**19.24**	**20.12**	**20.48**	**20.96**	**21.22**	**18%**	**20.47**	**20.99**	**21.19**	**18%**
Total (sem LULUCF)	**17.29**	**19.20**	**20.08**	**20.48**	**20.96**	**21.22**	**18%**	**20.47**	**20.99**	**21.19**	**18%**
1. Energy	1.67	2.90	3.06	3.54	4.19	4.44	112%	3.54	4.21	4.41	112%
2. Industrial Processes	1.83	1.40	1.95	1.93	1.93	1.93	5%	1.93	1.93	1.93	5%
3. Solvents and Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
4. Agriculture	12.28	13.00	13.11	12.89	12.57	12.57	5%	12.89	12.57	12.57	5%
5. Land Use, Land Use Change and Forestry	0.05	0.04	0.04	0.00	0.00	0.00	-	0.00	0.00	0.00	-
6. Waste	1.52	1.90	1.96	2.12	2.28	2.28	39%	2.12	2.28	2.28	39%

Source: IAa, 2006 and IAb, 2006

Table 8. Historic and projected emissions for F-gases, for reference scenario and with additional measures

IPCC Sector	Historic emissions (kt CO_2e)			Reference Scenario (kt CO_2e)			Δ 1995-2010 (Reference Scenario)	With Additional Measures (kt CO_2e)			Δ 1995-2010 (with Additional Measures)
					Low	High			Low	High	
	1995	2000	2004	2010	2020	2020		2010	2020	2020	
Consumption of F-gases (SF6, HFC, PFC)	9	140	359	748	1328	1328	37 300%	748	1328	1328	37 300%

Source: IAa, 2006 and IAb, 2006

2.3 Analysis of the Contribution of Domestic Policies and Measures Towards the Compliance with the Kyoto Target

In light of the PNAC 2006 emissions projections for 2010, which take into consideration the reference scenario as well as the emissions reduction potential from additional policies and measures, it is possible to assess how Portugal will achieve its quantitative GHG emissions limitation target for the first commitment period of the Kyoto Protocol, in the frame of the EU Burden Sharing Agreement. This commitment corresponds to a limitation of GHG emissions in the order of 385 970 450 kt CO_2e (Assigned Amount Units) in the five year period (2008-2012), equivalent to 77 194 kt CO_2e/year.

In line with these results, the following are noted:

- The net GHG emissions balance in the reference scenario (including afforestation, reforestation and deforestation activities under art. 3(3) of the Kyoto Protocol) is of 84 608 kt CO2e, about 10% above the emissions reduction target (7.4 Mt CO2e gap).
- The net balance of emissions, considering the additional policies and measures under the PNAC (including those activities under art. 3(4) of the Kyoto Protocol) is estimated at 80 920 kt CO2e. This entails a GHG emissions reduction potential of about 3.7 Mt CO2e/year, and demonstrates a capacity to achieve 50% of the referred deficit through domestic measures.

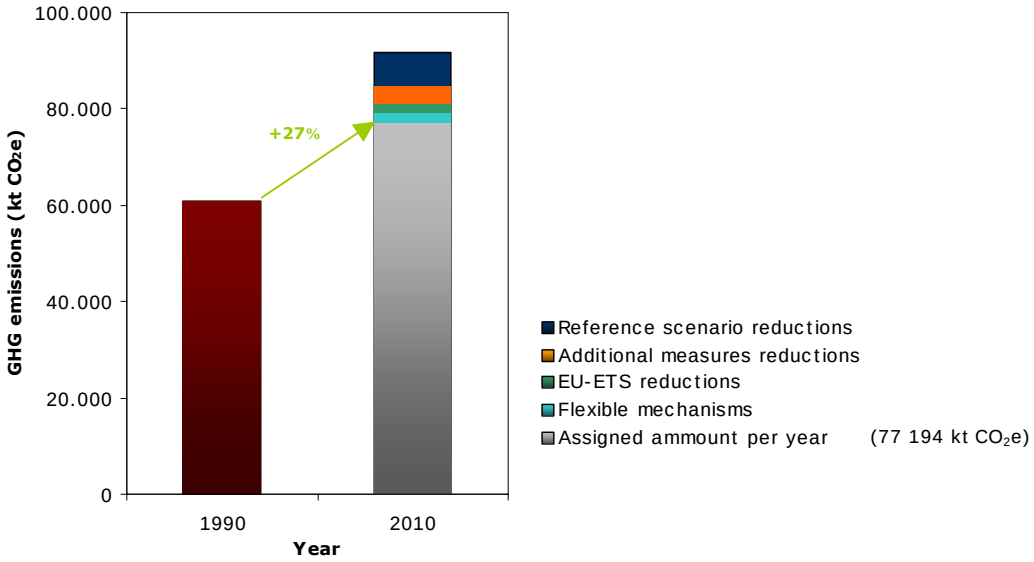

Figure 7. Compliance with the Kyoto target

Source: IAa, 2006

This 3.7 Mt CO_2e/year gap can be met through the EU-ETS and the acquisition of emissions reduction credits through the flexibility mechanisms of the Kyoto Protocol. As such, credits in the amount of 1.86 Mt CO_2e/year shall be acquired from the Kyoto Protocol's flexibility mechanisms, leaving to the operators of the EU-ETS an emissions reduction effort of 1.87 Mt CO_2e/year.

This demonstrates Portugal's effort in fully exploring fully the potential of emissions reduction, through a broad range of policies and measures, and by using market mechanisms as a tool to ensure an overall benefit in the most cost-effective manner, as foreseen under the Kyoto Protocol.

3 Demonstration of Progress Towards Compliance with other Commitments

3.1 Improvement of the National Inventory System

Ahead of the Kyoto Protocol deadline by almost two years, Portugal was one of the first countries to approve, through a Council of Ministers Resolution[24], a National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants (SNIERPA). This system was initially conceived for the preparation of inventories of GHG, acidifying and eutrophicating gas emissions, with the inclusion of particulates, heavy metals and persistent organic pollutants foreseen at a latter stage. SNIERPA defines the institutional responsibilities of the various bodies involved in the process, as well as a set of technical instruments that ensure the preparation of the inventory according to the guidelines of the Intergovernmental Panel on Climate Change.

SNIERPA is composed of three technical elements: a Methodological Development Programme (MDP), a Quality Assurance and Quality Control (QA/QC) System and an integrated IT system for the management of the SNIERPA.

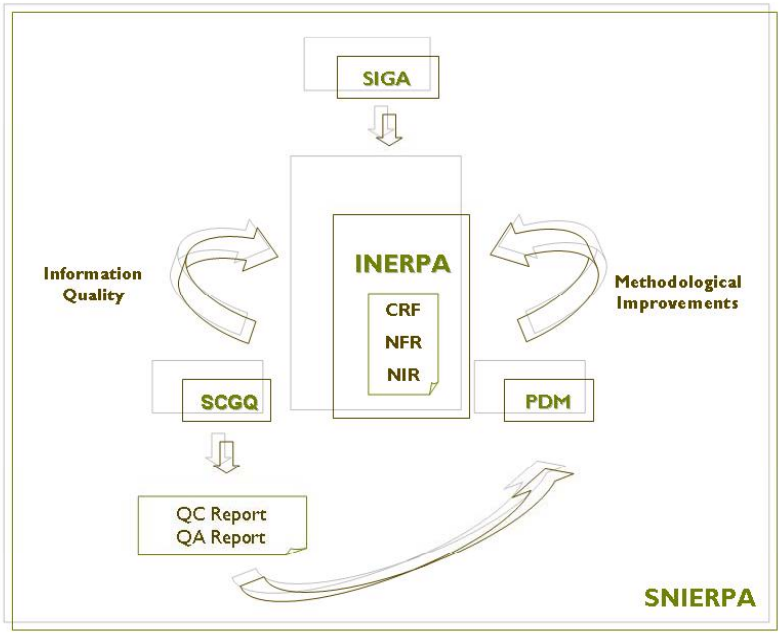

Figure 8. Linkages between the various elements of the SNIERPA

Source: IA, 2005

Additional information can be obtained from Chapter 2 of the Fourth National Communication.

[24] Council of Ministers Resolution 68/2005, of 17 March.

3.2 Adaptation to Climate Change

Portugal has important experience and knowledge to define climate change adaptation strategies. This results from the adoption of a series of measures to mitigate the intensification and increased regularity of certain extreme weather events such as heat waves and droughts, as well as the indirect effects of forest fires. Against this background, the Government created and implemented the Contingency Plan for Heat Waves (Ministry of Health) which relies on the coordination of the Meteorology Institute (IM), the Fire and Civil Protection National Service (SNBPC) and the National Observatory of Health of the Dr. Ricardo Jorge National Health Institute (ONSA/INSA).

Several measures have been taken in relation to protection against forest fires: several legal documents have been prepared and are under discussion, namely with regard to infractions applicable in the frame of the National System for Forest Fire-Protection and the new rules in relation to Forest Fire Fighters. The Council of Ministers Resolution 5/2006, of 18 January, approved the strategic directives for the Recovery of Burnt Areas, established by the National Council for Reforestation set up after the extensive fires of 2003. The 25-year National Plan for Defence Against Forest Fire (Resolution of the Council of Ministers 65/2006, of 26 May) presents a strategy and coordinated array of initiatives with the objective of promoting active forest management, enabling conditions for a progressive reduction in forest fires. Regional Plans for Forestry Planning (PROFs) are finalised and in approval phase. The National Strategy for Forests, presently under public discussion, redefines sectoral objectives and targets and implements the Forestry Intervention Zones (ZIF) with a view to overcoming barriers from excessive fragmentation of properties, in order to ensure sustainable forest protection and management in specific areas.

Portugal, together with the other member countries of the *Red Iberoamericana de Oficinas de Cambio Climático* (RIOCC) [25] and *Rede de Organismos de Alterações Climáticas da CPLP* (RELAC) [26] (see sub-section 3.4, below), has identified climate change adaptation as one of the main priorities in the definition of policies, in particular with regard to North-South cooperation. As such, following decision 1/CP.10, Portugal supported financially the organisation of regional workshops on adaptation in Latin America and Africa.

Additional information can be obtained from Chapter 5 of the Fourth National Communication.

3.3 Technical and Scientific Cooperation, and Access to and Transfer of Technology

Technical cooperation is the most important item of bilateral assistance (see point 6.3 of the Fourth National Communication), facilitated by the historical and cultural ties, as well as by the common institutional and legal matrix between Portugal and its partner countries. It is mainly developed through sectoral programmes or projects covering, among other activities, teacher training, local engagement of aid/cooperation workers, scholarship awards (in Portugal as well as in partner countries) and technical assistance for capacity-building of partner countries´ administrations.

In this context, it is worth noting the ongoing scientific and technical collaboration with institutions of the Portuguese Speaking Countries, namely the continued participation of the Meteorological Institute in several operational and Research and Development projects, in particular with Sao Tome and Principe and Cape Verde, in the fields of Systematic Observation and models for weather, climate and ocean turbulence.

Within the framework of the Portuguese Official Development Assistance (ODA), and in the context of the Bonn Political Declaration, several cooperation protocols were celebrated with Cape Verde and Sao Tome and Principe in

[25] Iberian-American Climate Change Network.

[26] Portuguese Speaking Countries Climate Change Network.

2005 and with Guinea-Bissau in 2006, for implementation of the Climate and Sea Information System for Sustainable Development (SICLIMAD) project in these countries.

The SICLIMAD project is characterised by the use of meso-scale numerical models, also known as regional scale models. Through climate modelling, regional scenarios for possible climate change have been established. The project thus provides a fundamental instrument to support political and economic decision-makers in determining policies for mitigating and adapting to the adverse effects of climate change. This yields invaluable positive impacts for society as a whole.

Also noteworthy is the scientific and technical cooperation with the Meteorological and Geophysical Services of the Special Administrative Region of Macau and the Meteorological Administration of the Popular Republic of China. Under the protocol established between the Meteorology Institute, the Meteorological Service of Macau and the Meteorological Administration of China, scientific and technical cooperation continues in the domain of Radar Meteorology and its applications, namely the development of precipitation measuring techniques using radar technology.

Between 2001 and 2005, there were several projects supported by Portuguese Official Development Assistance (ODA) which involved technology transfer of various kinds. With the view of mainstreaming environment and climate change, Portugal has been focusing its support on technologies that allow for a more rational use of resources, particularly water and energy.

Additional information can be obtained from Chapter 7 of the Fourth National Communication.

3.4 Institutional Capacity-Building and Assistance to Developing Countries in the Implementation of the Convention

Portugal has been engaging ever more actively in the activities developed by the various international bodies and specialised agencies in the context of assistance to developing countries. It has been particularly active in the participation in a variety of international fora on Africa, Latin America and Asia, although its interventions still have a special focus on Community of Portuguese Speaking African Countries[27] (CPLP).

The largest share of multilateral contributions is channelled through the EU, via instalments to the European Development Fund (EDF) which finances EU assistance to African, Caribbean and Pacific (ACP) countries, and the contributions the European Commission Budget for External Assistance which finances the assistance to developing countries not covered by the EDF.

In order to address global environmental problems, including those stemming from climate change, Portugal contributed to the Global Environment Facility a total of USD$ 6.08 million in the period from 2001 to 2004 (Table 9).

[27] The Community of Portuguese Speaking Countries (CPLP) was created on the 17th July 1996 and is a privileged multilateral forum for deepening friendship and cooperation among its member-states: Angola, Brazil, Cape Verde, Guinea-Bissau, Mozambique, Portugal, Sao Tome and Principe and East Timor.

Table 9. Portugal's multilateral contributions, 2001-2004 (millions, USD)[28]

	Contribution			
	2001	2002	2003	2004
Global Environment Fund (GEF)	1.09	0[29]	3.21	1.78
Total Multilateral	112.19	168.85	187.90	219.47

Source: IPAD, 2005

With regard to bilateral cooperation, political action favours intervention in the Portuguese speaking countries – with which there are historical, linguistic and cultural ties – through public-private partnerships, the development of an appropriate financial support framework and the support to civil society organisations with relevant activities in this area.

Table 10. Bilateral and regional financial contributions related to the implementation of the Convention in the period 2001-2005 (Euros)

2001	2002	2003	2004	2005
958 250.00	1 042 991.00	662 158.00	1 788 735.00	2 172 386.00

Source: IPAD, 2005

Following the commitment by the EU, Canada, New Zealand, Norway and Switzerland at the Second Part of the Sixth Conference of the Parties in Bonn in 2001, to contribute annually with 410 million dollars for the support to non-Annex I countries in climate change related projects (Bonn Political Declaration), as well as decisions subsequently made within the EU, Portugal ensured in 2005 that its own share of annual international obligations were duly met.

Table 11. Breakdown of Portugal's contributions in accordance with the Bonn Political Declaration (Euros)

Type of Contribution	2005	
	Description	Amount
Contributions for activities related to climate change in the context of GEF		-
Additional bilateral and multilateral contributions	Multilateral contribution: participation at the LDC workshop (Bonn, May)	5000.00
	Multilateral contribution: participation in the Conference of the Parties (COP/CMP) and Subsidiary Bodies (SBs) (Cape Verde, Guinea-Bissau, Mozambique, Sao Tome and Principe)	17 584.22
	Bilateral Contribution: SICLIMAD-CV[30] Project	66 189.60
	Bilateral Contribution: SICLIMAD-STP[31] Project	35 151.00
Contributions for the *Special Climate Change Fund* (SCCF), the *Adaptation Fund* do Kyoto Protocol and the *Least Developed Countries Fund* (LDCF)	SCCF Contribution	1 070 000,00
Contributions resulting from the approval of CDM projects		-
Total (Euros)		**1 193 924.82**
Total (USD[32])		**1 753 995.99**

Source: IAd, 2006

[28] Contributions to Part I organisations (ODA) and Part II (OA) to DAC /OECD.

[29] This value is explained by a delay in its accounting and was therefore subsequently compounded with the figure for 2003.

[30] Climate and Sea Information System for Sustainable Development – Cape Verde.

[31] Climate and Sea Information System for Sustainable Development – Sao Tome and Principe.

[32] Dollar amount calculated using the exchange rate of the day of the transfer.

The funding available for compliance with the Bonn Declaration is new and additional relative to previous years, as it results from a new budget line of MAOTDR created specifically for this objective. Further to integrated support already provided to other projects, the management of this specific funding line, under the responsibility of the Institute for the Environment, will support projects conceived for the implementation of the Convention and the Kyoto Protocol, namely through mitigation and adaptation initiatives.

The referred funds will be managed so as to meet the objectives of the two regional networks established specifically to promote cooperation on the implementation of the Convention and Kyoto Protocol – the Portuguese Speaking Countries Climate Change Network (RELAC) and the Iberian-American Climate Change Network (RIOCC) – both promoted by Portugal between 2004 and 2005 in close collaboration with the involved countries. With similar objectives and formats, these networks differ mainly by their geographical scope, with RELAC being focused fundamentally in Africa while RIOCC focuses on Latin America. However, both these networks aim at promoting the exchange of knowledge and experiences between the regions, through specific mechanisms to be created.

RELAC includes Angola, Brazil, Cape Verde, Guinea-Bissau, Mozambique, Portugal, Sao Tome and Principe and East-Timor, and is a fundamental instrument for networking between CPLP countries. It will facilitate the exchange of perspectives and experiences, as well as the preparation of joint proposals promoting action against climate change.

RIOCC is composed of Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Equador, El Salvador, Spain, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguai, Peru, Portugal, Republica Dominicana, Uruguai and Venezuela.

Additional information can be found in Chapter 6 of the Fourth National Communication.

Accronyms

ACP	African, Caribbean and Pacific Countries
CAC	Climate Change Commission
CARRIS	Lisbon Public Transport Company
CDM	Clean Development Mechanism
CE	European Commission
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
CP	*Comboios de Portugal* (national train company)
CPLP	Community of Portuguese Speaking Countries
DAC	Development Assistance Committee
DGGE	Directorate-General for Geology and Energy
EAMA	European Automobile Manufacturers Association
ECCP	European Climate Change Programme
ENGO	Environmental Non-Governmental Organisation
EU	European Union
EU-ETS	European Union Emissions Trading Scheme
FCT	Science and Technology Foundation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas(es)
GVA	Gross Value Added
GWP	Global Warming Potential
hab	Inhabitant
HFC	Hydrofluorocarbon
IA	Institute for the Environment
III FSP	Third Framework Support Programme
INE	National Statistics Institute
INERPA	National Inventory of Emissions by Sources and Removals by Sinks of Air Pollutants
IPAD	Portuguese Institute for Development Support
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
JAMA	Japan Automobile Manufacturers Association
KAMA	Korean Automobile Manufacturers Association
KP	Kyoto Protocol
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
LULUCF	Land Use, Land Use Change and Forestry
MA	Additional policies and measures (scenario)
MADRP	Ministry of Agriculture, Rural Development and Fisheries (includes Forestry)
MAI	Ministry of Internal Administration
MAOTDR	Ministry of the Environment, Spatial Planning and Regional Development
MCTES	Ministry of Science, Technology and Higher Education
ME	Ministry of Education
MEI	Ministry of Economy and Innovation (includes Energy and Industry)
MFAP	Ministry of Finance and Public Administration
ML	Lisbon Metro
MNE	Ministry of Foreign Affairs
MOP	Meeting of the Parties

MOPTC	Ministry of Public Works, Transports and Communications
MP	Porto Metro
MR	Policies and measures integrated in the reference scenario
N_2O	Nitrous Oxide
NGO	Non-Governmental Organisation
NIR	National Inventory Report
NMVOC	Non-methanic volatile organic compounds
ODA	Overseas development Assistance
OECD	Organisation for Economic Co-operation and Development
PALOP	Portuguese Speaking African Countries
PDM	Methodological Development Programme
PIC	Indicative Co-operation Programmes
PLOP	Portuguese Speaking Countries
PNAC	National Climate Change Programme
PNALE	National Allocation Plan
PNDFCI	National Plan for Defence Aganist Forest Fire
PROF	Regional Plans for Forestry Planning
QA	Quality Assurance
RELAC	Portuguese Speaking Countries Climate Change Network
RES	Renewable Energy Sources
RIOCC	Iberian-American Climate Change Network
SB	Subsidiary Bodies to the Convention
SCCF	Special Climate Change Fund
SCGQ	Quality Control and Assurance System
SEA	Secretary of State for the Environment
SIDCLIMAD	Climate and Sea Information System for Sustainable Development
SIGA	Integrated IT Management System of SNIERPA
SNIERPA	Portuguese National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants
SoER	State of the Environment Report
STCP	Oporto Public Transport Company
toe	Tonnes of oil equivalent
UN	United Nations
UNDP	United Nations Development Programme
ZIF	Forestry Intervention Zones

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