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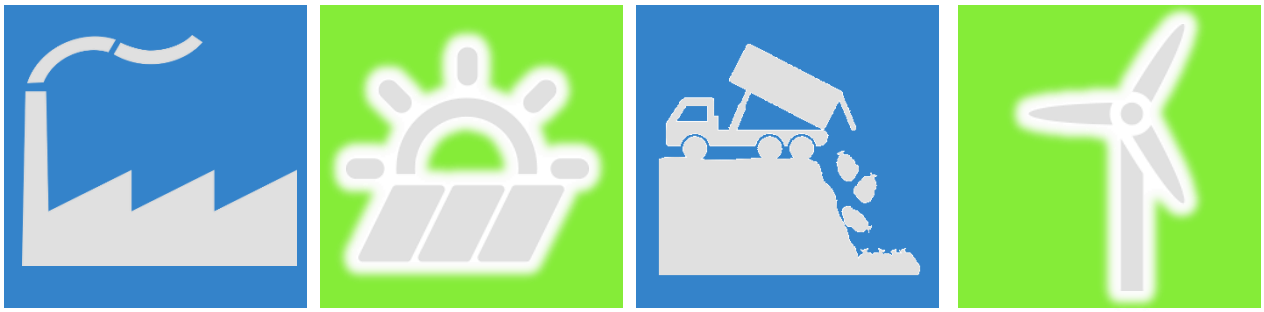

7th NATIONAL COMMUNICATION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

3RD BIENNIAL REPORT TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

4TH NATIONAL COMMUNICATION IN THE CONTEXT OF THE KYOTO PROTOCOL

PORTUGAL

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Acronyms

APA	Portuguese Environment Agency
AR	Autonomous Region
CC	Climate Change
CDM	Clean Development Mechanism
CECAC	Climate Change Commission, Executive Committee
CPLP	Community of Portuguese Speaking Countries
CRF	Common Report Format
CRP	Constitution of the Portuguese Republic
DGADR	Directorate-General for Agriculture and Rural Development
DGAV	Directorate-General for Food and Veterinary
DGAE	Directorate-General for Economic Activities
DGEG	Directorate-General of Energy and Geology
DGT	Directorate-General of Territory
ECV	Essential Climate Variables
EDF	European Development Fund
EEA	European Environmental Agency
EFAP	Economic and Financial Assistance Programme
ENAAC	National Climate Change Adaptation Strategy
ENGO	Environmental Non-Governmental Organizations
EPB	European Polar Board
ES	Education System
ESA	European Space Agency
ESU	Environmental Education for Sustainability
EU	European Union
EU ETS	European Union Emissions Trading Scheme
FCT	Foundation for Science and Technology
FEC	Final Energy Consumption
FPC	Portuguese Carbon Fund
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOP	Major Planning Options
GOS	Global Observing System
GPP	Office of Planning and Policy of Ministry of Agriculture and Sea
GTEAS	Working Group on Environmental Education for Sustainability
GVA	Gross Value Added
HFC	Hydrofluorocarbons
HI	Hydrographic Institute
HICP	Harmonised Index of Consumer Prices
IC	Joint Implementation
ICC	Inter ministerial Commission for Cooperation
ICNF	Institute for Nature Conservation and Forestry
ICT	Information and Communication Technology
IFAP	Financing Institute of Agriculture and Fisheries
IHP	Index of Hydro Production
IMOP	Instruments and Methods of Observation Programme
IMT	Institute for Mobility and Transport.
INAC	National Civil Aviation Institute
INE	National Statistics Institute

INERPA	National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Air Pollutants
INIAV	National Institute for Agricultural and Veterinary Research
IPC	Indicative Cooperation Programs
IPMA	Portuguese Institute of Sea and Atmosphere
IUCN	International Union for Conservation of Nature
KP	Kyoto Protocol
LBSE	Law on the Education System
LULUCF	Land Use, Land-Use Change and Forestry
MDG	Millennium Development Goals
MW	Municipal (urban) Waste
NGDO	Non-Governmental Development Organizations
NIR	National Inventory Report
NREE	National Register of ENGO and Equivalents
NUW	Non-Municipal Waste
NWMP	National Waste Management Plan
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PALOP	Portuguese Speaking Countries
PEC	Primary Energy Consumption
PEGRA	Strategic Waste Management Plan for the Azores
PERH	Strategic Hospital Waste Plan 2011-2016
PERSU II	Strategic Plan for Municipal Solid Waste 2007-2016
PESGRI	Strategic Plan for Industrial Waste Management 2013-2020
PNDFCI	National Plan for the Protection of Forest Fire
PP	Portuguese Parliament
PR	President of the Republic
PREMAC	Central Administration Improvement and Production Plan
PW	Packaging Waste
RAA	Azores Autonomous Region
RAM	Madeira Autonomous Region
RCM	Resolution of the Council of Ministers
RES	Renewable Energy Sources
RIWS	Regional Information Waste System
SCAR	Scientific Committee for Antartic Research
SIRAPA	Integrated System of Registration of the Portuguese Environmental Agency
SNIERPA	National Inventory System of Emissions by Sources of Removals by Sinks of Air Pollutants
TOE	Ton of Oil Equivalent
UNFCCC	United Nations Framework Convention on Climate Changes
WCP	World Climate Programme
WEEE	Waste of Electrical and Electronic Equipment
WHYCOS	World Hydrological Cycle Observing System
WMO	World Meteorological Organization
WTO	World Trade Organization
WWW	World Weather Watch

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1. Executive Summary

The 7th National Communication to the United Nations Framework Convention on Climate Change (4th National Communication in the context of the Kyoto Protocol) hereby presented, is organised in accordance with articles 4th and 12th of the Convention, as well as the guidelines adopted in its 5th session (Decision 4/CP.5), as follows: national circumstances; information concerning the national system and greenhouse gas (GHG) inventory, information about policies and measures, projections of greenhouse gas emissions; impacts, vulnerability and adaptation; financial commitments, technology transfer, and international cooperation; systematic research and observation and, finally, education, training and awareness of the people.

The objective is to have a document containing information covering the 1990-2015 period, coherent with the National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of air pollutants, previously submitted to the Convention (2017), covering emissions up to 2015. In some cases and specific chapters, updated information to 2016 and even 2017 years was also included.

Portugal is bound by GHG limitation commitments, agreed in the context of the Kyoto Protocol and the European Union, under Effort Sharing Decision[1], to a 1% increase in GHG emissions not covered by ETS by 2020, relative to 2005. The main instruments geared towards compliance with the national GHG emissions target and, more broadly, the implementation of the Kyoto Protocol includes the National Climate Change Programme[2] (PNAC 2020/2030), the National System of Policies and Measures (SPeM)[3], the National System for the Estimation of Emissions by Sources and Removals by Sinks of Air Pollutants [4] (SNIERPA), being one of main financial instruments to support Climate Policy the Portuguese Environmental Fund[5] (FA). Adaptation Policy coordination is assured under the National Strategy for Adaptation to Climate Change[6] (ENAAC 2020) and political coordination of Climate Change Policy is taken by the Interministerial Commission of Air and Climate Change[7] (CIAAC).

National Circumstances

The Portuguese Republic is a democratic State based upon the sovereignty of the people, the pluralism of democratic expression and democratic political organisation, and respect and effective guarantees for fundamental rights and freedoms and the separation and inter-dependence of powers, aiming to achieve economic, social and cultural democracy and a more participative democracy. The archipelagos of the Azores and Madeira are autonomous regions with their own political and administrative statutes and their own institutions of self-government.

In relation to climate change, and impacts related to them, the organic structure of the XXI Constitutional Government of Portugal designates the Ministry for Environment to carry out climate policy[8].

Portugal's territory has a total area of 92 225.62km^2, a perimeter of 3 920km, an extensive coastline (2 601km) and comprises three different areas, one of the parts in the European Continent (the Mainland) and the other two are archipelagos in the Atlantic Ocean (the Archipelago of the Azores and the Archipelago of Madeira).

The climate in mainland Portugal is predominantly influenced by latitude, orography and its proximity to the Atlantic Ocean; some climate variables, such as precipitation and temperature, display strong north-south and west-east gradients as well as a very sharp seasonal and inter-annual variability

[1] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020. OJ L 140, 5.6.2009, p. 136–148,

[2] Council of Ministers Resolution 56/2015, July the 30th .

[3] Council of Ministers Resolution 45/2016, August the 26th

[4] Council of Ministers Resolution 20/2015, April the 14th .

[5] Decree-Law 42-A/2016, August the 12th.

[6] See footnote 2

[7] See footnote 2

[8] Decree-law 251-A/2015, December 17th

Since the mid-70s the average temperature has risen in all regions of Portugal at a rate of approximately 0.3 °C/decade. Out of the ten warmest years, seven occurred after 1990, with 1997 being the warmest year.

There is an increase in the number of days with high temperatures and a decrease in the number of days with low temperatures, in particular after 1976. There is also an increase in the intensity and duration of heat waves.. Regarding precipitation, the last 20 years have been particularly dry in Portugal mainland.. Annual precipitation has decreased (-25 mm/decade): the last 20 years have had particularly low rainfall in mainland Portugal. Five out of the ten driest years occurred after 2000, with 2005 being the driest year.

According to data collected by National Statistics Institute, in 2015 the resident population in Portugal was estimated at 10 341 330, and between the years 1991 and 2015 shows a tendency for a slight increase. One of the major demographic phenomena that characterized the last decade in Portugal is the trend of the inversion of the age pyramid with an increase of age disparity between the younger (≤ 14 years) and the elder population (≥ 70 years).

Since 2000 the Portuguese economy has been showing difficulties in ensuring economic growth, which was aggravated, since 2008, by the international economic and financial crisis and forced a program of economic and financial adjustment. The recessive flow of international trade and investment, due to the financial crisis in 2008, reinforced the need for the adjustment of the Portuguese economy. However, since 2013 growth has been steady with an unemployment rate progressively lowering. Looking at the Gross Domestic Product indicator, a general increase can be observed in 2015 compared to data from 2000 (39.8 %).

The GVA structure has remained relatively constant. Nevertheless, the improvement of the Portuguese economy should undergo an increasing incorporation of added value in the external demand through exports.

Primary Energy Consumption during the period 2006-2015 had an average annual growth rate of -1.8 %. Energy dependency in 2015 stood at 78.3 %, representing a reduction of 10.5 % compared to 2005, when the highest energy dependency of recent years was registered. In 2015, the share of renewable energy sources (RES) in gross final energy consumption stood at 28.0 %. The energy import balance has been decreasing in recent years, in the period 2006-2015 the average annual growth rate was -2.1 %, in contrast with 4.3 % in the period 1996-2005. Domestic energy production also showed a reversed growth trend in relation to the years before. The average annual growth rate of domestic energy production was 2.2 % in the period 2006 2015.

In 2015, the energy intensity of the economy in primary energy consumption was -14.2% compared to 1995 while the energy intensity of the economy in final energy consumption was -13.7% compared to 1995. On the other hand, the energy intensity of the economy in electricity was +27.7% compared to 1995.

As for the economy's carbon intensity indicator, it was registered -21.6 % in 2015 compared to 1995.

Regarding per capita energy consumption indicators, in 2015 primary energy consumption was at 2.1 toe/inhabitant (+16.0% compared to 1995), final energy consumption was at 1.5 toe/inhabitant (+5.0% compared to 1995), and electricity was at 4.5 MWh/inhabitant (+55.4% compared to 1995).".

The transports in Portugal have been a major source of GHG emissions and major causes arrive from the changes in the last decades.

In 2015 the number of passengers carried in Portugal was 888 million (less 22 % than in 2011), with a focus on road transport mode which accounts for 56 % of the total.

The volume of passengers carried in Portugal was 42.624 billion passenger-kilometres (7 % more than in 2011), and air transport accounted for a share of 74 % of this value. Air and road transport modes have experienced a higher increase in the number of passenger-kilometres travelled. Fuel consumption in transport was 5 576 294 toe in 2015, which represents an increase of 56 % since 1990 (the year with the lowest consumption) and a decrease of 19 % since 2006 (the year with the highest fuel consumption). The road sector represents approximately 95 % of that consumption, while the national air and maritime sectors account for 2 % each and the railway sector for 1 %.

The production of municipal waste increased strongly since 1990, after the peak around the year 2010, presents a decreasing tendency, resulting from the policies on preventing, reducing and recycling of waste.

Although landfilling remains the main final destination for municipal waste, the disposal of waste in landfills have been continuously decreasing since 2010. This trend has been accompanied by the growth of importance of Mechanical and Biological Treatment (MBT) as well as Sorting units. The number of waste management infrastructures for organic recovery and biological treatment have grown expressively in the last decade, with the aim to increase the direct diversion of biodegradable waste from landfills and increase recycling.

The percentage of the population served by any kind of wastewater treatment is at present approximately 70%.

In 2015 compared to 2001, there is an increase of 12.5% in the number of Buildings of Traditional Family Housing (housing stock) in Portugal. The number of Completed Reconstructions per 100 New Completed Constructions when comparing 2015 with 2005, indicates a significant increase in Portugal reaching 64.3 %.

There is an increase equivalent to 4.1 % in Portugal in 2015 when compared to 1990 in terms of Energy Consumption of Residential Buildings. When dealing with Service Buildings, the increase is equivalent to 150.0 % in 2015 when compared to 1990.

In comparison with the base year of 1990, there is a decrease of around 12 % in the total farm area in 2015. The largest share of Usable Agriculture Area was occupied by permanent grassland (49.9 %), followed by arable land (30.2 %) and permanent crops (19.5 %). The increase in permanent grassland area, from 20.9 % in 1990 to 49.9 % in 2015, stands out and goes hand in hand with the increase of livestock units under extensive production systems. In economic terms, this sector experienced significant variations in the period under consideration, due to a number of factors, especially adjustments to public support policies, such as the Common Agricultural Policy, alongside market factors and produce availability, which is highly influenced by the weather conditions for each year (e.g.: territorial extension of main droughts).

In terms of Land Use, the main accumulated changes over the period 1990-2015 are an increase in forest area, grasslands, settlements and shrublands and a decrease in cropland.

Forest composition has undergone some major shifts (eucalyptus became the major species, replacing pinus trees), but one of the main drivers for forest areas evolution have been fires that have reached huge proportions.. Effectively, forest fires are one of the major threats to this sector in the country, especially in Mainland, and climatic conditions have been favourable to these occurrences with big damages both in economic, social and environmental terms.

Nevertheless, forestry resources play an important role in the national economy as, the main forest industries contribute significantly to the Portuguese economy, representing 14,9% of the Gross Added Value (GAV) of Transforming Industries in 2014When considered in its entirety, the LULUCF sector has turned from a net-source of emissions in 1990 to an overall net-sink in 2015. The main contributors for this change have been an increase in removals in forest land and in other land and reductions in emissions in cropland and grassland.

Information concerning the National System and the Greenhouse Gases Inventory

The National Inventory System of Emissions by Sources and Removals by Sinks of Air Pollutants (SNIERPA), is established by Council of Ministers Resolution 20/2015, of 14th April , which revised and updated the previous one of 2005. It includes the institutional and legal definitions and procedures designed to ensure the estimation of emissions by sources and removals by sinks of air pollutants, their report and the archive of all relevant information.

Two SNIERPA instruments guarantee, in technical and methodological terms, the accuracy, completeness and reliability of the inventory: Methodological Development Program (MDP) and Quality Control and Assurance System (QCAS).

According to the National Emissions Inventory 2017 (relative to 2015), total Portuguese GHG emissions, including indirect CO_2, without land-use, land-use change and forestry (LULUCF) were estimated at about 68.9 Mt CO_{2e}, representing an increase of 15.7 % compared to 1990 The total emissions trend presents different phases along the time. The steady increase of emissions during the 90s, was followed by a more moderate rate and started to stagnate in the early 2000s, registering thereafter, in particular after 2005, a decrease.

Energy is by far the most important sector, accounting for 70 % of total emissions in 2015, followed by Industrial Use of Products (11%), Agriculture (10%) and Waste (9%). The largest GHG gas emitted - CO_2 - is mainly generated from fossil fuel combustion in energy-related activities. The increase of CO_2 emissions since 1990 is driven by the growth of energy industries and transport that have registered, respectively, a 12% and 62% growth from 1990 to 2015.

The main factors (key drivers) that explain the emissions reduction since 2005 include: (i) use in " cruising speed" of natural gas, (ii) the unprecedented penetration of renewable energy, (iii) the beginning of scale penetration of biofuels in transport, (iv) energy efficiency in sectors covered by the EU ETS (v) the " green" tax reform on vehicles and, finally, (vi) the economic crisis (especially 2009-12). Meteorological parameters such as rainfall, which have high inter-annual variability, also have a significant effect in hydroelectric production, which influences very significantly the variation of the emissions. In 2015, the inversion of the emissions declining trend, with an emissions increase of 7.1% compared to the 2014, reflects in part the positive variation of GDP, and the particularly unfavorable hydrologic conditions which contributed to a greater use of coal and natural gas in the electro producer sector.

Transports represent a major source of GHG emissions, largely dominated by road traffic, one of the sectors that have risen faster. In the period 1990-2015 the emissions of transportation sources increased 61 %, due to the steady growth of vehicle fleets (in particular with more powerful engines) and road travel from 1990 to the early 2000s, reflecting the increase in family income and the strong investment in the road infrastructure of the country in the 1990s decade. The situation seems however to have stabilized in the early 2000s and then started to decline since 2005. An inversion of this tendency is registered in the most recent years, with an increase in transport emissions of 3.4 % from 2013 to 2015.

The analysis of greenhouse gases emissions per unit of GDP shows that the process of decoupling between GDP and emissions had started only in 2005, which is a result of the "decarbonisation" of the economy, i.e., an economy with less carbon emissions per unit of produced wealth..

Information concerning Policies, Measures and Projections

Portugal has a new generation of climate policy instruments to respond to the ambition of a forward-looking climate policy that enables the achievement of the targets set at national EU and International levels. The broad lines for the post-2012 climate policy instruments in their mitigation and adaptation dimensions were launched by the preparation of the National Low-Carbon Roadmap (RNBC 2050) , finalized and subject to public consultation in 2012.

The RNBC 2050 was a forward-looking instrument of utmost relevance, which presented strategic guidelines for the shift to a competitive low-carbon economy and served as a reference to other subsequent climate policy instruments. It was followed by the Commitment for Green Growth (CCV) enabling the transition to a development model capable of reconciling the indispensable economic growth with lower consumption of natural resources, people's quality of life and social and territorial inclusion.

The CCV established GHG emission reduction targets, as well as quantified targets in the field of energy with a view to increasing the share of renewable energy in final energy consumption. The ambition of a competitive, resilient and low-carbon economy also required the creation of an integrated, complementary and coordinated framework of climate policy instruments for 2020/2030, comprising the review of the National Programme for Climate Change (PNAC 2020/2030) and the 2nd stage of the National Strategy for Adaptation to Climate Change (ENAAC 2020). PNAC 2020/2030 establishes a set of specific guidelines for the transition to a low-carbon economy while aggregating input from sectoral policies. A National System of Policies and Measures (SPeM) was established as a tool to define and monitor the measures necessary to achieve sectoral

targets. Portugal is in the lead on renewable energy, reflected in the reduction of foreign energy dependency (-5.6% compared to 2006), in the increase in domestic energy production, which together ensure a higher level of security of supply (24 % of total primary energy consumption in 2015 against 16.5 % in 2006), and in the reduction of GHG emissions (-26.7 % in 2014 compared to 2005).

In the area of transport and mobility at national level, Portugal is one of the European countries with lower CO_2 emissions from new vehicles placed on the market. Measures implemented by national initiative in this sector include the establishment of national targets for the incorporation of biofuels in transport, the inclusion of CO_2 in the tax on vehicles (ISV), investments in transport infrastructure, investment in cleaner vehicles for public transport fleets and the Programme for Electric Mobility – MOBI.E.

Means of decarbonisation in industry include an increased energy efficiency, an increase in the consumption of natural gas, the maintenance of electricity consumption and the increase of renewables.

Measures in the Agriculture sector include improving energy efficiency and promote the use/production of renewable energy on farms as well as the use of agricultural and forestry by-products for energy purposes and soil conservation techniques. LULUCF has great potential in terms of mitigation policy, and measures target increase the resilience of the forest to the abiotic and biotic agents, the support for afforestation and promotion of the use of forest products as substitutes for fossil raw materials.

Waste has been one of major focus on policy implementation, namely on the transition to a circular economy, with an action plan recently adopted.

Impacts, Vulnerability and Adaptation

In 2010, Portugal adopted the National Adaptation Climate Change to Climate Strategy (ENAAC) supported on previous national climate change assessments, namely the SIAM studies. The developments undertaken by the various sectors and coordination within the ENAAC were summarized in the Progress Report in 2013, which included the identification of the main vulnerabilities and proposals of adaptation measures. A revision was carried out leading to the adoption in 2015 of the National Strategy for Adaptation to Climate Change 2020 (ENAAC 2020), within an integrated framework which also includes the PNAC 2020/2030, SPeM and the political decision making structure, the CIAAC.

In ENAAC 2020 there is a focus on better articulation between the domains (particularly the cross-cutting ones) and on the implementation of adaptation measures, along with mainstreaming in sectoral policies. Portugal is a southern European, coastal, with Mediterranean influence country, located in a *hotspot* region in Europe, potentially more affected by climate change impacts. All scenarios show a variety of impacts, from heat waves, droughts, floods, wildfires and storm surges, which have been already observed in recent years with more frequent and intense patterns. With the purpose of understanding the changing climate patterns and to assess climate risks it was developed a website with climate scenarios (http://www.portaldoclima.pt/en/) which stands as the reference source of information for Portugal's future climate. Financing adaptation is one of main obstacles to action and therefore it was developed an adaptation funding programme under the EEA Grants 2009-2014, Programme AdaPT, which constituted pilot for other financing instruments, namely EU structural funding.

Financial, Technology Transfer and International Cooperation commitments

As a EU Member State, Portugal made the commitment to mobilize 0.15 % to 0.20 % of its GNI as ODA allocated to Least Developed Countries (LDCs) by 2030. The Portuguese ODA features a regular and strong geographical concentration in the PALOP countries (Portuguese-speaking African countries) and in Timor-Leste, in line with the principle of geographical concentration set out in the Strategic Concept of Portuguese Cooperation for 2014-2020.

In general, programmes, projects and actions supported by the Portuguese cooperation have a strong component of technical assistance targeted at national capacity-building.

Research and Systematic Observation

In the period between 2010 and 2016, FCT funded 107 scientific research projects exclusively in the field of Climate Change (CC), with a budget line of over EUR 20 million (data for 2016 not yet available).

Additionally, in the same period, 225 research grants were funded (doctoral and post-doctoral level, among others), with a total value in excess of EUR 19 million.

As a member of the WMO, Portugal develops and operates several weather and climate observation networks in the framework of its global programmes, in particular the World Weather Watch (WWW) through the Global Observing System (GOS), but also the Global Atmosphere Watch (GAW) and the World Hydrological Cycle Observing System (WHYCOS), and it follows the recommendations of the Instruments and Methods of Observation Programme (IMOP) and of the World Climate Programme (WCP) of the WMO.

IPMA (Met and Sea Institute) is the Portuguese body responsible for carrying out observations for meteorological and climatological purposes and it has pursued and developed relevant scientific and technical activities since the mid-nineteenth century, focusing on the availability and quality of longer series of climatological data, which are key to conducting studies on CC, especially in terms of trends and climate extremes.

IPMA has done its utmost to ensure the operability of the network of climatological stations, providing for its maintenance and for quality control and subsequent recording of observations. In 2017 there were 146 climatological stations operating in Portugal, of which 125 are automated and 21 are conventional. All stations measure air temperature, wind speed and direction, air humidity and precipitation, among other climate elements, almost all of them also measure global solar radiation, and some measure atmospheric pressure.

Education, Training and Public Awareness

In the framework of formal education, environmental content and themes have been integrated in school programmes since the late 70's. From the 80's onwards, it has been made possible for schools to be formally involved in project methodologies with a focus on environmental issues from the perspective of study and intervention at local level.

In 2002, programmes for Geography, Natural Sciences and Physicochemical Science in basic education were replaced by curricular guidelines, reinforcing the relationship between Science, Technology, Society and Environment in a critical approach to economic and technological development. Issues related to proper management of natural resources, comprising climate change impacts, have been included in these curricular guidelines and may be dealt with across all subjects.

In Basic and Secondary Education, Citizenship Education was adopted as a cross-cutting topic in all programmes, including Climate Change and broader environmental themes.

Portugal has adopted the National Strategy for Environmental Education 2020 (ENEA 2020) aimed at promoting effective ownership and accountability of civil society.

The delivery of this Strategy focuses on thematic and cross-cutting activities which are able to ensure the fulfilment of national and international commitments undertaken by Portugal in the area of Sustainability and Climate Change. These include, in particular, the Paris Agreement and the Sustainable Development Goals of the United Nations – 2030 Agenda. Environmental Non-Governmental Organizations (ENGO) and equivalents play a key role in the promotion, protection, awareness and appreciation of the environment, developing activities of public interest with particular emphasis in the field of Environmental Education for Sustainability.

2. National Circumstances Relevant to Greenhouse Gas Emissions and Removals

2.1. Government structure

As a territory, Portugal comprises the following three geographic areas:

- The mainland (located in the European Plateau);
- The Azores (located on the convergence of the American, European and African Plateaus);
- The Archipelago of Madeira (located in the African Plateau).

In accordance with Article 1 of the Constitution of the Portuguese Republic (CPR), Portugal is a Sovereign Republic, based on human dignity and popular will, committed in building a free, fair and solidary society.

The Portuguese Republic is a democratic State of Law, sustained on popular sovereignty, pluralism of expression and democratic political organization, on respect and effective guarantees for fundamental rights and freedoms and on the separation and inter-dependence of powers, aiming to achieve economic, social and cultural democracy and a more participative democracy (article 2 CPR).

Portugal is a unitary state that respects, regarding its organization and function, the rule of self-governing system of the islands and the principles of subsidiarity, autonomy of local authorities and the democratic decentralisation of public services. The archipelagos of the Azores and Madeira are autonomous regions with their own political and administrative statutes and their own institutions of self-government (article 6 CPR). Politically and administratively speaking, the Portuguese Republic structure is based on a tripartite division of its territory: Districts (total of 20), Municipalities (total of 308) and Parishes (total of 3092).

These administrative levels reflect the specificities of the Portuguese territory, namely of Portugal mainland and of the Autonomous Regions (AR). Portugal mainland is organised into 18 districts, 278 municipalities and 2882 parishes, and the geographic characteristics of the AR's territory are reflected as follows:

a) Autonomous Region of Azores: 1 District, 19 municipalities and 156 parishes;

b) Autonomous Region of Madeira: 1 District 11 municipalities and 54 parishes.

Regarding Sovereign Organs, the CPR distinguishes the President of the Republic, the Portuguese Parliament, the Government and the Courts of Law (article 110 CPR). All should care for the separation and the interdependency established by the Constitution (article 111/1 CRP).

The President of the Republic (PR) who represents the Portuguese Republic ensures the national independence, the unity of the State and the normal functioning of the democratic institutions and, inherently, he is also the Supreme Commander of the Armed Forces (article 120 CPR).

The election is effected through universal, direct and secret suffrage (article 121 CPR) and all citizen voters of Portuguese origin, over 35 years, are eligible (article 122 CPR). The President is elected to a five-year term (article 128 CPR). However, his re-election is not allowed for more than two consecutive terms, nor during the years immediately following the end of the second consecutive term (article 123/1 CPR).

The PR has competences concerning other bodies of the Republic (article 133 CRP), such as the Council of State, the Government and the representatives of the Republic for the Autonomous Regions. He has also competences to practice is own acts (article 134 CPR) and in international relations (article 135 CPR).

The second body of sovereignty to describe is the Portuguese Parliament (PP), Composed by a minimum of 180 and a maximum of 230 Members (article 148 CPR) which is the representative assembly of all Portuguese citizens (article 147 CPR).

Members are elected by electoral districts geographical established by law, which may determine the existence of multi-member and single member electoral districts as well as their nature and complementary, to ensure the system of proportional representation and the Hondt highest average method in conversion of votes into the number of seats. The number of Members per plurinominal circle of the national territory, except for the domestic circle, when exiting, that is proportional to the number of registered electors (article 149 CPR).

It is important to emphasize that despite the connection between the Members and the geographic circles, by the time they assume their roles they also assume the responsibility of representing the whole country (Article 152/2 CPR).

The AR is responsible for exerting political and legislative power (article 161 CPR), supervise competences (article 162 CPR) and concerning other organs (article 163 CRP), witness the swearing-in ceremony of the PR or give the PR its consent to leave the national territory.

Each legislature last for four legislative sessions (article 171 CRP), starting each of one on the 15th of September and ending on the 15th of June.

The 3rd body of sovereignty is the Government which is responsible for setting general policy of the country. It is also the superior organ of the public administration (article 182 CPR) and it is formed by the Prime Minister, the Ministers and Secretaries and Secretaries of State.

The Prime Minister (PM) is nominated by the PP, after hearing the parties represented in the AR and in accordance with the election results (article 187 CRP). Therefore the PMs are accountable to the PR and to the AR, under the political responsibility of the Government (article 191 CRP).

The Government has political (article 197 CPR), legislative (article 198 CPR) and administrative (article 199 CRP) competences.

Finally, the Courts, the fourth Portuguese body of sovereignty, have the competence to administrate the justice on behalf of the people (article 202/ 1 CPR). They are independent and are only subjected to Law 1 (article 203 CPR).

The 21st Constitutional Government (which took office at the end of 2015), whose Organic Law was passed by Decree-Law No 251-A/2015, of 17th December, established a new structure of the Ministry of Environment, no longer being responsible for energy issues, since these were transferred to the Ministry of Economy.

Currently, the mission of the Ministry of Environment consists of designing, steering and evaluating policies relating to environment, spatial planning, cities, housing, urban, suburban and road passenger transport, climate and nature conservation, from the point of view of sustainable development and social and territorial cohesion. The incorporation of responsibilities for the transport sector is an innovative feature compared to the previous structure, and falls within the logic of an integrated vision of sustainability, taking into account the role played by the transport sector in the future decarbonisation of our economy, also from the point of view of territorial and social cohesion.

This responsibility for the transport area is also shared with the Ministry of the Interior, the Ministry of Planning and Infrastructure and the Ministry of the Sea concerning issues related to the respective areas. This shared vision also extends to issues necessary for the conservation of nature and forestry, namely with the Ministry of Agriculture, Forestry and Rural Development.

Regarding the involvement of Portugal on matters related to climate change and its impacts, the Portuguese Environment Agency, I.P. (APA), which organic law was approved by the Decree-Law 56/ 2012 of March 12th, is the Portugal's public administration body responsible for the national climate policy, thereby assuming a decisive role in the proposal, development and implementation of related policies.

APA remains under the Ministry of Environment, and it also retains the powers to propose, develop and monitor the implementation of environmental policies, notably in the fight against climate change, an area for which the Minister of Environment is directly responsible.

Concerning the APA's structural organization, its major purpose is to develop its activities sustained on rigor and control of the revenues and expenditures, transparency and effectiveness of the perfomed operations and turn effective the coordination and participation in the sectors that its integrates, promoting a form of performance based on positive collaboration with other governmental entities, businesses, non-governmental organizations, and citizens in general.

Until the 31st of December of 2016, APA was fully reponsible by the administrative management of several financial funds related to environment, namely the Portuguese Carbon Fund (FPC), created by Decree-Law 71/ 2006 of March the 24th, an instrument which main purpose is to support the transition to a resilient, competitive and low-carbon economy by financing or co-financing measures that contribute to the fulfilment

of the commitments of Portugal under the Kyoto and other international and EU commitments on climate change protocol.

In addition, and with regard to financial mechanisms, it was established that the Government's programme should provide for the creation of a single Environmental Fund by aggregating resources from existing funds, so as to obtain an instrument with greater financial capacity and more adaptability to challenges.

To this end, the Environmental Fund was set up by Decree-Law No 42-A/2016, of 12th August, with effect from 1st January 2017, thus terminating the Portuguese Carbon Fund (FPC), the Environmental Action Fund, the Fund for the Protection of Water Resources and the Fund for the Conservation of Nature and Biodiversity.

As a consequence, the Environmental Fund takes up all responsibilities inherent to the former funds, aiming to support environmental policies in order to achieve the sustainable development goals, thus helping to meet national and international objectives and commitments, including those related to climate change, water resources, waste and conservation of nature and biodiversity.

Following the reorganisation process mentioned above, the Environmental Fund is now under the direct responsibility of the Ministry of Environment and its day-to-day management is performed by the Secretary General of the Ministry of Environment.

2.2. Population Profile

The analysis to the Demographic Profile is structured within a timeframe between 1991 and 2015 (Portugal, Mainland, the Autonomous Region of the Azores and the Autonomous Region of Madeira). Due to unavailability of data, the following indicators are exceptions to the requirement established for the definition of the timeframe:

- Total dependency ratio (No) by place of residence (1992 to 2015);
- Natural balance (No) by place of residence (2011 to 2015);
- Population density (No/km²) by place of residence (2004 to 2015).

Resident population estimates for the years 1991 and 2015 show a tendency for a slight increase in the four territorial dimensions under analysis (Table 2.2.1). It should be noted that, despite a slight increase in population in Portugal and in its mainland component, the Autonomous Region of the Azores (ARA) and the Autonomous Region of Madeira (ARM) stand out as they reveal an even slower growth rate.

Table 2.2.1

Years	Total resident population estimates (No) by place of residence and sex (M/F)			
	Portugal	Mainland	ARA	ARM
1991	9 950 029	9 456 452	239 984	253 593
2015	10 341 330	9 839 140	245 766	256 424
Years	Development of total resident population estimates (%) by place of residence and sex (M/F)			
	Portugal	Mainland	ARA	ARM
1991-2015	3,9	4,0	2,4	1,1

Source: National Statistical Institute (INE), 2017

Regarding the age distribution of resident population, the analysis to Figures 2.2.1, 2.2.2, 2.2.3 and 2.2.4 shows a prevalence, in 2015, of older age groups to the detriment of younger ones in Portugal and in its mainland dimension, which suggests a reverse of the natural structure of the age pyramid – the top tends to be wider than the bottom. This is particularly visible in age groups 0 to 4 years and 5 to 9 years.

The scenario described above is less marked in the ARA and ARM, since youth is predominant among the resident population in these territorial dimensions (the pyramid bottom is larger than its top).

Attention should be drawn to the gender imbalance in the three age groups at the top of the pyramid (75-79 years, 80-84 years and 85 years and over) in the Autonomous Regions, where the male population is significantly smaller than the female one.

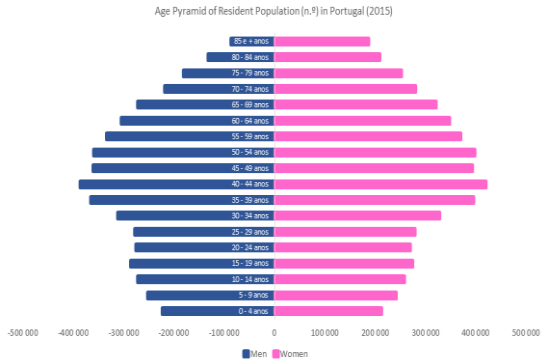
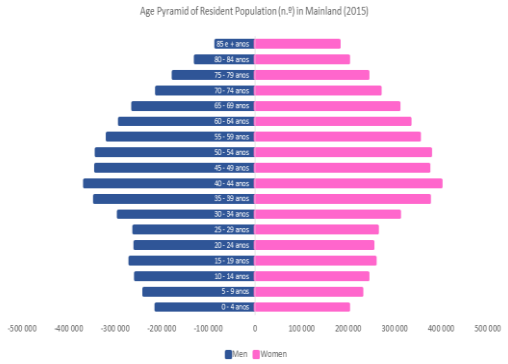


Figure 2.2.1



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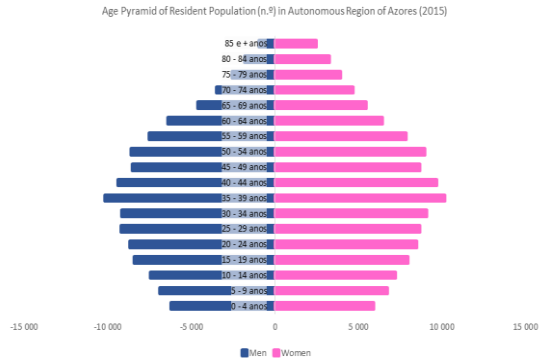


Figure 2.2.3

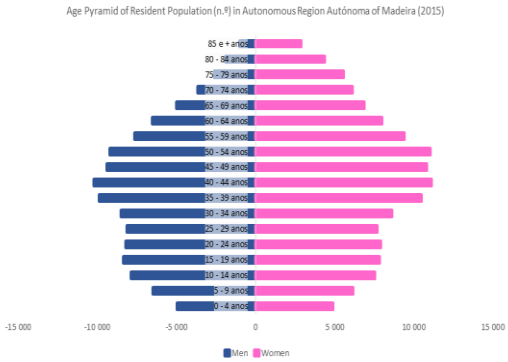


Figure 2.2.4

As for the elderly in relation to young people, the analysis to the ageing index[9] for the years 1991 and 2015 (Table 2.2.2) reveals a growing ageing trend in all territorial dimensions under analysis.

Table 2.2.2

Years	Ageing index (No) by place of residence			
	Portugal	Mainland	ARA	ARM
1991	72,1	73,6	48,8	50,2
2015	146,5	149,6	82,4	105,3

Source: National Statistical Institute (INE), 2017

As regards young people and the elderly in relation to the working-age population, i.e. the total dependency ratio[10], Table 2.2.3 (statistical information only available from 1992 onwards), an increase in Portugal and its mainland component is visible.

[9] Ratio between the number of people aged 65 and over and the number of people aged between 0 and 14 years (usually expressed by 100 (10^2) persons aged 0 to 14 years).

[10] Usually understood as the ratio between the number of people aged between 0 and 14 years together with people aged 65 and over, and the number of people aged between 15 and 64 years (usually expressed by 100 (10^2) persons aged 15-64).

In turn, the rising trend mentioned above for the ARA and the ARM is not reflected here, as these territorial dimensions stand out with a decrease in total dependency ratio values for 2015 compared to 1992.

Table 2.2.3

Years	Total dependency ratio (No) by place of residence			
	Portugal	Mainland	ARA	ARM
1992	49,4	49	61,1	53,7
2015	53,4	54	42,8	43,6

Source: National Statistical Institute (INE), 2017

The set of demographic data mentioned in previous paragraphs is confirmed when analysing the Natural Balance indicator, which establishes the difference between the number of live births and the number of deaths during a given period of time.

As can be seen from Tables 2.2.4 and 2.2.5, whose statistical information for the four territorial dimensions is only available from 2011 onwards, there is a falling trend in the number of live births in relation to population replenishment needs, in view of the number of deaths recorded, which underpins the following statements:

- Reduction of resident population: a (virtually) residual population growth will have a damaging influence on the number of residents in the medium or long term.
- Aging of resident population: it should be noted that some evidence supports the suggestion that an inversion process of the age pyramid occurs, whereby its bottom will be occupied by older age groups to the detriment of younger ones.

Table 2.2.4

Years	Natural balance (No) by place of residence			
	Portugal	Mainland	ARA	ARM
2011	-5 992	-6 291	373	-74
2015	-23 011	-22 303	-44	-664

Source: National Statistical Institute (INE), 2017

As regards the spatial distribution of resident population in 2015 and population density, statistical information for the four territorial dimensions is only available from 2004 onwards.

Looking at the spatial distribution of resident population, Figures 2.2.5, 2.2.6 and 2.2.7 enable the visualisation and identification of certain dynamics which vary according to the geographic location involved.

In mainland Portugal, resident population is concentrated along the coastline, between Viana do Castelo (north top of the map) and Setúbal, and the only two metropolitan areas of the country, Porto and Lisbon, are included in this territorial line.

Another population cluster is the region of the Algarve, in particular the city of Faro, with characteristics differing from those of the earlier case (metropolitan areas of Porto and Lisbon). The main economic driving force in this region is based on tourism, an economic activity which is deeply linked to seasonality.

The ARA, due to its geographical features, shows significant population dispersion. However, it should be noted that there is a significant concentration of population to the east of the island of São Miguel and on the entire island of Terceira.

In the ARM, resident population is concentrated in the south of the island, especially near the city of Funchal.

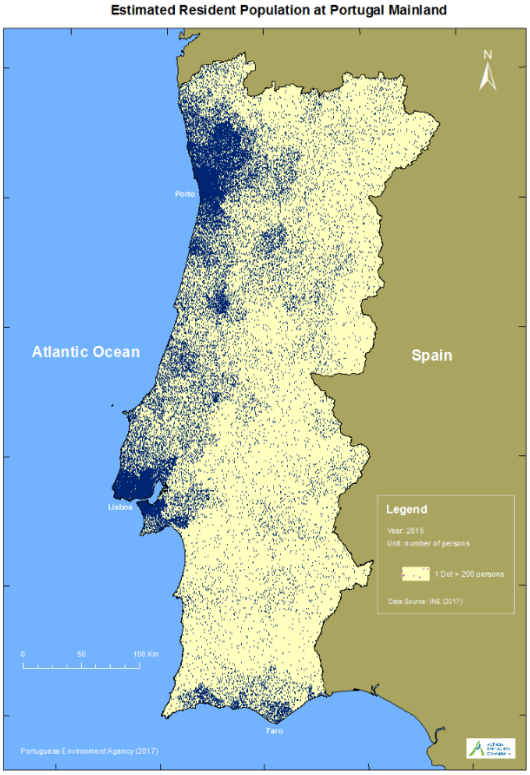


Figure 2.2.5

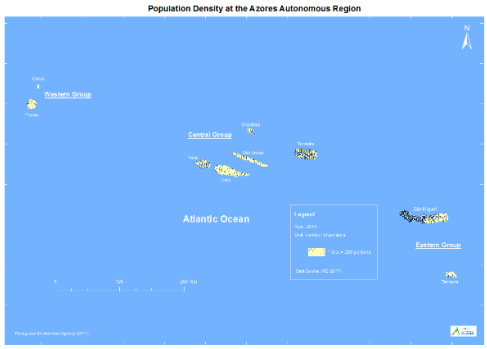


Figure 2.2.6

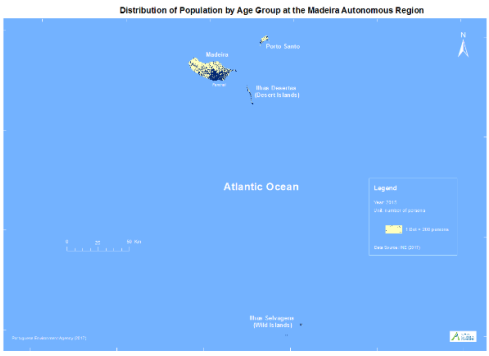


Figure 2.2.7

In what concerns population density (Table 2.2.6), Portugal and its mainland dimension show a slight decrease in values, suggesting a slight increase in territorial dispersion of resident population. The ARA and the ARM show an opposite trend, especially the latter, which had 319.9 resident individuals per km² in 2015 compared to 309.6 recorded in 2004.

Table 2.2.6

Years	Population density (No/km²) by place of residence			
	Portugal	Mainland	ARA	ARM
2004	114,1	112,5	105,3	309,6
2015	112,1	110,4	105,8	319,9

Source: National Statistical Institute (INE), 2017

2.3. Geographic and Climate Profile

Portugal's territory (table 2.3.1. and Figure 2.3.1) has a total area of 92 225.62km², a perimeter of 3 920km, an extensive coastline (2 601km) and comprises three different areas, one of the parts in the European Continent (the Mainland) and the other two are archipelagos in the Atlantic Ocean (the Archipelago of the Azores and the Archipelago of Madeira).

Table 2.3.1
Portugal's geographic data

Area	Perimeter				Maximum Length		Altitude	
	Total	Coastline	Land borders		North-South	East-West	Maximum	Minimum
			International	Inter-regional				
Km²	Km						mt	
92 225.62	3 920	2 601	1 319	//	1 345	2 258	2 351	0

Source: National Statistical Institute (INE), 2017

The Mainland (Table 2.3.2) is geographically located in the southwest corner of Europe (European Tectonic Plate) and occupies an area of about 89 000 km², with a perimeter of almost 2 600 km, half of which corresponds to the Atlantic Ocean coastline, sharing 1 200 km, north and east, boarder with Spain.

Table 2.3.2
Mainland's geographic data

Area	Perimeter				Maximum length		Altitude	
	Total	Coastline	Land borders		North-South	East-West	Maximum	Minimum
			International	Inter-regional				
Km²	Km						mt	
89 102.14	2 559	1 240	1 319	//	577	286	1 993	0

Latitude				Longitude			
North		South		North		South	
Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates
Mouth of Trancoso river, confluence with Minho river	42° 09' 15''	Cape of Santa Maria	36° 57' 42'	Border marker 494 (Douro river)	-06° 11' 20'	Ponta da França (Berlenga, municipality of Peniche)	-09° 31' 01''

Source: National Statistical Institute (INE), 2017

The archipelago of Madeira (Table 2.3.3) is located at the African Tectonic Plate and includes the islands of Madeira, Porto Santo and the islands of Desertas and Ilhas Selvagens (Savage Islands). This part of Portugal occupies a total of 801.51 km2, with a total perimeter and coastline of 418 km.

Table 2.3.3
Archipelago of Madeira's geographic data

Area	Perimeter				Maximum length		Altitude	
	Total	Coastline	Land borders		North-South	East-West	Maximum	Minimum
			International	Inter-regional				
Km²	Km						mt	
801.51	418	418	//	//	343	134	1 862	0

Latitude				Longitude			
North		South		North		South	
Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates
Ilhéu de Fora	33° 07' 41''	Ponta do Sul - Ilhéu de Fora (Selvagens)	30° 01' 49''	Ponta do Leste (Selvagem Grande)	-15° 51' 21''	Ponta do Pargo	-17° 15' 57''

Source: National Statistical Institute (INE), 2017

The Archipelago of the Azores is located over the Mid-Atlantic Ridge and its islands are spread over the American, African and European Tectonic Plates. This part of the Portuguese territory is composed by a total of nine major islands divided into three groups according to their geographic location: the western group (Flores and Corvo), the central group (Terceira, Graciosa, São Jorge, Pico and Faial) and the eastern group (Santa Maria and São Miguel).

Concerning Azores geographic data (Table 2.3.4), this archipelago occupies a total of 2 321.96 km2, with a total perimeter and coastline of 943 km.

Table 2.3.4
Archipelago of the Azores' geographic data

Area	Perimeter				Maximum length		Altitude	
	Total	Coastline	Land borders		North-South	East-West	Maximum	Minimum
			International	Inter-regional				
Km²	Km						mtt	
2 321.96	943	943	//	//	311	547	2 351	0

Latitude				Longitude			
North		South		North		South	
Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates	Location	Geographical coordinates
Ponta do Mar	39° 43' 34''	Ponta do Castelo	36° 55' 39''	Ponta das Eirinhas	-25° 00' 47''	Fajã Grande (Flores island)	-31° 16' 07''

Source: National Statistical Institute (INE), 2017

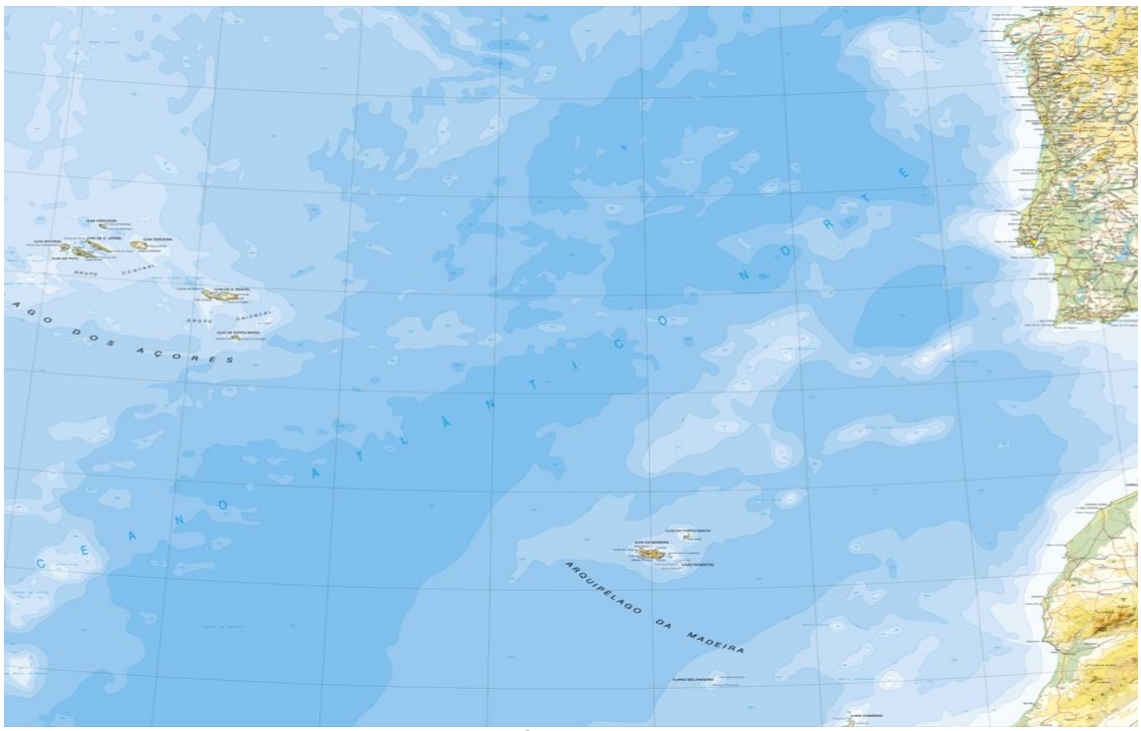


Figure 2.3.1
Portugal´s geographic location
Source: DGT, 2013

The climate in mainland Portugal (Figure 2.3.2) is predominantly influenced by latitude, orography and its proximity to the Atlantic Ocean; some climate variables, such as precipitation and temperature, display strong north-south and west-east gradients as well as a very sharp seasonal and inter-annual variability.

Average annual precipitation in mainland Portugal (Figure 2.3.2) shows a strong spatial variability, with the highest values observed in the mountainous regions of Minho, exceeding 2 500 mm, and the lowest values, below 600 mm, in some northern and central inland regions (non-mountainous areas) and in inland Alentejo. Precipitation has very strong variations from year to year, making the region vulnerable to extreme events associated to lack (droughts) or excess (floods) of rainfall.

On average, around 40 % of annual precipitation occurs during winter (December to February) and only 7 % of total annual precipitation occurs during summer (June to August). Transition seasons – spring (March to May) and autumn (September to November) – show a very variable inter-annual distribution, with approximately 24 % and 28 % of total average precipitation during these seasons, respectively.

The number of days with precipitation of 0.1, 1 and 10 mm or more show a very similar pattern, since the largest number of days occurs in northern and central coastal regions (Figure 2.3.2), while the southern inland regions show fewer days. Regarding the number of days in a year with precipitation of 30 mm or more, the highest values (> 20 days) appear in the Region of Minho and the lowest (< 3 days) in the northern inland regions and in Alentejo (Figure 2.3.2).

Annual precipitation has decreased (-25 mm/decade): the last 20 years have had particularly low rainfall in mainland Portugal (Figure 2.3.3). It should also be noted that 5 out of the 10 driest years occurred after 2000, with 2005 being the driest year, 2007 the second driest and 2004 the third driest.

Figure 2.3.2
NUT 3 Regions and particular sub-regions in Portugal

The last four decades have been continuously drier, the driest one being 2001-2010.

Seasonal precipitation has shown great variability, with a (statistically significant) decrease in spring, summer and winter, and an increase in autumn, which results in a shorter winter period and early spring.

There has been an increase in extremely rainy days (above the 99th percentile) within annual precipitation, especially in the past 30 years and in southern regions.

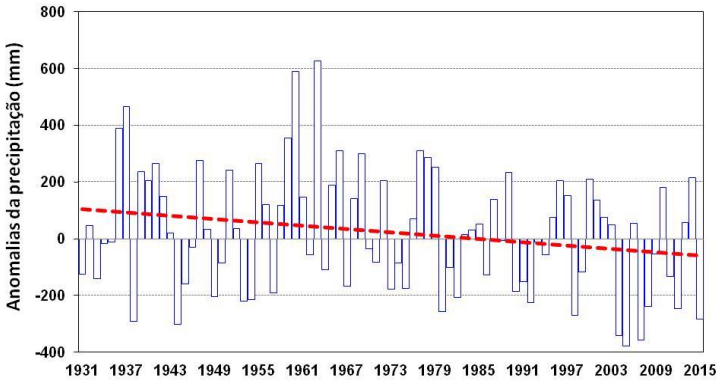


Figure 2.3.3
Deviations of total annual precipitation in mainland Portugal in relation to normal values 1971-2000.
Source: IPMA, 2017

The spatial distribution of average temperature in mainland Portugal shows the combined effect of three main factors, whose relative importance varies within the annual cycle, while a significant temperature gradient is evident in the north-south direction during winter and a strong gradient in coastal areas during summer.

Average annual values for mean air temperature are lower in highland areas in inland North and Centre (Serra da Estrela), between 6 ºC and 9 ºC, and higher, above 17 °C, in eastern Algarve and the Guadiana valley.

Average monthly temperature varies regularly throughout the year, reaching a peak in August and a minimum value in January. In the summer, average values for maximum temperature vary between 20 °C in Cabo Carvoeiro and 33 °C Amareleja. The highest values for maximum temperature in the summer are recorded in the whole region of inland Centre and inland Alentejo, between 30 °C and 34 °C, while the lowest figures of 20 °C to 25 °C occur in almost the entire western coastline. Average values for minimum air temperature in winter range from -1 °C to 2 °C in northern and central inland mountainous areas and from 9 °C to 10 °C in the headlands south of Cabo Carvoeiro and in the coastal region of the Algarve.

The number of days in a year with a minimum temperature of 0 °C or less presents higher figures (40 to 60 days) in northern and central inland regions and lower figures in southern coastal regions. The number of days in a year with a minimum temperature of 20 °C or more (tropical nights) shows maximum values in the region of Beira Baixa/Alto Alentejo, in the area of Amareleja, and in eastern Algarve; the lowest values (1-2 days) correspond to coastal North and Centre.

The number of days with a maximum temperature of 25 ºC or more is higher than 80 days virtually throughout the whole territory except for the western coastline. The regions of the Douro Valley, Ribatejo, Alentejo and eastern Algarve have the largest number of days (> 120 days). Days with a maximum temperature of 30 °C or more occur mainly in the summer (more than 20 days throughout the whole territory) and more frequently in the regions of the Douro Valley, Beira Baixa and Alentejo.

Since the mid-70s the average temperature has risen in all regions of Portugal at a rate of approximately 0.3 °C/decade (Figure 2.3.4). It should be noted that out of the 10 warmest years, seven occurred after 1990, with 1997 being the warmest year.

There is an increase in the number of days with high temperatures and a decrease in the number of days with low temperatures, in particular after 1976. There is also an increase in the intensity and duration of heat waves.

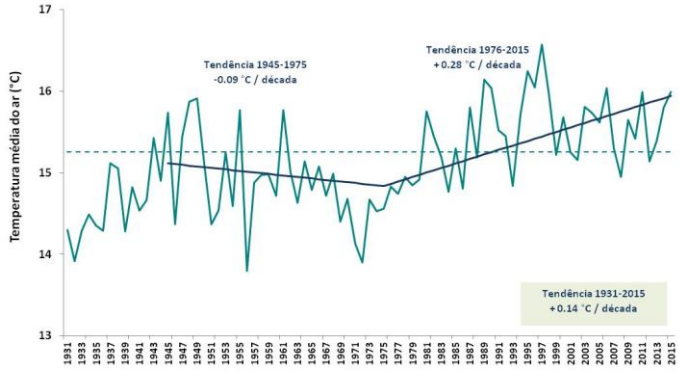


Figure 2.3.4
Inter-annual variability of average annual temperature in mainland Portugal (dotted line: mean values for the period 1971-2000)
Source: IPMA, 2017

The archipelago of the Azores is situated in the subtropical area of the northern hemisphere anticyclones, and the dominant factor for its weather conditions is the Azores anticyclone.

The Azores are characterised by a temperate and humid climate, however given the variation of air temperature according to altitude, its climate is ocean cold in highland regions, where it is extremely rainy.

Average annual values range from 14 °C to 18 °C in coastal regions and from 6 °C to 12 °C in higher areas, except for the highest spot on the island of Pico (Pico mountain) where temperature is below 2 °C (Figure 2.3.5).

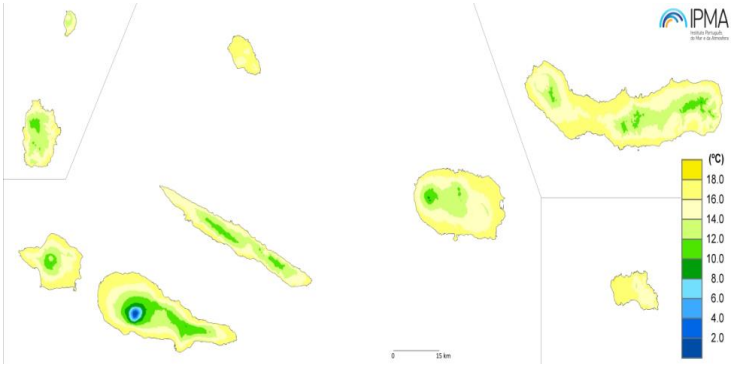


Figure 2.3.5
Average annual temperature for the period 1971-2000 in the Archipelago of the Azores.
Source: IPMA, 2017

Values for average monthly temperature vary regularly throughout the year, reaching a maximum in summer, particularly in August, and a minimum in winter, namely in the months of January and February.

Average monthly values for mean air temperature in January and February are lower in areas of higher altitude in the archipelago and vary between 4 °C and 8 °C, except for the Pico mountain (Ponta do Pico) where values are even lower, below 0 °C. In August, the hottest month, the highest values for the archipelago of the Azores are close to 22 ºC and occur in some coastal areas of all islands, but in particular in Santa Maria (west), São Miguel (south), Corvo, Pico and Faial (south-east).

The distribution of average annual precipitation recorded for the archipelago of the Azores (Figure 2.3.6) at lower elevations varies from west to east and rainfall is more abundant in the Western Group, on the island of Flores, with an average of 1 666 mm (Boca da Baleia), while the lowest quantities of precipitation are recorded in the Eastern Group, on the island of Santa Maria (729 mm).

The amount of average annual precipitation in this archipelago is also strongly influenced by its orography, with the highest average annual precipitation values recorded in certain islands with higher elevations, as is

the case of some locations on the island of Pico, where values in excess of 4 000 mm/year may occur, for example in Lagoa do Caiado, which has an average of 4 695 mm.

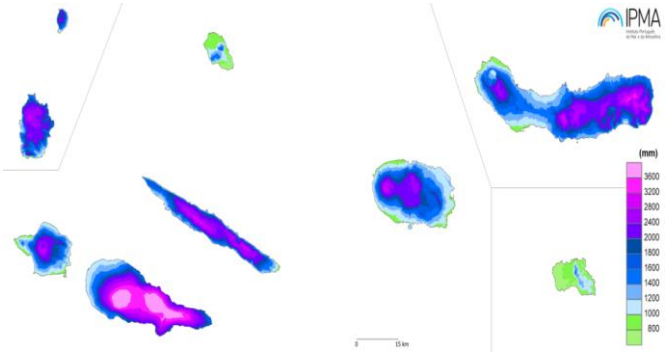


Figure 2.3.6
Average annual precipitation for the period 1971-2000 in the Archipelago of the Azores.
Source: IPMA, 2017

The season between September and March is predominantly rainy, characterised by the frequent crossing of polar front depressions, and the average amount recorded during these months exceeds 500 mm. In the remaining months, the seasons are less rainy due to the influence of the Azores anticyclone.

Climate in the archipelago of Madeira is mild, both in winter and summer, except in higher areas where temperatures are lower. Depressionary systems which cross the Atlantic and go as far as the latitude of Madeira in winter, or those that are formed between the archipelago and mainland Portugal, can cause significant rainfall. Winds from the north (linked to the eastern branch of the Azores anticyclone) predominate in the summer. However, the complex topography of the island of Madeira is at the origin of many microclimates:

- Temperate with dry and hot summers – occurs in coastal areas of the island of Madeira and in some specific locations of higher altitude on the island of Porto Santo.
- Temperate with dry and mild summers – is predominant on the island of Madeira and on the island of Porto Santo, and occurs only in the areas of higher altitude.
- Temperate with dry and cool summers – observed in the small highland areas of Pico Ruivo and Pico do Areeiro.

Values for average annual air temperature vary between 8 °C in the highest peaks and 22 °C in the coastal areas of the island of Madeira and in almost the entire island of Porto Santo (Figure 2.3.7). The region of Funchal, which is south and downstream of dominant winds, is the warmest on the island.

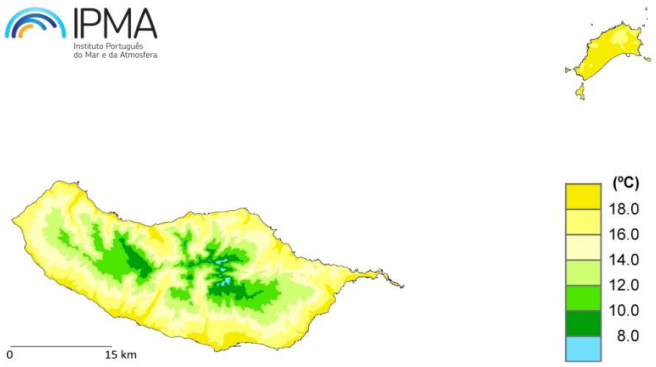


Figure 2.3.7
Average annual temperature for the period 1971-2000 in the archipelago of Madeira.
Source: IPMA, 2017

In the archipelago of Madeira the average annual precipitation (Figure 2.3.8) shows a variation between islands, with rainfall being more abundant on the island of Madeira than on the island of Porto Santo, and Funchal having 596 mm on average.

Annual precipitation in Madeira varies between 3 400 mm (highest peaks) and 600 mm (Funchal region) and is strongly influenced by its orography, the most abundant rainfall being at higher elevations of the island (Encumeada 2 794 mm, Bica da Cana 2 635 mm and Arieiro 2 620 mm/year). There is also a significant contrast between the north and higher locations, where precipitation values are very high, and the south with low precipitation.

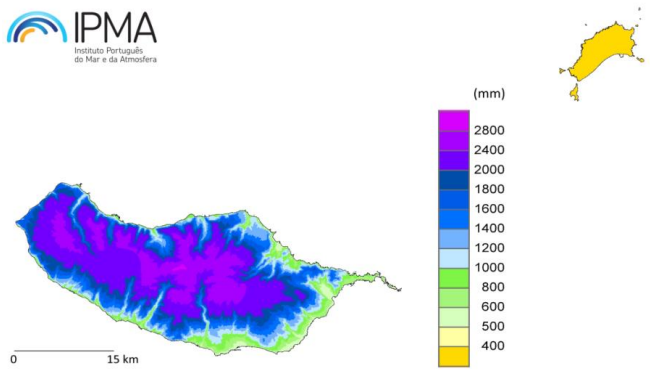


Figure 2.3.8
Annual average precipitation for the period 1971-2000 in the archipelago of Madeira.
Source: IPMA, 2017

Precipitation in winter exceeds 1 400 mm in the highest areas, while it is less than 300 mm in the regions of Funchal and Machico valley. In the summer months the amount of precipitation varies between 150 mm in highland areas and less than 50 mm on the south coast of the island. The fact that it rains more in the northern part of Madeira during summer is clearly linked to the dominant direction of the (north) wind during this season and to the fact that precipitation is essentially influenced by its orography.

Climate scenarios

For mainland Portugal, climate simulations for the future, which are obtained by the European Consortium ECEARTH and available in "Portal do Clima", provide projections for the end of the 21st century of an increase in average annual air temperature by 2 °C (RCP 4.5 scenario) to 4 °C (RCP 8.5 scenario). This heating should be higher in the summer and in inland and southern regions of the country (Figure 2.3.9).

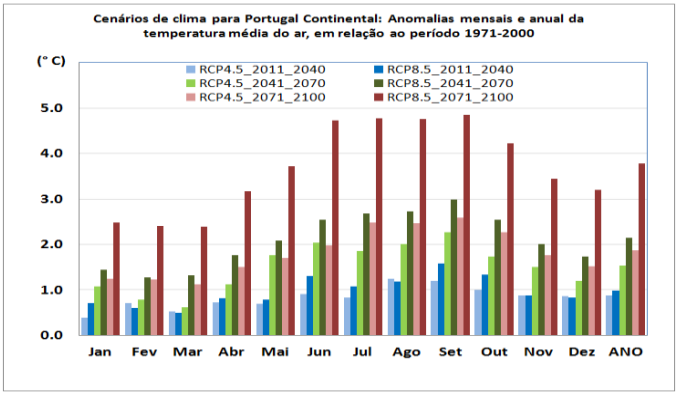


Figure 2.3.9
Climate scenarios (RCP 4.5 and 8.5) for mainland Portugal: monthly and annual deviations in average air temperature in relation to the period 1971-2000.
Source: IPMA, 2017

With regard to precipitation, these scenarios show a decline of 15 % by 2040 and 30 % by 2100, which will be more marked in southern mainland Portugal (Figure 2.3.10).

In the island territories, the scenarios used in the SIAM II Project suggest increases in maximum temperature by 2 °C to 3 °C in Madeira and by 1 °C to 2 °C in the Azores. In terms of annual precipitation, it could be reduced in Madeira by 20 % to 30 %. In the Azores, results show small variations.

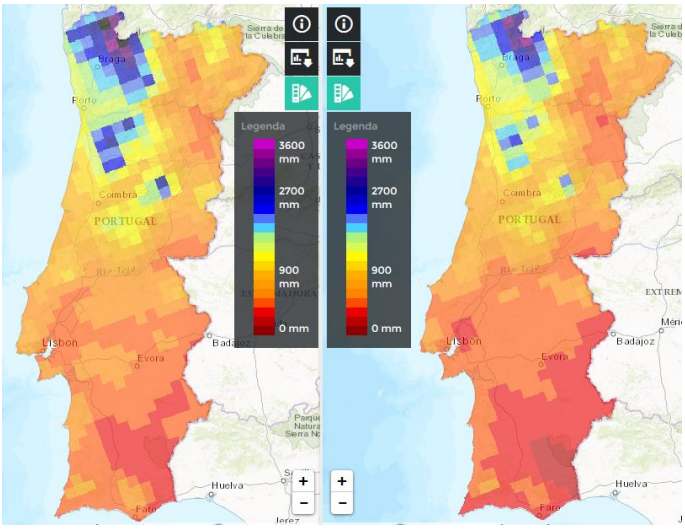


Figure 2.3.10
Spatial distribution of annual precipitation, simulation for the period 1971-2000 (left) and RCP 8.5 scenario for the period 2071-2100 (right).
Source: Climate Portal (Portal do Clima).

2.4. Economic Profile

The Economic Profile analysis is structured within a timeframe between 2000 and 2015, with the exception of the indicators associated to Gross Value Added (only available between 2000 and 2014), in the light of the requirements related to geographical disaggregation in accordance with the UNFCCC guidelines for this reporting (Portugal, Mainland, Autonomous Region of the Azores and Autonomous Region of Madeira).

Looking at the Gross Domestic Product indicator (Table 2.5.1), a general increase can be seen, both chronologically and geographically in 2015pe[11] compared to data from 2000.

In particular, Portugal and its mainland component show growth figures equivalent to 39.8 % and 39.5 % respectively. This trend is stronger in the ARA and ARM, which show values equivalent to 55.9 % and 53.2 % respectively.

Table 2.5.1

Gross Domestic Product at current prices by geographic location (EUR 10^6)				
Year	Portugal	Mainland	ARA	ARM
2000	128 466,3	123 009,7	2 427,9	2 715,0
2015Pe[11]	179 539,9	171 553,5	3 785,1	4 158,9

Source: National Statistical Institute (INE), 2017

Development of Gross Domestic Product at current prices by geographic location (%)				
Year	Portugal	Mainland	ARA	ARM
2000-2015pe[11]	39,8	39,5	55,9	53,2

[11] Preliminary figures (INE 2017).

The Gross Value Added indicator (Table 2.5.2) shows a trend which is very similar to that observed for the Gross Domestic Product, with an increase in 2015 compared to 2000 of the values recorded in Portugal and in its mainland component by 39.1 % and 38.8 % respectively. The ARA and the ARM show a significant increase in 2015 compared to 2000 by 55.2 % and 51.9 % respectively.

Table 2.5.2

Gross Value Added at current prices by geographic location – base year 2011 (EUR 10^6)				
Year	Portugal	Mainland	ARA	ARM
2000	112 568,0	107 763,9	2 127,0	2 402,2
2015pe	156 612,2	149 626,2	3 301,3	3 647,8

Source: National Statistical Institute (INE), 2017

Development of Gross Value Added at current prices by geographic location – base year 2011 (%)				
Year	Portugal	Mainland	ARA	ARM
2000-2015pe	39,1	38,8	55,2	51,9

Looking at the *Gross Value Added* indicator from a sectoral point of view (Table 2.5.3), it should be pointed out that there are various territorial dynamics, which enable the identification of some of the national economic *drivers*.

First of all, the general increase in values equivalent to 34.8 %, 34.3 %, 53.4 % and 49.6 % for Portugal, Mainland, ARA and ARM respectively, reflected in the Total Gross Value Added.

With regard to the economic sector of *Agriculture, animal production, hunting, forestry and fishing*, in 2014 compared to 2000, Portugal and its mainland component show a decline equivalent to 11.6 % and 15.1 % respectively. Both the ARA and the ARM experience an opposite trend, with an increase equivalent to 35.3 % and 16.8 % respectively.

As regards the economic sector of Mining and Quarrying, Manufacturing, Electricity, gas, steam and air conditioning supply, Water collection, treatment and supply, Sewerage, waste management and remediation activities and Construction, it shows an increase in values for the territorial dimensions of Portugal (4.1 %), Mainland (4.0 %) and ARA (27.4 %). In contrast, the ARM shows a decrease equivalent to 7.2 %.

The Services sector, similarly to the Total Gross Value Added indicator, presents a general increase in values equivalent to 49.7 %, 49.4 %, 61.5 % and 66.0 % for Portugal, Mainland, ARA and ARM, respectively.

Table 2.5.3

Gross Value Added at current prices by geographic location and sector of activity (EUR 10^6)								
Year	Total				Agriculture, animal production, hunting, forestry and fishing			
	Portugal	Mainland	ARA	ARM	Portugal	Mainland	ARA	ARM
2000	112 568,0	107 763,9	2 127,0	2 402,2	3 992,5	3 691,2	239,9	61,4
2014pe	151 714,0	144 758,0	3 262,9	3 592,9	3 528,5	3 132,1	324,7	71,7
Year	Mining and quarrying; Manufacturing; Electricity, gas, steam and air conditioning supply; Water collection, treatment and supply; Sewerage, waste management and remediation activities; Construction				Services			
	Portugal	Mainland	ARA	ARM	Portugal	Mainland	ARA	ARM
2000	31 409,9	30 591,0	321,3	497,5	77 165,6	73 481,6	1 565,8	1 843,3
2014pe	32 687,9	31 816,7	409,3	461,9	115 497,6	109 809,2	2 528,9	3 059,4

Source: National Statistical Institute (INE), 2017

Development of Gross Value Added at current prices by geographic location and sector of activity (%)								
Year	Total				Agriculture, animal production, hunting, forestry and fishing			
	Portugal	Mainland	ARA	ARM	Portugal	Mainland	ARA	ARM
2000-2014pe	34,8	34,3	53,4	49,6	-11,6	-15,1	35,3	16,8
Year	Mining and quarrying; Manufacturing; Electricity, gas, steam and air conditioning supply; Water collection, treatment and supply; Sewerage, waste management and remediation activities; Construction				Services			
	Portugal	Mainland	ARA	ARM	Portugal	Mainland	ARA	ARM
2000-2014pe	4,1	4,0	27,4	-7,2	49,7	49,4	61,5	66,0

The following analysis focuses on indicators that shape the trade balance, which consists of imports and exports; it should be clarified that the statistical information used is only available for the territorial dimension of Portugal.

Thus, an analysis to imports in the first place (Table 2.5.4) reveals significant increases in 2015 compared to 1995 for the indicators Total (142.3 %), Goods (140.5 %) and Services (152.4 %) in Portugal.

Table 2.5.4

Portugal imports (EUR 10^6)			
Year	Total	Goods	Services
1995	29 508,3	25 074,8	4 433,5
2015Pe	71 502,7	60 313,0	11 189,7

Source: National Statistical Institute (INE), 2017

Development of Portugal imports (%)			
Year	Total	Goods	Services
1995-2015pe	142,3	140,5	152,4

As for exports (Table 2.5.5), significant increases are recorded for 2015 compared to 1995 for the indicators Total (205.5 %), Goods (190.7 %) and Services (252.4 %) in Portugal.

Table 2.5.5

Portugal exports (EUR 10^6)			
Year	Total	Goods	Services
1995	23 831,33	18 097,44	5 733,89
2015Pe	72 808,35	52 600,56	20 207,79

Source: National Statistical Institute (INE), 2017

Development of Portugal exports (%)			
Years	Total	Goods	Services
1995-2015pe	205,5	190,7	252,4

To conclude the economic profile description, concerning the employment analysis (Table 2.5.6), it is noted that the statistical information reported here is only available between 2000 and 2015 (preliminary data).

When comparing the values recorded in 2015 with the ones from 2000, the downward trend is clear. However, the territorial dimensions of Portugal (-9.2 %) and Mainland (-9.1 %) show a lower decrease in this context, while the ARA (-2.7 %) and ARM (-14.1 %) aggravate the performance.

Table 2.5.6

Employment – Total of individuals by geographic location (10^3 persons)				
Year	Portugal	Mainland	ARA	ARM
2000	5 041,9	4 804,1	102,7	125,1
2015Pe	4 575,8	4 366,2	100,0	107,4

Source: National Statistical Institute (INE), 2017

Employment development – Total of individuals by geographic location (%)				
Year	Portugal	Mainland	ARA	ARM
000-2015	-9,2	-9,1	-2,7	-14,1

2.5. Energy Profile

Portugal is in the lead regarding the focus on renewable energy, having achieved very positive results in recent years. This is reflected in the reduction of foreign energy dependency (-5.6 % in 2015 compared to 2006), in the increase in domestic energy production, which together ensure a higher level of security of supply (24 % of total primary energy consumption in 2015 against 16.5 % in 2006). The contribution of the renewable energy sector to the Portuguese economy also needs to be highlighted, in that it generates a whole new industrial and business strand which creates jobs, promotes regional development, boosts exports of goods and services, drives innovation and scientific research, and is able to attract international investment and stimulate the internationalisation of national businesses.

National targets for renewable energy

Directive 2009/28/EC of the European Parliament and of the Council of 23rd April 2009 introduces the obligation for EU Member States to submit a plan promoting the use of energy from renewable sources. The National Action Plan for Renewable Energy (PNAER) sets national targets for each Member State regarding the share of energy from renewable sources consumed in Transport (RES-T), Electricity (RES-E) and Heating and Cooling (RES-H&C) by 2020, as well as their penetration paths in accordance with the implementation pace of the measures and actions envisaged for each of these sectors, bearing in mind the effects of other policies related to energy efficiency on energy consumption.

Portugal has prepared and submitted the first national action plan in 2010, in which it committed to attaining the targets set in the Directive, in particular the overall target of 31.0 % of energy from renewable sources in gross final energy consumption and 10.0 % in final energy consumption within the Transport sector.

Portugal revised recently its PNAER, as approved by Resolution of the Council of Ministers No 20/2013, which maintains the same level of ambition and the same commitment towards achieving the EU targets.

In 2015, the share of renewable energy sources (RES) in gross final energy consumption stood at 28.0 %, +1.0 p.p. above the value recorded in 2014 and 2.8 p.p. above the indicative path, meaning that Portugal has already reached approximately 90 % of its target for 2020. At sectoral level, the share of renewable energy sources in Electricity (RES-E) was 52.6 % (+0.5 p.p. compared to 2014), in the Heating and Cooling sector (RES-H&C) 33.4 % (-0.6 p.p. compared to 2014) and in the Transport sector (RES-T) 7.4 % (+3.7 p.p. compared to 2014). Regarding the transport target, there was a significant increase in 2014, since the process of biofuel certification started during that year, which enabled its inclusion to a greater extent for the purposes of the Renewable Energy Directive.

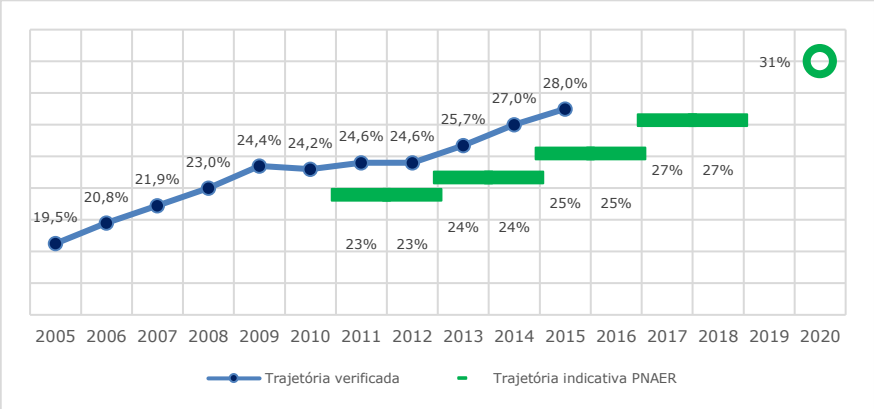


Figure 2.5.1
Development of the target to incorporate renewables in gross final energy consumption[12] in accordance with Directive 2009/28/EC
Source: Directorate-General for Energy and Geology (DGEG), 2017

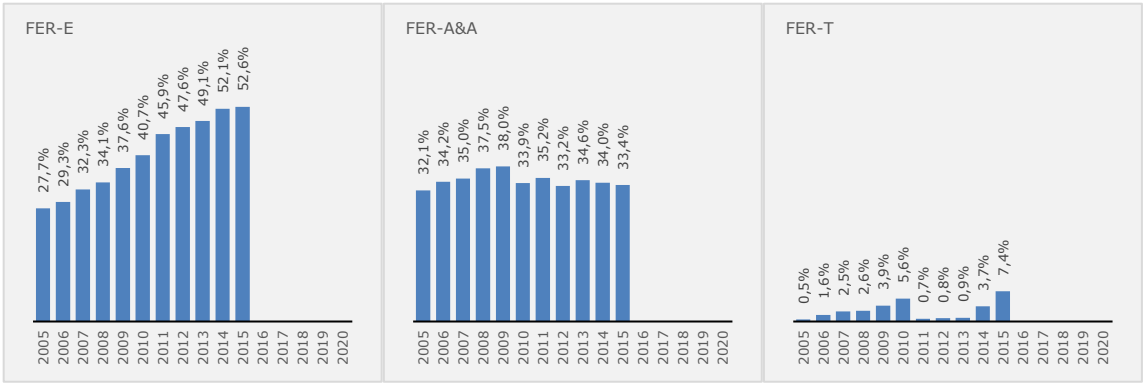


Figure 2.5.2
Development of sectoral targets to incorporate renewables in energy consumption[12] in accordance with Directive 2009/28/EC
Source: Directorate-General for Energy and Geology (DGEG), 2017

One of the major challenges and objectives of the current national energy policy is to reduce foreign energy dependency. Traditionally, Portugal has had high energy dependency, between 80 % and 90 %, due to the lack of domestic production of fossil energy sources, such as oil or natural gas, which still weigh significantly in the energy consumption mix. Investment in renewable energy and energy efficiency, with a stronger focus in recent years, has enabled Portugal to reduce its dependency to levels below 80 %. However, the variability of the hydrological regime, coupled with a large hydro component in the national electricity

[12] Indicator only available from 2005 onwards.

generation system, affects energy dependency negatively in dry years, as was the case for 2005 or 2008, and to some extent 2015.

Energy dependency in 2015 stood at 78.3 %, representing an increase of 5.9 p.p. compared to 2014 and a reduction of 10.5 p.p. compared to 2005, when the highest energy dependency of recent years was registered. This increase in energy dependency is largely due to a decrease in the production of electricity from renewable sources, in particular hydro and wind power, leading to an increase in the consumption of coal and natural gas for electricity production and resulting in increased imports. Another factor contributing to an increased energy dependency is the increase in imports of crude oil for the refining sector.

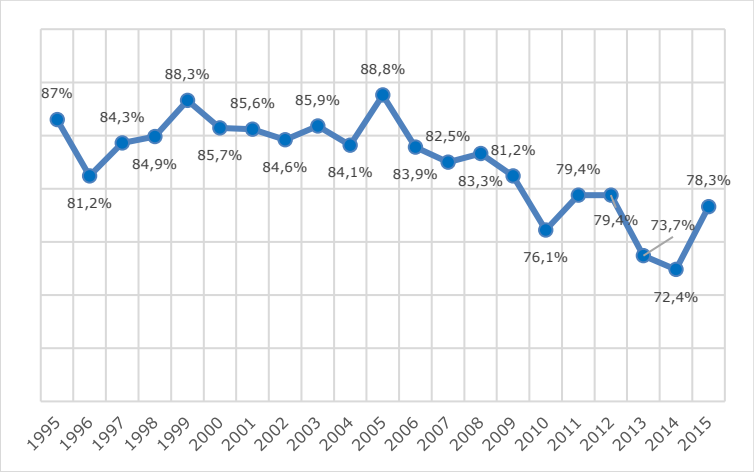


Figure 2.5.3
Development of Energy dependency in Portugal[13] (%)
Source: Directorate-General for Energy and Geology (DGEG), 2017

Looking at the Normalised Energy Dependency, which is determined taking into account the normalised electricity generated from hydropower and wind power in compliance with Directive 2009/28/EC (the average of the last 15 years for hydropower and the average of the last 5 years for wind power), a normalised dependency of 77.6 % is recorded for 2015, while real energy dependency is at 78.3 %. The analysis of this indicator allows mitigating the effects of the variability associated to the production of energy from hydropower and wind power and obtaining values concerning energy dependency for an average year in terms of water and wind availability.

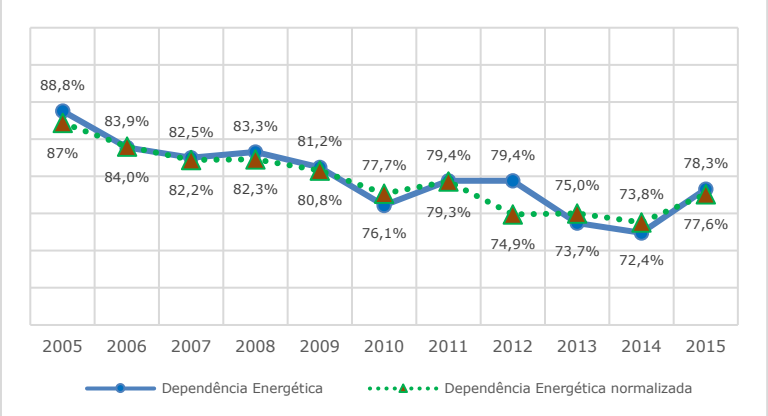


Figure 2.5.4
Development of Normalised Energy Dependency[12] (%)
Source: Directorate-General for Energy and Geology (DGEG), 2017

The energy import balance has been decreasing in recent years, however, this trend was reversed in 2015, with a balance of 18 591 178 toe (+14 % compared to 2014), while in the period 2006-2015 the average annual growth rate was -2.1 %, in contrast with 4.3 % in the period 1996-2005.

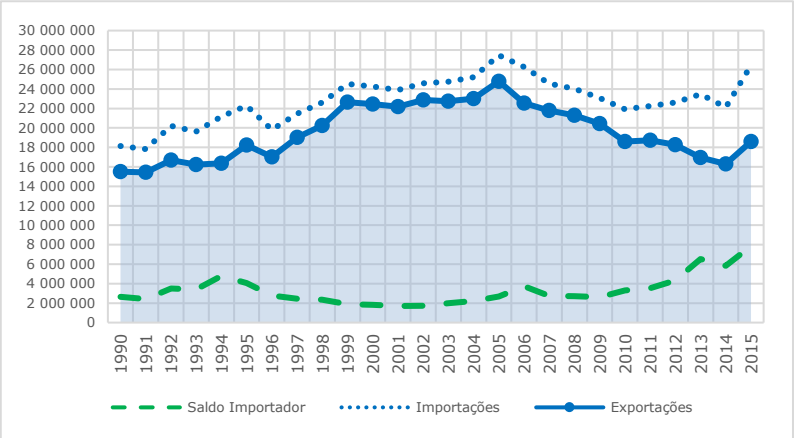


Figure 25.5
Development of Energy Import Balance (toe)
Source: Directorate-General for Energy and Geology (DGEG), 2017

The rise of the energy import balance in relation to 2014 resulted mainly from the increase in imports of coal and natural gas for electricity production and the increase in imports of crude oil for the refining sector.

Domestic energy production, by comparison with the development of the import balance, also showed a reversed growth trend in relation to the years before. In 2015 domestic energy production was 5 243 713 toe (-10.8 % compared to 2014), whereas in the period 2006-2015 the average annual growth rate was 2.2 %.

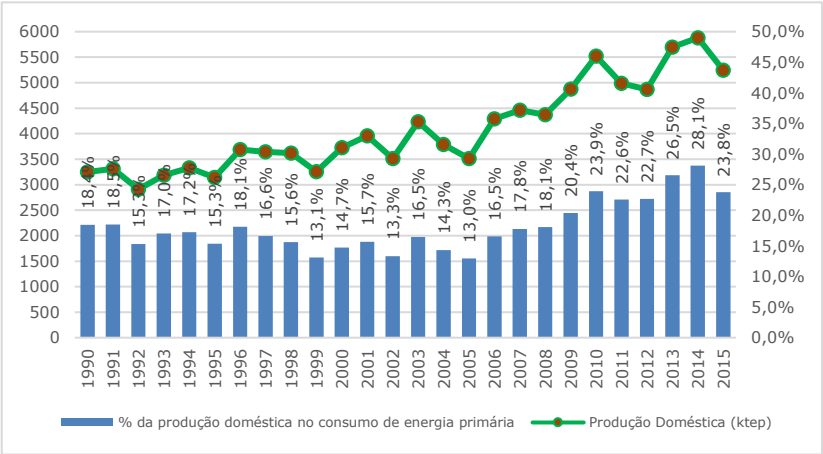


Figure 2.5.6
Development of Domestic Energy Production (ktoe)
Source: Directorate-General for Energy and Geology (DGEG), 2017

Compared to the total primary energy consumption, the domestic production of energy accounted for some 24 % (-15.1 p.p. compared to 2014), due a lower uptake of renewable indigenous sources of energy, particularly hydro.

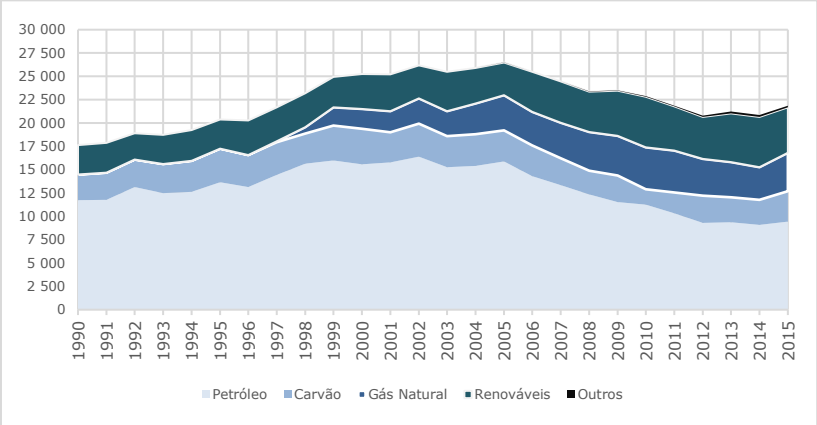


Figure 2.5.7
Development of Total Primary Energy Consumption (ktoe)
Source: Directorate-General for Energy and Geology (DGEG), 2017

Primary Energy Consumption (PEC) in Portugal was 22 059 570 toe (+5.4 % compared to 2014) in 2015. During the period 2006-2015, it had an average annual growth rate of -1.8 %.

Regarding the consumption of the different energy sources in 2015, crude oil remains the main source of primary energy (43 %), followed by renewables (22 %), natural gas (19 %) and coal (15 %). It should be noted that the weight of crude oil has been falling in recent years (55 % in 2006 vs. 43 % in 2015), while the weight of renewable sources (16 % in 2006 vs. 22 % in 2015) and natural gas (14 % in 2006 vs. 19 % in 2015) increased significantly.

Final Energy Consumption (FEC) in 2015 was 15 352 460 toe, which represents an increase of 1.2 % compared to 2014. During the period 2006-2015, it had an average annual growth rate of -2.5 %.

As for final consumption by source type, it can be seen that in 2015 crude oil remains the main source of energy (49 %), followed by electricity (26 %), natural gas (11 %), heat (8 %), and renewables (7 %). It should be noted that the weight of crude oil has been falling in recent years (56 % in 2006 vs. 49 % in 2015), while the weight of electricity (21 % in 2006 vs. 26 % in 2015) and natural gas (7 % in 2006 vs. 11 % in 2015) has increased.

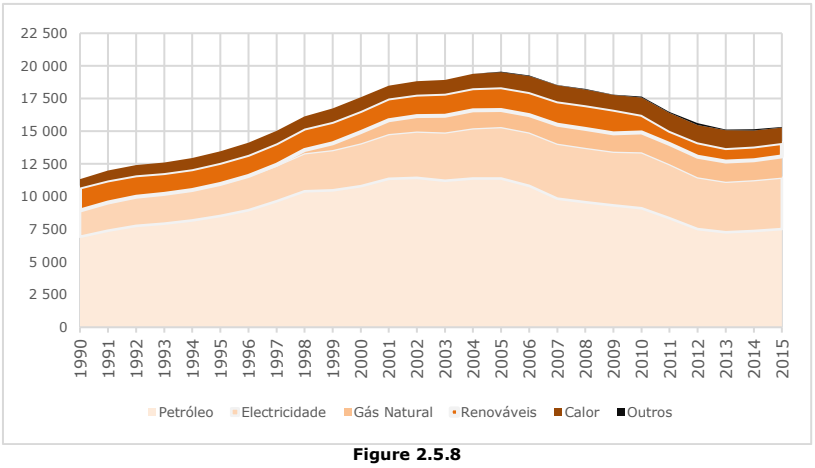


Figure 2.5.8
Development of Total Final Energy Consumption by source (toe)
Source: Directorate-General for Energy and Geology (DGEG), 2017

At sectoral level, in 2015 the Transport sector (37 %) remained the main energy consumer, followed by Industry (31 %), Households (16 %), Services (13 %) and Agriculture and Fisheries (3 %). There have been no significant changes in relation to the consumption mix of 2005, with negative average annual growth rates

in the period 2006-2015: Transport (-2.4 %), Industry (-3.2 %), Households (-2.6 %), Services (-1.0 %) and Agriculture and Fisheries (-1.3 %).

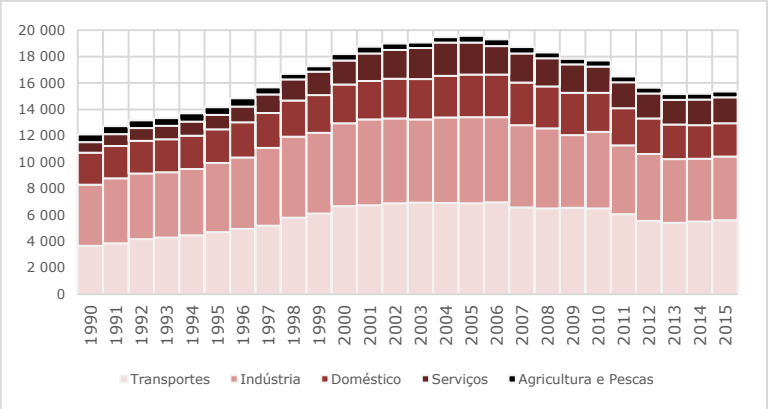


Figure 2.5.9
Development of Total Final Energy Consumption by sector (toe)
Source: Directorate-General for Energy and Geology (DGEG), 2017

In terms of market structure, and as underlined by the IEA in its recent 2016 review for Portugal (Energy policies of IEA Countries), the Iberian electricity system remains an island with interconnection with France being only 1.5% of total capacity. This is very low by European standards and, if not addressed, could have important implications. Efficiency gains in the electricity sector could help to reduce prices, and could be achieved by improving international interconnection capacity. While the electricity markets of Portugal and Spain are increasingly well connected in a common Iberian electricity market (MIBEL), better connections from Spain to France, and onward to other European countries, could allow more competition and facilitate grid management. Increasing interconnection is also central to support Portugal's renewables aspirations. Interconnection with Europe offers potentially more cost-effective options to manage system constraints and also a wider market for Portugal's renewable potential. The recent European Union decision to target a minimum of 10% interconnection capacity as a share of total generating capacity by 2020 and 15% by 2030 is an important one. In the current circumstances, there are concerns that Iberian electricity consumers could be unable to benefit from the advantages of a fully-integrated European electricity market

In 2015 the energy intensity of the economy in primary energy consumption stood at 129 toe/M€'2011 (+3.8 % compared to 2014) while the energy intensity of the economy in final energy consumption was 90 toe/M€'2011 (-0.4 % compared to 2014). On the other hand, the energy intensity of the economy in electricity stood at 273 MWh/M€'2011 (-0.04 % compared to 2014).

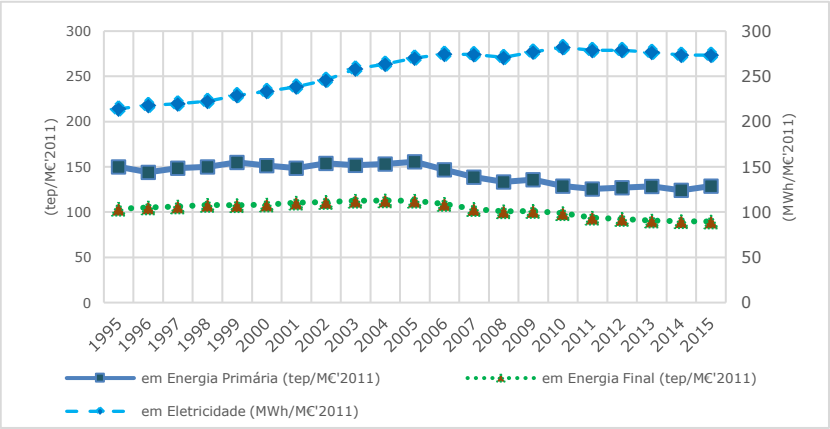


Figure 2.5.10
Development of Energy Intensity[13]
Source: Directorate-General for Energy and Geology (DGEG), 2017

[13] Indicator only available from 1995 onwards.

In terms of energy intensity by sector of activity, in 2015 the Industry sector had an energy intensity of 152 toe/M€'2011 (+0.7 % compared to 2014), the Agriculture and Fisheries sector 127 toe/M€'2011 (-4.2 % compared to 2014), the Transport sector 33 toe/M€'2011 (-15.1 % compared to 2014), the Household sector 23 toe/M€'2011 (-3.5 % compared to 2014), while the Services sector showed an energy intensity of 17 toe/M€'2011 (+0.5 % compared to 2014).

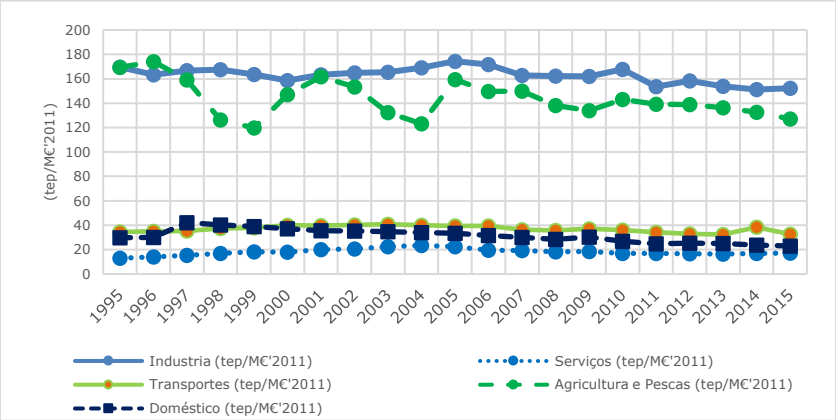


Figure 2.5.11

Development of energy intensity by sector of activity[13]

Source: Directorate-General for Energy and Geology (DGEG), 2017

Regarding per capita energy consumption indicators, in 2015 primary energy consumption was at 2.1 toe/inhabitant (+5.8 % compared to 2014), final energy consumption was at 1.5 toe/inhabitant (+1.6 % compared to 2014), and electricity was at 4.5 MWh/inhabitant (+1.9 % compared to 2014).

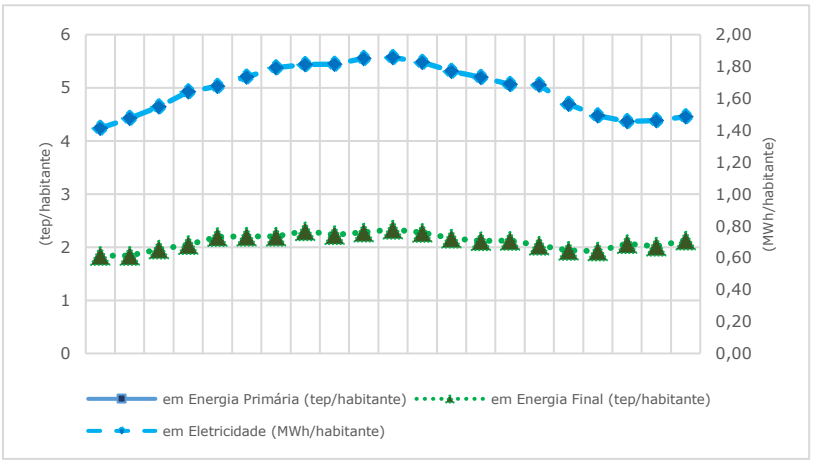


Figure 2.5.12

Development of per capita Energy Consumption[13]

Source: Directorate-General for Energy and Geology (DGEG), 2017

As for the economy's carbon intensity indicator, which results from the ratio between total GHG emissions and Gross Domestic Product (GDP), an intensity of 402 ton CO_2/M€'2011 (-21.6 % compared to 1995 and +5.4 % compared to 2014) was recorded in 2015. The indicator of per capita greenhouse gas emissions in 2015 was at 6.7 ton/inhabitant (-4.6 % compared to 1995 and +7.4 % compared to 2014).

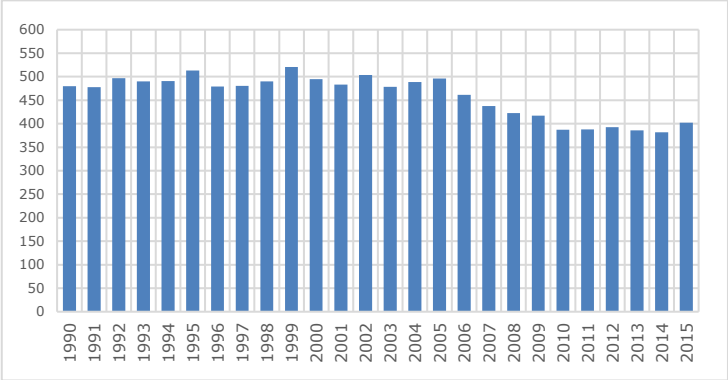


Figure 2.5.13
Development of Economy's Carbon Intensity (tonCO2/M€'2011)
Source: Portuguese Environment Agency (APA), 2017

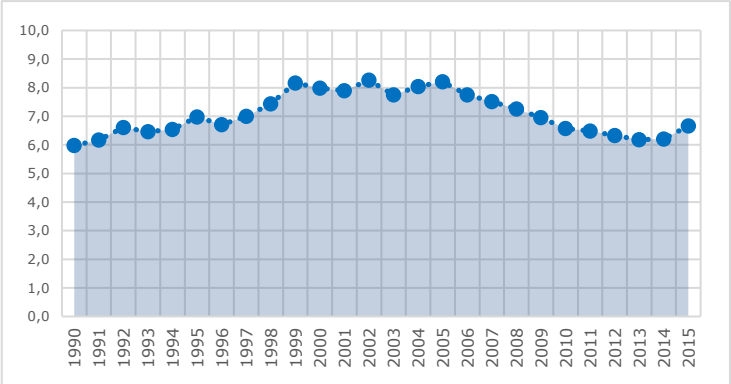


Figure 2.5.14
Development of per capita CO_2 Emissions (ton CO_2/inhabitant)
Source: Portuguese Environment Agency (APA), 2017

Regarding the carbon intensity indicator in energy consumption, which results from the ratio between total GHG emissions from energy consumption and the consumption of primary energy, it was at 2.2 ton CO2/toe in 2015 (-11.1 % compared to 1995 and +4.3 % compared to 2014). In what concerns emissions from the national electricity generation system (mainland Portugal and the Autonomous Regions), which result from data relating to the consumption of various primary energy sources (natural gas, coal, etc.) in power plants (large thermal plants, CHP and other thermal plants) in Portugal, values stood at 352 ton CO2/GWh in 2015 (+24.6 % compared to 2014).

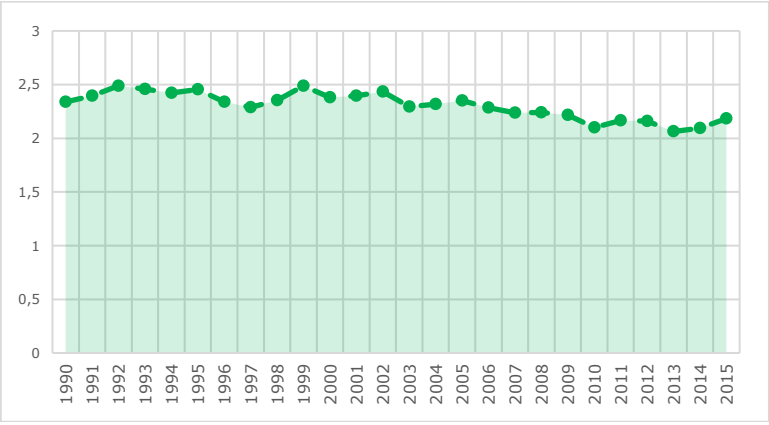


Figure 2.5.15
Development of carbon intensity in energy consumption (ton CO_2/toe)
Source: Portuguese Environment Agency (APA), 2017

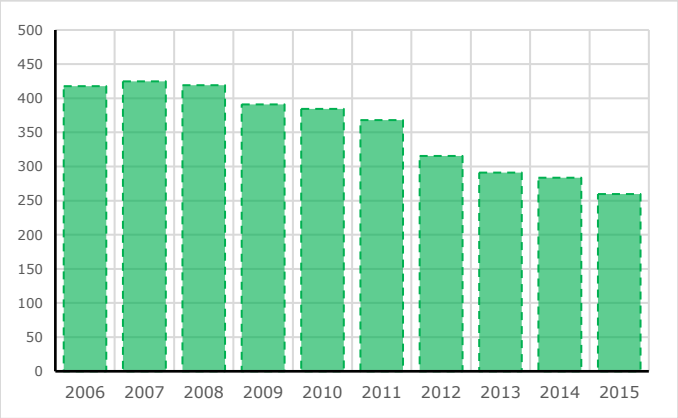


Figure 2.5.16

CO_2 annual emissions from the national electricity generation system[14] (ton CO_2/GWh)

Source: Directorate-General for Energy and Geology (DGEG), 2017

2.6. Transportation

The length of the national road network was, at the end of 2015, 14 310 kilometres (6.7 % more than in 2011), of which 16.3 % were main routes, 13.2 % complementary routes, 37.0 % national roads and 33.5 % regional roads.

The national railway network in operation spread along 2 546 km, of which 1 639 km were electrified. The underground railway network comprised a total of 121 711 metres in length.

In 2015 the number of passengers carried in Portugal was 888 million (less 22 % than in 201115), with a focus on road transport mode which accounts for 56 % of the total.

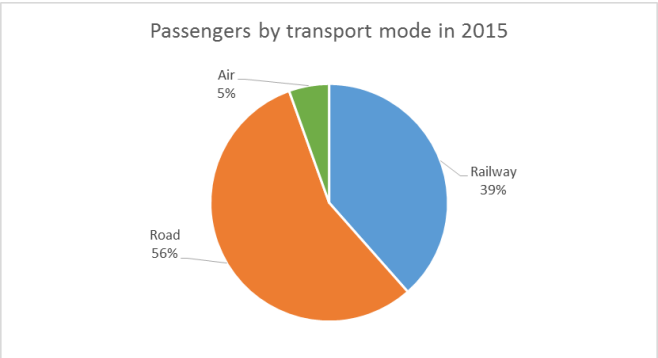


Figure 2.6.1

Source: Transport and communication statistics for 2015, INE 2016

The volume of passengers carried in Portugal was 42.624 billion passenger-kilometres (7 % more than in 20111), and air transport accounted for a share of 74 % of this value. Air and road transport modes have experienced a higher increase in the number of passenger-kilometres travelled.

[14] Indicator only available from 2006 onwards.

[15] For the purpose of comparing the transport modes under analysis, only the timeframe between 2011 and 2015 is available.

Table 2.6.1
Passenger-kilometres by transport mode (Unit: 10^6 Pkm)

Transport mode	2011	2012	2013	2014	2015
Rail					
Heavy rail system	4,143	3,803	3,649	3,852	3,957
Underground rail systems	1,155	1,028	941	967	1,009
Road	5,850	5,850	6,023	5,657	6,047
Air					
National airline carriers	28,516	30,007	31,586	32,954	31,611

Source: Transport and communication statistics for 2015, INE 2016[1]

The aviation sector should be highlighted, also regarding the number of passenger-kilometres, in view of the increase of nearly 170 % since 1990 in the total landings and take-offs (LTO) at the main national airports.

The volume of carried goods in 2015 was 37.532 billion tonne-kilometres (which represents a decrease of 7 % compared to 2011), where the road sector stands out with around 92 % of tonne-kilometres carried.

Table 2.6.2
Tonne-kilometres by transport mode (Unit: 10^6 Pkm)

Transport mode	2011	2012	2013	2014	2015
Rail	2,322	2,421	2,290	2,438	2,688
Road	37,472	32,274	39,624	36,336	34,524
Air					
National airline carriers	389	365	365	339	320

Source: Transport and communication statistics for 2015, INE 2016[1]

In what concerns the maritime sector, despite a reduction of 11 % in the number of dockings in the main Portuguese ports since 2011, there has been an increase in the total of handled goods by 29 %, and in the total number of passengers at national ports by 154 %.

Fuel consumption in transport was 5 576 294 toe in 2015, which represents an increase of 56 % since 1990 (the year with the least consumption) and a decrease of 19 % since 2006 (the year with the most fuel consumption). The road sector represents approximately 95 % of that consumption, while the national air and maritime sectors account for 2 % each and the railway sector for 1 %.

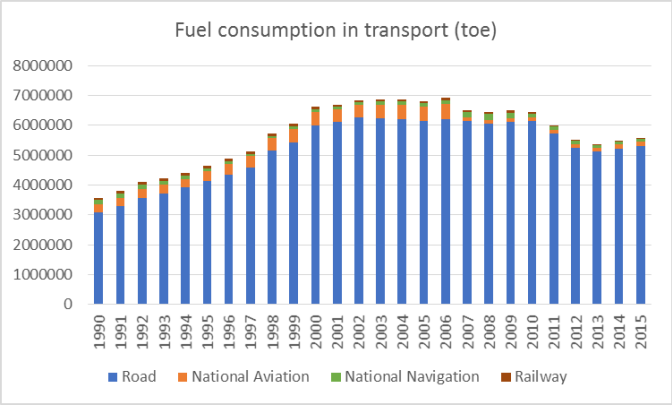


Figure 2.6.2
Source: Energy balance, Directorate-General for Energy and Geology (DGEG)

In the road sector, fossil fuels remain the main source of consumption, and although the use of biofuels and electricity has increased, its consumption is still low. There has also been an increase in the consumption of diesel, LPG and natural gas, and a decrease of 22 % in petrol consumption.

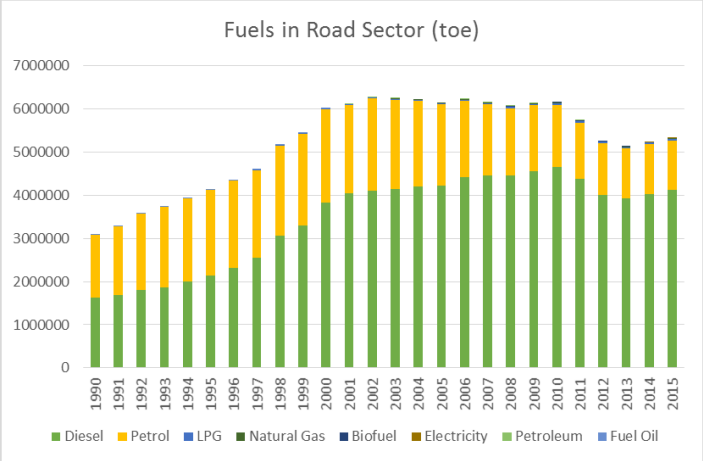


Figure 2.6.3
Source: Energy balance, Directorate-General for Energy and Geology (DGEG)

The variation in petrol and diesel consumption between 1990 and 2015 follows the evolution trend of the light vehicle fleet (passenger and commercial vehicles), with a 5 times increase in diesel vehicles during this period and a decrease in petrol vehicles by 42 % since 2002, and we can observe that the numbers relating to the petrol light-duty vehicle fleet in 2015 are very close to the ones existing in 1990.

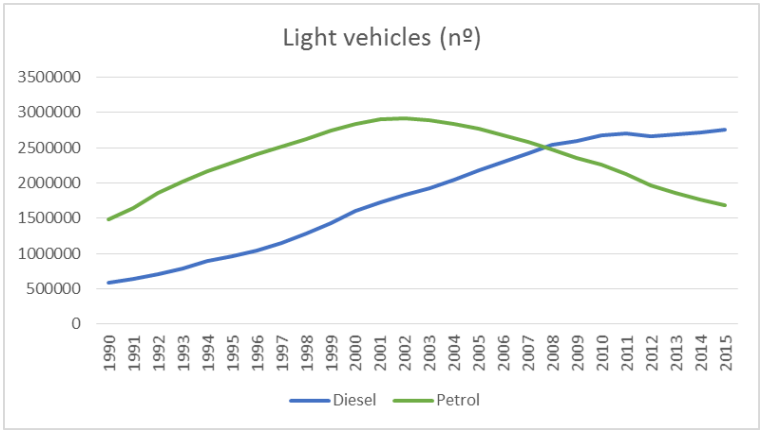


Figure 2.6.4
Source: National Emission Inventory, Portuguese Environment Agency (APA)

Kilometres travelled in the road transport sector go hand in hand with fuel consumption, with an increase of 80 % since 1990. It can be seen that, among the various categories of this type of transport, both passenger cars and motorcycles show an increase in kilometres travelled.

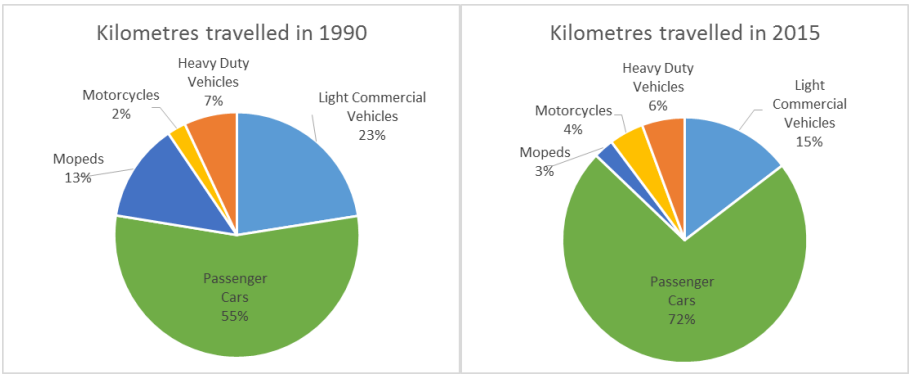


Figure 2.6.5
Source: National Emission Inventory, Portuguese Environment Agency (APA)

2.7. Industry

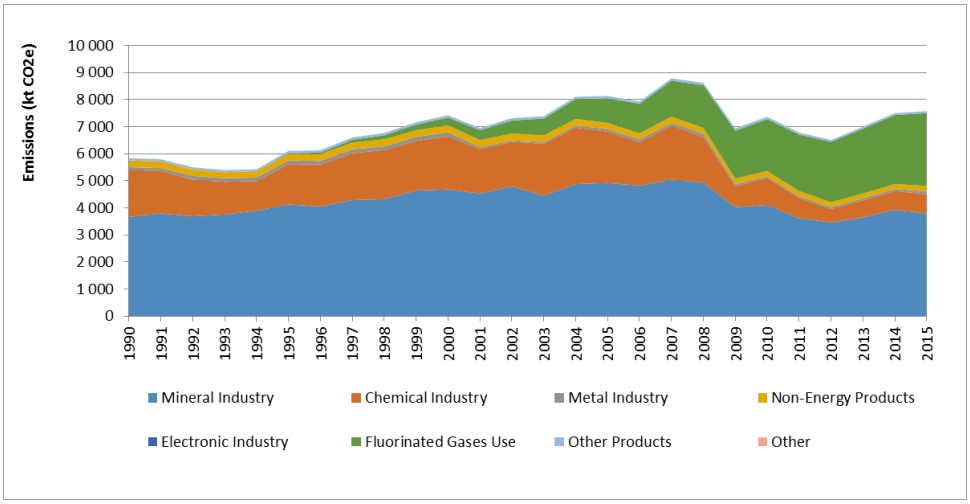
This sector includes emissions resulting from physical and chemical processing of raw materials in industrial processes, excluding combustion processes related to energy production, in accordance with the following classification:

- Mineral Industry (Cement, Lime, Glass, Other Uses of Carbonates);
- Chemical Industry (Ammonia, Nitric Acid, Ethylene, Carbon Black, Fibres, Sulfuric Acid, Explosives, Fertilisers, etc.);
- Metal industry (Iron and Steel Production, Metals and Metal Alloys);
- Non-Energy Products from Fuels and Solvent Use (Lubricant Use, Paraffin Wax Use, Solvent Use, Asphalt for Road Paving and Manufacture of Catalytic Converters with Urea);
- Electronics Industry (Integrated Circuits, Semiconductors, TFT Flat Panel Display, Photovoltaics and Heat Transfer Fluids);
- Fluorinated Gas Uses as Substitutes for Ozone Depleting Substances (Refrigeration, Air Conditioning, Foams, Fire Extinguishers, Aerosols, Solvents and Other Applications);
- Other Product Manufacture Processes (Electrical Equipment, Use of SF_6 and PFCs, Use of N_2O in medical applications);
- Other (Paper, Pulp, Food and Beverages Industry).

When analysing the sector of Industrial Processes in an aggregated form, in terms of total greenhouse gas (GHG) emissions, an increase can be seen between 1990 and 2015 of around 29.5 %, from 5.8 Mt CO_2e in 1990 to 7.6 Mt CO_2e in 2015.

In 2015, a considerable proportion of GHG emissions (62.4 %) was linked to CO_2. Fluorinated gases have become increasingly relevant (35.9 %) due to the phasing out of the use of ozone depleting substances, replacing these by fluorinated gases in refrigeration and air-conditioning equipment from 1995 onwards. N_2O emissions (1.1 %) are not very relevant, as they are linked to the production of nitric acid and the use of N_2O for medical purposes. CH_4 emissions (0.6 %) are associated with ethylene production, iron and steel production and solvent use.

Figure 2.7.1
Greenhouse gas emissions trend by subsector of Industrial Processes



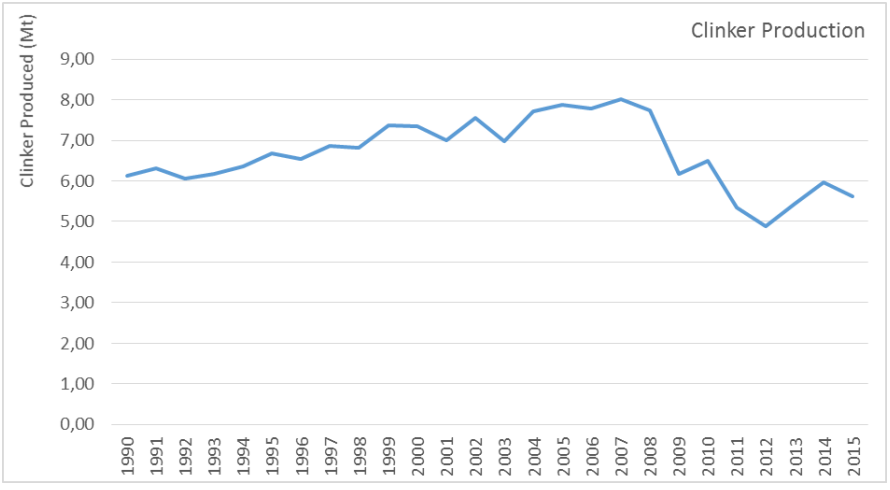
Source: APA, NIR 2017

Mineral Industry

Sector "2.A – Mineral Industry" (mostly clinker production for the manufacture of cement) is the most relevant at national level, accounting for 62.8 % of GHG emissions from industrial processes in 1990 and 50.1 % in 2015.

In 2015 there were 7 cement factories in Portugal. From 2008 to 2012 there was a significant decrease in clinker production due to falling demand in the Portuguese, Spanish and North African markets. Between 2013 and 2014 there was an increase in clinker production, linked to the increase of exports to Africa and South America. The decrease seen in 2015 is due to a downturn in sales in external markets, due to oversupply in the Mediterranean area and a consumption decrease in Africa.

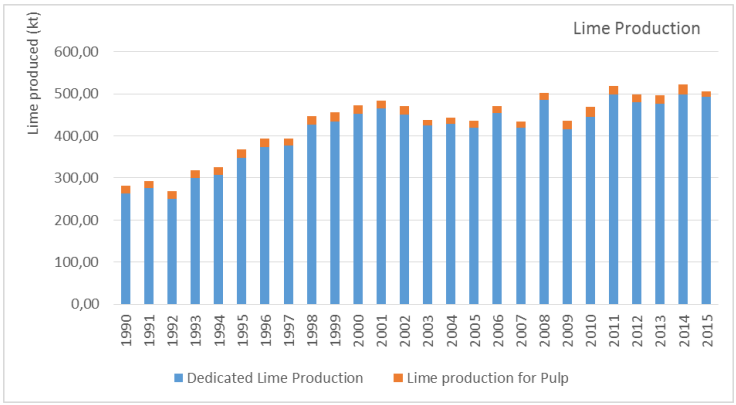
Figure 2.7.2
Clinker production (Mt)



Source: Plant specific data

In 2015, there were 4 lime production units and 4 pulp production units with an associated lime kiln.

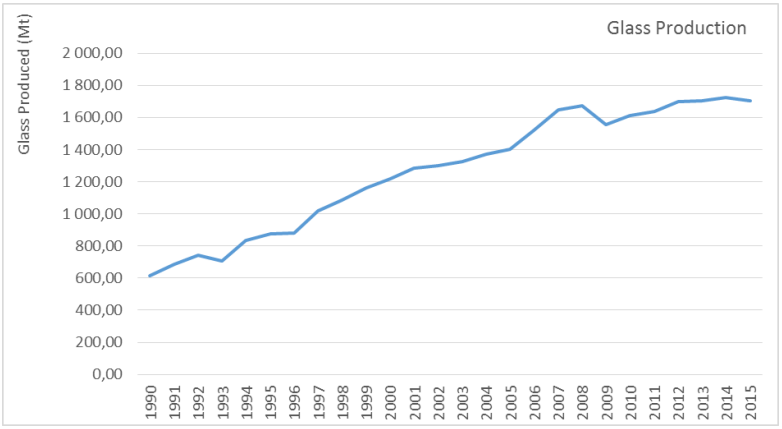
Figure 2.7.3
Lime production (kt)



Source: Plant specific data

As of 2010 there has been no production of flat glass in Portugal. In 2015, 97.7 % of the glass produced in Portugal was container glass, the remaining 2.3 % being hollow glass.

Figure .2.7.4
Glass production (Mt)

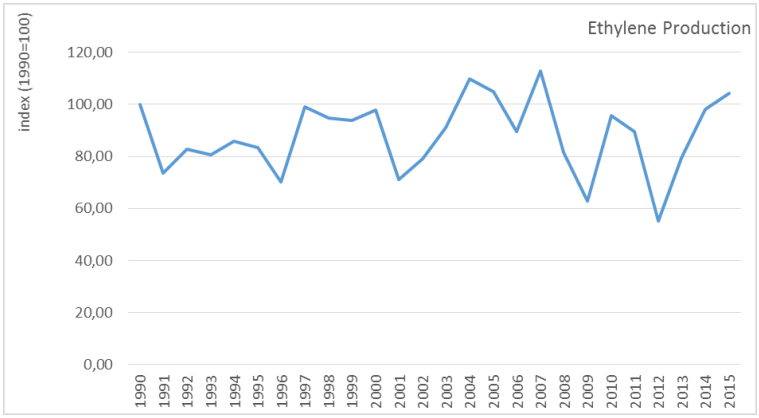


Source: Plant specific data

Chemical industry

The most relevant emissions are associated with the production of ethylene (CO2 and CH4 emissions) and nitric acid (N2O emissions).

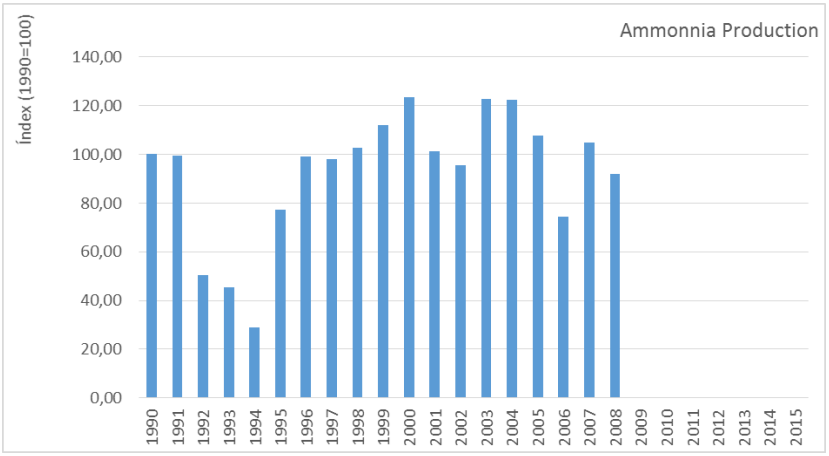
Figure 2.7.5
Ethylene production (index compared to 1990)



Source: Plant specific data

From 2008 to 2009, there was a sharp fall in emissions from the chemical sector due to the shutdown of the only plant producing ammonia in Portugal.

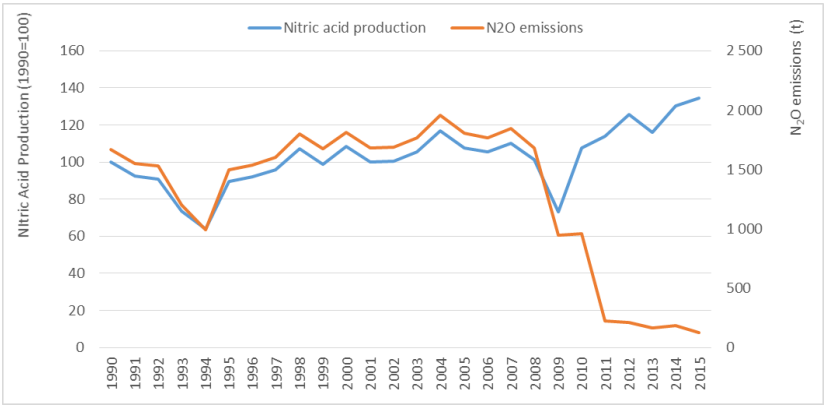
Figure 2.7.6
Ammonia production (index compared to 1990)



Source: National Statistics, INE, 2010

As of 2011, there has been a substantial reduction in N_2O emissions linked to the production of nitric acid, due to the installation of a new catalytic converter in one of the plants, the shutdown of old facilities and the commissioning of new facilities with a lower emission profile.

Figure 2.7.7
Nitric acid production and associated N_2O emissions



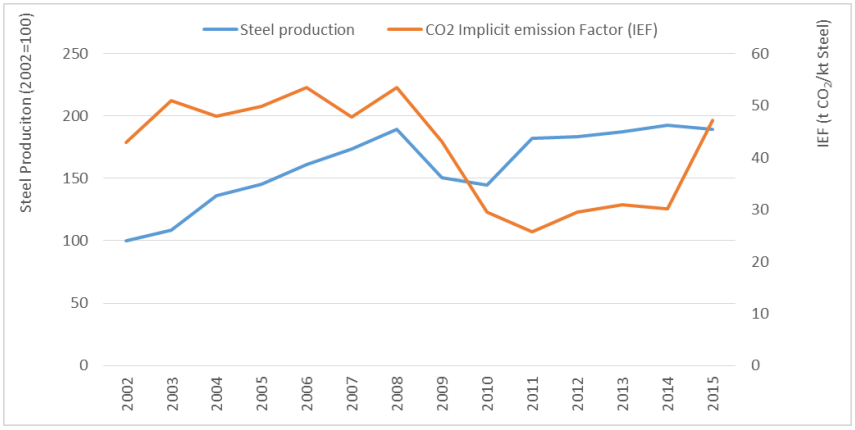
Source: Plant specific data

Metal Industry

From 2002 onwards, Portugal started producing steel only from scrap, which led to a substantial emission reduction between 2001 and 2002.

Between 2014 and 2015 there was a consumption increase of pig iron scrap (EF = 0.15 t CO_2/t pig iron scrap) and a consumption decrease of steel scrap (EF = 0.04 t CO_2/t steel scrap). There was also an increase in coal consumption (EF = 2.92-3.11 t CO_2/t coal). The combination of these 3 factors resulted in a significant increase in CO_2 emissions for 2015.

Figure 2.7.8
Steel production and associated CO_2 emissions



Source: Plant specific data

Non-energy Products and Solvent Use

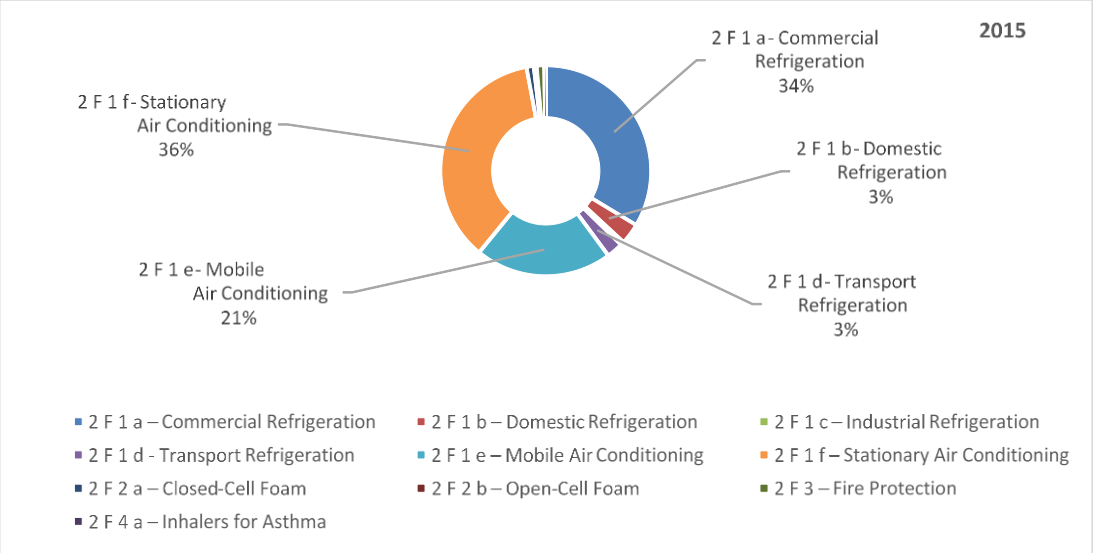
The most relevant sectors in Portugal are: Solvent Uses and Asphalt for Road Paving.

Consumption of Fluorinated Gases

There has been a considerable increase in the representativeness of emissions related to the consumption of fluorinated gases when compared to total emissions from industrial processes between 1995 and 2015 (they represent 35.9 % of CO_2e emissions from this sector). This increase is due to a shift towards the use of fluorinated gases as substitutes for ozone depleting substances in applications for refrigeration, air conditioning, foams, inhalers for asthma and fire protection systems.

The most relevant sectors are: Stationary Air Conditioning (36 %), Commercial Refrigeration (34 %) and Mobile Air Conditioning (21 %).

Figure 2.7.9
Consumption of Fluorinated Gases



Source: APA, different sources.

2.8. Waste

The production of municipal waste increased strongly since 1990, driven by changes in consumption patterns and life style associated with the steady economic growth registered in particular in the years following the Portuguese accession to the EU in 1986.

After the peak around the year 2010, municipal solid waste (MSW) production presents a decreasing tendency, resulting from the policies on preventing, reducing and recycling of waste, but also due to the economic crisis effect on consumption.

In 2015 they were produced around 4.7 million tonnes of municipal waste in Portugal, approximately 1.0% more than in 2014, reversing the downward trend started in 2010. This increase may be related to an improvement of the economic situation of Portugal which registered approximately 1.6% growth in 2015 as compared to 2014.

The Portuguese MSW production per capita in 2015 corresponded to 460 kg/year, while the EU28 average per capita MSW production was about 476 kg/year.

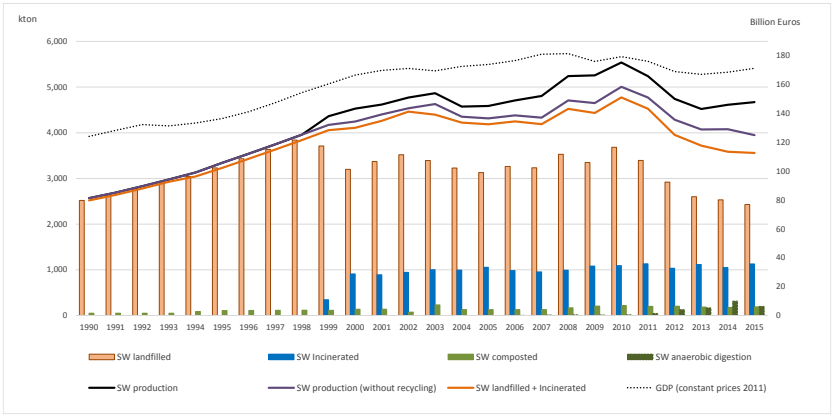


Figure 2.8.1
Municipal waste trends
Source: APA, include estimates

The geographical distribution of the population changed considerably since the early '60s with a significant increase of the population living in urban centres. This trend was accompanied by the development of solid

waste collection systems that covered only 40% of the population in 1960. Although the level of collection had improved satisfactorily and was extended to the whole country in the year 2000, that was not accompanied by the construction of the adequate infrastructures for waste treatment and disposal, with the consequent proliferation of open dumps.

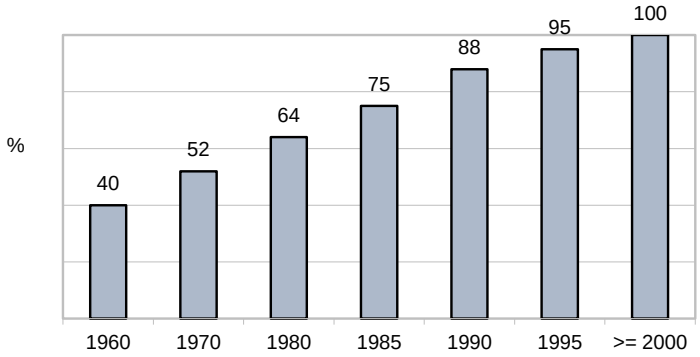
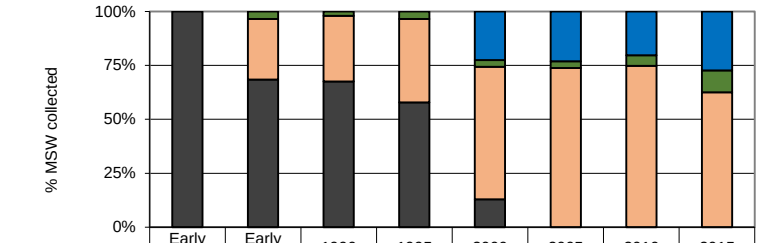


Figure 2.8.2
Population served by waste collection systems.
Source: APA

The Strategic Plan on Municipal Solid Waste (PERSU - "Plano Estratégico dos Resíduos Sólidos Urbanos"), approved in 1997, settled the main axis of action in this domain: the deactivation and closure of all uncontrolled dumping sites which occurred in 2002, the implementation of several treatment infrastructures, and the launch of selective collection in bring points (ecopontos) .

Until the late '90s, landfilling remained almost exclusively the main waste disposal practice. In 1999/2000, with the start of operation of two MSW incineration units in Mainland Portugal, and in 2003 one more in the Autonomous Region of Madeira, waste started to be diverted from SWDS. All MSW incineration occur with energy recovery.



	Early 70s	Early 80s	1990	1995	2000	2005	2010	2015
Incinerated	0	0	0	0	23	23	20	27
Composted/ AD	0	3	2	3	3	3	5	10
Managed landfills	0	28	30	39	62	74	75	63
Open dump sites	100	68	68	58	13	0	0	0

Figure 2.8.3
Evolution of municipal waste treatment.
Source: APA estimates

Although landfilling remains the main final destination for municipal waste, the disposal of waste in landfills have been continuously decreasing since 2010. This trend has been accompanied by the growth of importance of Mechanical and Biological Treatment (MBT) as well as Sorting units as foreseen in the Municipal Solid waste Strategic Plan (PERSU, PERSU II) and the National Plan for Waste Management (PGNR 2014-2020). The number of waste management infrastructures for organic recovery and biological treatment have grown expressively in the last decade, with the aim to increase the direct diversion of biodegradable waste from landfills and increase recycling.

The figure below presents the evolution of recyclable waste recovered in different treatments in recent years. The significant increase registered in 2015 (approx. 30%) can be explained by the start of operation of new MBT and Sorting units.

The recovery of biogas at landfills have been also growing importance along the years.

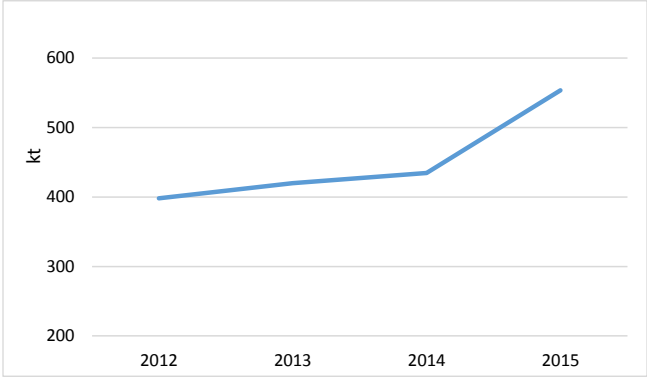


Figure 2.8.4
Evolution of recyclable waste recovered.
Note: Data refer to recyclable waste recovered in incineration, MBT, organic valorisation and sorting units.
Source: APA

Non-municipal waste generated in Portugal amounted to 8.2 million tonnes in 2015, corresponding to a decrease of 1.6 million tonnes (-16.3%) compared to 2014, and maintaining the downward trend registered in the previous year.

The sectors related to Waste Management and the Manufacturing Industry are the major waste producers, accounting for more than 60% of the total sectoral waste in 2015, and having registered an increase of about 10% in relation to 2014. On the other hand, the Construction sector lost importance, with a decrease of around 900,000 tonnes in 2015 of waste generated (1.5 million in 2014 to 620,000 tons in 2015). Within the Manufacturing Industry, the "Pulp, Paper and Cardboard Industries", the "Base Metallurgy" and the "Non-metallic Minerals", which together generated 1.4 million tonnes of waste in 2015, representing 57.1% of the waste generated in all manufacturing industries.

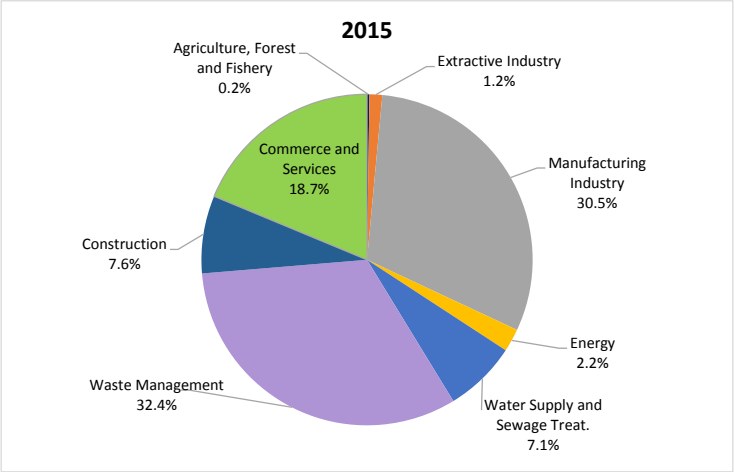


Figure 2.8.5
Sectoral waste generated by major economic sectors.
Source: APA, I. P.;INE, I.P.; SREA; DRA, R. A. dos Açores.

The evolution of management waste operations reflects the growing importance of recovery along the years, which amounts to approx. 85% of the sectoral waste produced in the last 2 years analysed (2014-2015).

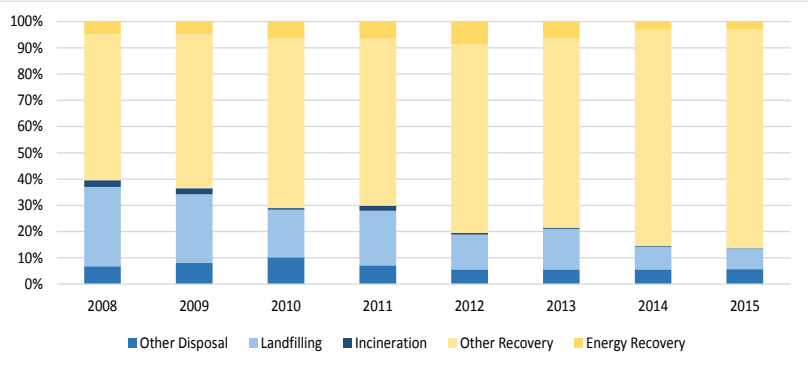


Figure 2.8.6–
Sectoral waste by major management types (2008-2015).
Source: APA, I. P.;INE, I.P.; SREA; DRA, R. A. dos Açores.

As regards municipal wastewater treatment, there was a big evolution since the early '90s where a significant percentage of the population was not served by a sewer system and less than 20% of the population was served by wastewater facilities. The situation has improved since then, with the percentage of the population served by any kind of wastewater treatment being at present approximately 70%.

Table 2.8.1
Percentage of population by wastewater handling system.

Wastewater handling systems	1990	1994	1999	2000	2005	2009-2015
	% population					
Population without sewerage						
% Pop: without sewerage (latrines)	**37.0**	**23.4**	**6.4**	**5.3**	**0.0**	**0.0**
% Pop: individual treatment (private septic tanks)	**1.5**	**8.2**	**14.8**	**16.9**	**27.5**	**21.0**
Population with sewerage						
% de Pop: with discharge into the ocean, without treatment	**6.5**	**6.5**	**6.5**	**5.6**	**1.0**	**1.2**
% de Pop: with discharge into inland waters, without treatment	**36.8**	**40.8**	**30.3**	**25.9**	**4.0**	**1.2**
% de Pop: with discharge into soil, without treatment	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**
% de Pop: unknown disposal	**0.0**	**0.0**	**0.0**	**0.4**	**2.4**	**5.6**
% Pop: with treatment	**18.2**	**21.1**	**42.0**	**45.8**	**65.0**	**71.0**
% Pop: colective septic tanks	2.2	2.3	5.0	5.0	5.0	3.0
% Pop: with preliminary treatment	0.0	0.0	0.0	0.5	3.0	7.6
% Pop: with primary treatment	5.2	5.2	9.0	8.5	6.0	1.9
% Pop: with secondary and tertiary treatment	10.8	13.6	28.0	31.8	51.0	58.5

The total organic load in wastewater, aggregated per industrial group, is presented in the Figure below, showing a continuous growth of discharge until the mid-2000 followed by a stabilization or decrease in some years.

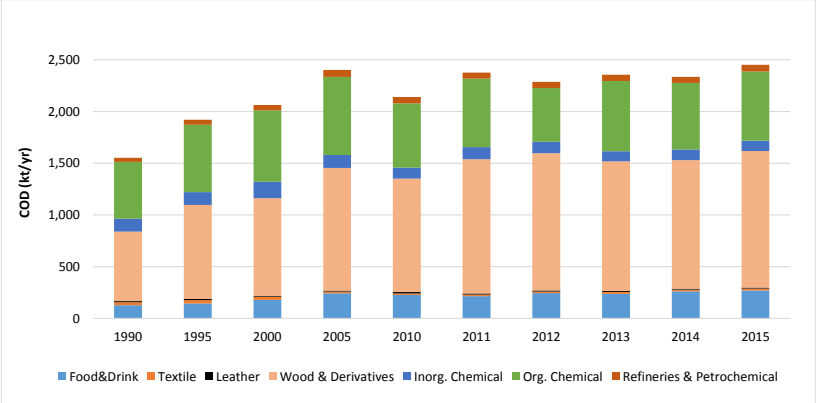


Figure 2.8.7
Industrial Wastewater load from major groups of industrial activity.

Table 2.8.2

Fraction of industrial wastewater by wastewater handling system (% of total industrial load expressed as COD).

Wastewater Handling System		1990	1995	2000	2005	2010	2015
No treatment, discharge in river or soil	%	11.7	14.3	10.0	11.8	10.5	12.2
Primary	%	5.7	5.1	5.3	6.4	1.0	0.8
Secondary treatment	%	19.7	16.4	17.3	18.1	28.9	27.1
Septic Tank	%	4.8	6.4	5.8	0.0	0.0	0.0
Municipal Sewer system, treatment with Municipal Waste Water	%	9.1	12.3	14.2	17.1	18.0	19.5
Unknown	%	49.0	45.4	47.4	46.7	41.6	40.4

2.9. Building Stock and Urban Structure

As a general rule, the Geographic database (GDB) starts in 2001 and ends in 2015, which is justified by the need to provide credible and stable information for the four territorial dimensions under analysis. Exception is made to this rule with the sub-theme relating to energy consumption of the national building stock, which has a timeframe with the following specific characteristics:

a. Overall Total, Total Oil and Total Electricity indicators are supported by a GDB covering a period between 1990 and 2015;

b. Natural Gas, as a source of energy, was only introduced in the national market in 1997, which in itself justifies the absence of geographic data prior to that date;

c. As regards the ARA and the ARM, GDB begins in 2007 and ends in 2015, due to the fact that the energy balances produced before 2007 only showed results for the national total and did not differentiate them geographically.

The analysis carried out to this sub-theme (energy consumption of the national building stock) distinguishes between residential buildings and service buildings.

Comparing the values recorded in 2015 vis-à-vis 2001, there is an increase in the number of Buildings of Traditional Family Housing[16] (housing stock) in the territorial dimensions of Portugal, Mainland, ARA and ARM, which show figures equivalent to 12.5 %, 12.3 %, 14.8 % and 21.2 % respectively (Table 2.9.1).

Table 2.9.1

Buildings of Traditional Family Housing (housing stock) by geographic location (No)				
Years	Portugal	Mainland	ARA	ARM
2001	3 185 972	3 022 087	87 267	76 618
2015	3 585 624	3 392 649	100 142	92 833

Source: National Statistical Institute (INE), 2017

Variation (%)

Years	Portugal	Mainland	ARA	ARM
2001-2015	12.5	12.3	14.8	21.2

As regards the number of Conventional Family Dwellings[17] (housing stock), there is a general rising tendency in the values recorded in 2015 compared to 2001 (Table 2.9.2).

[16] This is understood as any free-standing construction with a roof, limited by external or internal walls from roof to cellar, intended for residential purposes (with one or more dwellings) or other purposes (Source: INE, 2017).

[17] This is understood as any separate and free-standing location, consisting of a room or suite of rooms and its annexes in a permanent building or in a (structurally) separated part of a building, which by the way it has been built, rebuilt, extended or converted is intended for housing purposes, usually for one family/household only. It must have its own entrance giving access (either directly or through a garden or piece of land) to a path or a common passage inside the building (staircase, corridor, lobby, etc.). Separate units which have clearly been built, extended or converted in order to be part of the conventional family dwelling are considered an integral part of it (Source: INE, 2017).

Table 2.9.2

Conventional Family Dwellings (housing stock) by geographic location (No)				
Year	Portugal	Mainland	ARA	ARM
2001	5 357 900	5 151 939	96 992	108 969
2015	5 925 437	5 683 328	111 345	130 764

Source: National Statistical Institute (INE), 2017

Variation (%)

Years	Portugal	Mainland	ARA	ARM
2001-2015	10.6	10.3	14.8	20.0

When analysing the development of the number of *Completed Buildings*[18] (Tables 2.9.3) in the four territorial dimensions, an indicator which is structured according to Type (Total construction works and New constructions) and Purpose of the works (Total; Family housing; Other), it is clear that there is a general decrease[19] in 2015 compared to the values recorded in 2001.

Therefore, for the indicator *Completed Buildings*, a comparison between 2015 and 2001 shows a significant decrease, i.e. a difference of over 50 %, in all types and purposes of works carried out in Portugal, Mainland, ARA and ARM.

[18] This is understood as any building presenting physical conditions to be inhabited or used, whether a permit or authorisation of use has been granted or not (Source: INE, 2017).

[19] A decrease is understood as any difference under 50 %.

Table 2.9.3
Completed buildings by type and purpose of the works (No)

Portugal						
Years	Total construction works			New constructions		
	Total	Family housing	Other	Total	Family housing	Other
2001	62 131	51 398	10 733	50 728	43 314	7 414
2015	11 009	6 548	4 461	7 313	4 467	2 846

Source: National Statistical Institute (INE), 2017

Variation (%)						
Years	Total	Family housing	Other	Total	Family housing	Other
2001-2015	-82.3	-87.3	-58.4	-85.6	-89.7	-61.6

Mainland						
Years	Total construction works			New constructions		
	Total	Family housing	Other	Total	Family housing	Other
2001	58 700	48 684	10 016	48 211	41 260	6 951
2015	10 360	6 172	4 188	6 898	4 227	2 671

Source: National Statistical Institute (INE), 2017

Variation (%)						
Years	Total	Family housing	Other	Total	Family housing	Other
2001-2015	-82.4	-87.3	-58.2	-85.7	-89.8	-61.6

Autonomous Region of the Azores						
Years	Total construction works			New constructions		
	Total	Family housing	Other	Total	Family housing	Other
2001	1 714	1 228	486	1 186	847	339
2015	482	246	236	315	161	154

Source: National Statistical Institute (INE), 2017

Variation (%)						
Years	Total	Family housing	Other	Total	Family housing	Other
2001-2015	-71.9	-80.0	-51.4	-73.4	-81.0	-54.6

Autonomous Region of Madeira						
Years	Total construction works			New constructions		
	Total	Family housing	Other	Total	Family housing	Other
2001	1 717	1 486	231	1 331	1 207	124
2015	167	130	37	100	79	21

Source: National Statistical Institute (INE), 2017

Variation (%)						
Years	Total	Family housing	Other	Total	Family housing	Other
2001-2015	-90.3	-91.3	-84.0	-92.5	-93.5	-83.1

However, since the absolute priority is to respect the requirements in terms of geographical disaggregation referred to in the previous section[20], it became necessary to resort to a second timeframe, between 2005 and 2015, in order to analyse the following indicators:

- Completed Buildings (houses[21]) in New Constructions[22] for Family Housing by geographic location (No);
- Floors[23] per Completed Building in New Constructions for Family Housing by geographic location (No);

[20] One of the priorities of the chapter on National Circumstances is to describe the national situation according to the following two criteria: describing the main national territorial dimensions (Portugal, Mainland, Autonomous Region of Madeira and Autonomous Region of the Azores) and using, where possible, a timeframe that coincides with the last Greenhouse Gas Emissions Inventory submitted to the UNFCCC (1990-2015). Therefore, these indicators are only available from 2005 onwards and the timeframe used goes until 2015.

[21] This is understood as a building for family housing, where most of its useful floor area is occupied with one or two dwellings, each of them with a main entrance, usually connected to a street or a piece of land surrounding the building (Source: INE, 2017).

[22] This is an entirely new building, even if is built on a ground where another construction had already been erected (Source: INE, 2017).

[23] This is understood as each floor of a building which is habitable or usable, regardless of its relation to the ground level. Floors also include underground and semi-underground constructions, as well as attics, if habitable or usable (Source: INE, 2017).

- Completed Reconstructions[24] per 100 New Completed Constructions by geographic location (No).

The next indicator under analysis is *Completed Buildings (houses) in New Constructions for Family Housing* (Table 2.9.4), where a significant decrease in the number of new constructions in all territorial dimensions (Portugal, Mainland, ARA and ARM) can be seen.

Table 2.9.4

Completed Buildings (houses) in New Constructions for Family Housing by geographic location (No)				
Years	Portugal	Mainland	ARA	ARM
2005	30 050	28 007	1 037	1 006
2015	4 133	3 903	154	76
Source: National Statistical Institute (INE), 2017				
Variation *(%)*				
Years	Portugal	Mainland	ARA	ARM
2005-2015	-86.2	-86.1	-85.1	-92.4

As regards the number of *Floors per Completed Building in New Constructions for Family Housing* (Table 2.9.5), it should be pointed out that there is a general decrease in the four territorial dimensions under analysis (Portugal, Mainland, ARA and ARM) in 2015 compared to 2005.

Table 2.9.5

Floors per Completed Building in New Constructions for Family Housing by geographic location (No)				
Years	Portugal	Mainland	ARA	ARM
2005	2.4	2.4	1.9	2.3
2015	2.0	2.1	1.7	2.2
Source: National Statistical Institute (INE), 2017				
Variation *(%)*				
Years	Portugal	Mainland	ARA	ARM
2005-2015	-16.7	-12.5	-10.5	-4.3

The number of *Completed Reconstructions per 100 New Completed Constructions* (Table 2.9.6), when comparing 2015 with 2005, suggests a significant increase in the territorial dimensions of Portugal, Mainland and ARM, which reaches 64.3 %, 65.1 % and 150.0 % respectively. In contrast, the ARA shows a decrease equivalent to 9.5 %.

Table 2.9.6

Years	Completed Reconstructions per 100 New Completed Constructions by geographic location (No)			
	Portugal	Mainland	ARA	ARM
2005	4.2	4.3	4.2	0.4
2015	6.9	7.1	3.8	1.0

Source: National Statistical Institute (INE), 2017

Variation *(%)*				
Years	Portugal	Mainland	ARA	ARM
2005-2015	64.3	65.1	-9.5	150.0

[24] This is understood as construction works following the total or partial demolition of an existing building, which result in the maintenance or renovation of the façade structure, the building's structural height and the number of floors (Source: INE, 2017).

With regard to *Energy Consumption of Residential Buildings* (Table 2.9.7), the reading of the Overall Total indicator suggests an increase equivalent to 4.1 %, 0.7 % and 6.3 % in Portugal, Mainland and ARA, respectively, of the values recorded in 2015 when compared to 1990. In the case of the ARM, there is a decrease equivalent of 6.0 %.

For *Total Oil*, the reading of this indicator suggests a decrease equivalent to 25.8 %, 31.3 % and 34.2 % in Portugal, Mainland and ARM, respectively, of the values recorded in 2015 compared to 1990. Despite being a residual increase, the ARA shows an upward curve of 0.9 %.

The consumption of *Natural Gas* recorded for 2015 shows a significant increase equivalent to 31,105.3 % compared to 1997 values in the territorial dimensions of Portugal and Mainland. It should be noted that this energy source was only introduced in the national market in 1997. There is no record for the consumption of this fossil energy source in the Autonomous Regions.

Equally significant is the increase equivalent to 101.1 % and 92.9 % in Portugal and Mainland, respectively, for the *Total Electricity* indicator in 2015 compared to 1990. Both the ARA and the ARM experience an opposite trend, with a decrease equivalent to 1.8 % and 4.3 % respectively.

It is also worth highlighting that there are no records for coal consumption in any of the territorial dimensions under analysis.

Table 2.9.7
Energy consumption of residential buildings

Portugal					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
	Toe				
1990	2 427 812.15	584 726.48	NA	511 980.04	0.00
1997	-	-	845.72	-	-
2015	2 528 207.00	433 970.00	263 908.00	1 029 809.00	0.00
Variation *(%)*					
Years	Overall Total	Total Oil	Natural Gas25	Total Electricity	Total Coal
1990-2015	4,1	-25.8	NE	101.	0.0
1997-2015	NE	NE	31 105.3	NE	NE
Mainland					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
	Toe				
1990	2 427 812.15	584 726.48	NA	511 980.04	0.00
1997	-	-	845.72	-	-
2015	2 445 775.00	401 852.00	263 908.00	987 608.00	0.00
Variation *(%)*					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
1990-2015	0,7	-31,3	NE	92,9	0.0
1997-2015	NE	NE	31 105,3	NE	NE
Autonomous Region of the Azores					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
	Toe				
1997	39 991,00	18 493,00	0.00	21 498,00	0.00
2015	42 494,00	18 667,00	Variation 0.00	21 111,00	0.00
Variation *(%)*					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
2007-2015	6,3	0,9	0.0	-1,8	0.0
Autonomous Region of Madeira					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
	Toe				
2007	42 480,00	20 441,00	0.00	22 039,00	0.00
2015	39 938,00	13 451,00	0.00	21 090,00	0.00
Variation *(%)*					
Years	Overall Total	Total Oil	Natural Gas[25]	Total Electricity	Total Coal
2007-2015	-6.0	-34.2	0.0	-4,3	0.0

Source: Portuguese Environment Agency (APA), 2017

With regard to *Energy Consumption of Service Buildings* (Table 2.9.8), the reading of the *Overall Total* indicator suggests a significant increase equivalent to 150.0 % and 138.6 % in Portugal and Mainland, respectively, of the values recorded in 2015 when compared to 1990. Both the ARA and the ARM experience an opposite trend, with a decrease equivalent to 53.6 % and 18.2 %, respectively, of the values recorded in 2015 when compared to 1990.

For *Total Oil*, there is a decrease equivalent to 35.6 %, 15.1 %, 86.6 % and 49.6 % in Portugal, Mainland, ARA and ARM, respectively, of the values recorded in 2015 compared to 1990.

The consumption of *Natural Gas* in 2015, compared to 1997 values, shows a significant increase of 59,334.7 % in the territorial dimensions of Portugal and Mainland. It should be noted that this energy source

[25] The statistical data on this fossil energy source are only available from 1997 onwards, when it was introduced in the national market.

was only introduced in the national market in 1997. There is no record for the consumption of this fossil energy source in the Autonomous Regions.

Equally significant is the increase equivalent to 193.9 % and 179.5 % in Portugal and Mainland, respectively, for the *Total Electricity* indicator in 2015 compared to 1990. Both the ARA and the ARM experience an opposite trend, with a decrease equivalent to 2.5 % and 5.7 % respectively.

It is also worth highlighting that there are no records for coal consumption in any of the territorial dimensions under analysis.

Table 2.9.8
Energy consumption of service buildings

Portugal					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
	Toe				
1990	789 515,3	278 351,4	0,0	499 108,7	0,0
1997	1 386 143,0	578 554,9	377,1	788 620,0	0,0
2015	1 973 453,0	179 248,0	224 099,0	1 467 038,0	0,0
Variation (%)					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
1990-2015	150,0	-35,6	-	193,9	0,0
1997-2015	-	-	59 334,7	-	-
Mainland (Total)					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
	Toe				
1990	789 515,3	211 206,4	0,0	499 108,7	0,0
1997	1 386 143,0	578 554,9	377,1	788 620,0	0,0
2015	1 884 058,0	179 384,2	224 099,0	1 395 124,0	0,0
Variation (%)					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
1990-2015	138,6	-15,1	-	179,5	0,0
1997-2015	-	-	59 334,7	-	-
Autonomous Region of the Azores					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
	Toe				
2007	76 516,0	46 478,0	0,0	30 038,0	0,0
2015	35 514,0	6 226,0	0,0	29 288,0	0,0
Variation (%)					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
2007-2015	-53,6	-86,6	-	-2,5	0,0
Autonomous Region of Madeira					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
	Toe				
2007	65 891,0	20 667,0	0,0	45 224,0	0,0
2015	53 881,0	10 419,0	0,0	42 626,0	0,0
Variation (%)					
Years	Overall Total	Total Oil	Natural Gas	Total Electricity	Total Coal
2007-2015	-18,2	-49,6	-	-5,7	0,0

2.10. Agriculture

Agricultural holdings in Portugal cover a total area of 3 818 058 hectares[26] and currently[27] account for approximately 41 % of the national surface area. The utilised agricultural area (UAA), with 3 641 592 hectares, represents the largest share, amounting to some 95 % of the total farm area.

In comparison with the base year of 1990, there is a decrease of around 12 % in the total farm area, with the largest reduction (51 %) being in unutilised agricultural areas (NUAA), followed by other areas (13 %). The UAA shows the least significant decrease, of around 9 %.

Table 2.10.1
Agricultural area in Portugal[28], comparison 1990-2015

Year	Agricultural area (ha)			
	UAA	NUAA	Other areas	**Total**
1990	4 005 573	245 110	87 219	4 337 901
2015	3 641 592	100 959	75 507	3 818 058

Source: National Statistical Institute (INE), 2017

In 2015 the largest share of UAA was occupied by permanent grassland (49.9 %), followed by arable land (30.2 %) and permanent crops (19.5 %).

Compared to 1990, the increase in permanent grassland area in 2015 stands out immediately, both in absolute terms (over 987 587 hectares) and in terms of its weight in total UAA, from 20.9 % in 1990 to 49.9 % in 2015. This increase in permanent grassland area goes hand in hand with the increase of livestock units under extensive production systems, as indicated ahead. Much of the decrease in arable land is justified by the transition to permanent grassland.

Table 2.10.2
UAA composition (ha) in Portugal, comparison 1990-2015

Year	Arable land	Kitchen gardens	Permanent crops	Permanent grassland
1990	2 345 656	32 488	789 415	838 015
2015	1 100 865	15 381	708 765	1 816 585

Source: National Statistical Institute (INE), 2017

As for the main temporary crops, which are produced in arable land, the following crop groups are highlighted due to their relevance to this sector:

- Autumn/winter cereals – wheat, triticale, rye, barley and oats;
- Spring/summer cereals – maize and rice;
- Tomatoes for industry;
- Potatoes;
- Vegetables;
- Grain legumes;
- Annual forage crops.

The table below shows the area under cultivation and the production obtained for each crop or group of crops[29] for the years 1990 and 2015.

[26] It does not include wooded areas integrated in agricultural holdings.
[27] Data from the Farm Structure Survey (FSS) 2013.
[28] 1990 – General Agricultural Census 1989; 2015 – Farm Structure Survey (FSS) 2013.
[29] Annual statistics of crop production, covering temporary and permanent crops.

Table 2.10.3
Main temporary crops in Portugal, comparison 1990-2015 of cultivated area and crop production

Crops	1990		2015	
	Cultivated area (ha)	Production (t)	Cultivated area (ha)	Production (t)
Wheat	207 553	296 623	39 736	80 396
Triticale	48 673	60 549	22 734	38 481
Rye	95 069	96 502	18 099	15 494
Barley	66 716	78 532	21 170	44 402
Oats	87 657	72 104	40 415	48 971
Maize	217 856	665 560	97 911	827 544
Rice	33 824	156 072	29 142	184 918
Tomatoes for industry	16 943	825 862	19 360	1 832 467
Potatoes	120 342	1 343 005	24 622	486 790
Vegetables	50 741*	1 272 153*	34 297	913 995
Grain legumes	65 616	34 570	4 823	3 203
Forage crops	433 000	10 705 000	330 155	7 735 571

* Data relating to vegetables were made available by the Portuguese National Statistical Institute (INE) for the first time in 1997. For the purpose of reconstructing a data series, the same data were adopted for the period 1990-1996.

It can be seen that the area under cultivation for virtually all main temporary crops decreased significantly in 2015, in most cases reaching a reduction of more than 50 %, and even 93 % in the case of grain legumes. The overall production figures are also lower, but a comparative analysis of productivity gained will show that it increased in comparison with 1990, as can be seen in the table below. Productivity increased significantly for all cereals except for rye, with an emphasis on maize which increased 177 %. Tomatoes for industry have also had an increase in productivity of around 94 %, followed by potatoes, where the increase was 77 %.

Table 2.10.4
Productivity of main temporary crops in Portugal, comparison 1990-2015

Crops	Productivity (kg/ha)	
	1990	2015
Wheat	1 429	2 023
Triticale	1 244	1 693
Rye	1 015	856
Barley	1 177	2 097
Oats	823	1 212
Maize	3 055	8 452
Rice	4 614	6 345
Tomatoes	48 744	94 652
Potatoes	11 160	19 771
Vegetables	25 072	26 649
Grain legumes	527	664
Forage crops	24 723	23 430

Source: National Statistical Institute (INE), 2017

As for permanent crops, the main emphasis is set on the following:

- Vineyards
- Olive groves

- Nuts
- Fresh fruit

The development of utilised areas and crop production between 1990 and 2015 is reflected in the table below.

Table 2.10.5
Main permanent crops in Portugal, comparison 1990-2015 of cultivated area and crop production

Crops	1990		2015	
	Cultivated area (ha)	Production (t)	Cultivated area (ha)	Production (t)
Vineyards	263 943	1 059 509	178 957	934 633
Olive groves	340 515	330 795	351 340	722 893
Nuts	60 566	80 244	69 407	42 140
Fresh fruit	.103 356	710 392	67 979	929 255

Source: National Statistical Institute (INE), 2017

For permanent crops, there has not been an overall reduction in as much as for temporary crops, with some of them even increasing in cultivated area, as is the case for olive groves by 3 % and nuts by 15 %. The area under cultivation for vineyards and fresh fruit orchards fell by around 32 % to 34 %, while productivity increased by 30 % for vineyards and almost 100 % for fresh fruit orchards. The increase in productivity for olive groves is 112 %, as can be seen in the table below.

Table 2.10.6
Productivity of main permanent crops, comparison 1990-2015

Crops	Productivity (kg/ha)	
	1990	2015
Vineyards	4 014	5 223
Olive groves	971	2 058
Nuts	1 325	607
Fresh fruit	6 873	13 670

Source: National Statistical Institute (INE), 2017

Since Portugal is situated in a region with Mediterranean climate, having two well distinctive periods throughout the year in terms of precipitation and temperatures registered – one humid period with low temperatures (autumn/winter) and one dry period with high temperatures (spring/summer) – it is important to include the share of existing irrigated areas when characterising national agricultural activity. In fact, spring/summer cereals, such as maize and rice, a large proportion of potatoes and vegetables, as well as tomatoes for industry are produced using irrigation to overcome the shortage of water during the period in which the conditions of light and temperature best suit their vegetative development (spring/summer). The irrigable area, i.e. the area with irrigation infrastructure and/or equipment, currently[30] stands at 551 427 ha (15 % of the UAA). However, the area which was actually irrigated was smaller, corresponding to around 87 % of the irrigable area. In 1990 the irrigable area covered 877 695 hectares, while 72 % was actually irrigated.

Crop production activity is linked to the use of fertilisers, particularly nitrogenous fertilisers. The consumption of nitrogenous fertilisers in agriculture, which is annually determined by the National Statistical Institute (INE), was 113 901 tonnes of N[31] for the year 2015. Data for fertiliser consumption only started being produced by the INE in 1995, when it registered 145 815 t N. There is therefore a decrease of around 22 % in the consumption of nitrogenous fertilisers.

[30] FSS 2013.

[31] Agricultural statistics 2015.

Concerning livestock numbers, the situation in 1990 and in 2015 is reflected in the table below.

Table 2.10.7
Livestock numbers in Portugal in 1990 and 2015

Species	No. of animals (1000 units)	
	1990	2015
Dairy cattle	402	243
Other bovines	990	1 363
Sheep	3 347	2 043
Goats	857	373
Pigs	2 618	2 247
Equidae	156	46
Poultry	31 153	28 615
Rabbits[1]	480	169

[1] Rabbit breeding does
Source: National Statistical Institute (INE), 2017

Most beef cattle, sheep and goats are produced extensively, i.e. through grazing. In contrast, pigs and poultry are mostly raised under intensive production systems.

With the exception of cattle for fattening, all other animal species and dairy cattle decreased between 1990 and 2015. Equidae, goats and rabbits show the most dramatic decline of 60 % to 70 %, followed by sheep and dairy cattle with a reduction of around 39 %. Pigs and poultry have experienced a smaller decrease, by 14 % and 8 % respectively. As mentioned above, only cattle for fattening shows an increase in the number of animals by 38 %, in line with the increase in permanent grassland area (extensive production system).

In economic terms, this sector experienced significant variations in the period under consideration, as shown in Figure 2.10.1. Variations arise due to a number of factors, especially deriving from adjustments to public support policies, such as the Common Agricultural Policy, alongside market factors and produce availability, which is highly influenced by the weather conditions for each year (e.g.: territorial extension of main droughts, illustrated in Figure 2.10.2).

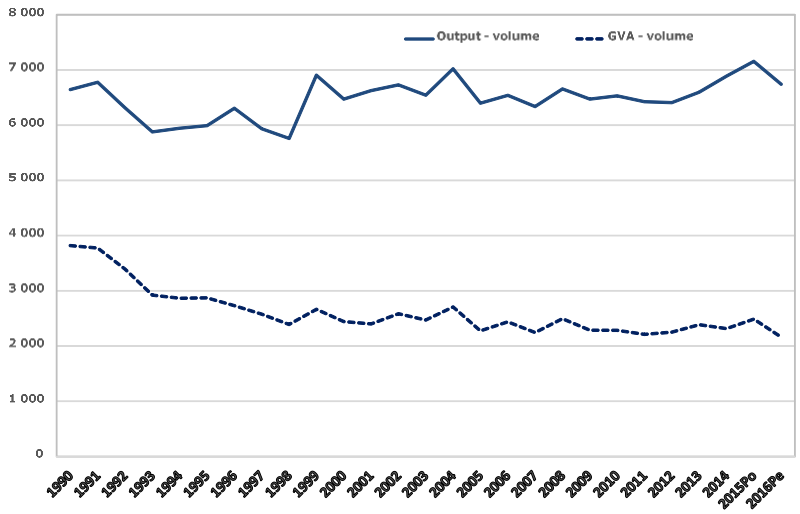


Figure 2.10.1
Agricultural output and GVA at constant prices of 2011, 1990-2016 (EUR million)
Source: INE, Economic Accounts for Agriculture

Po – provisional Pe – estimate

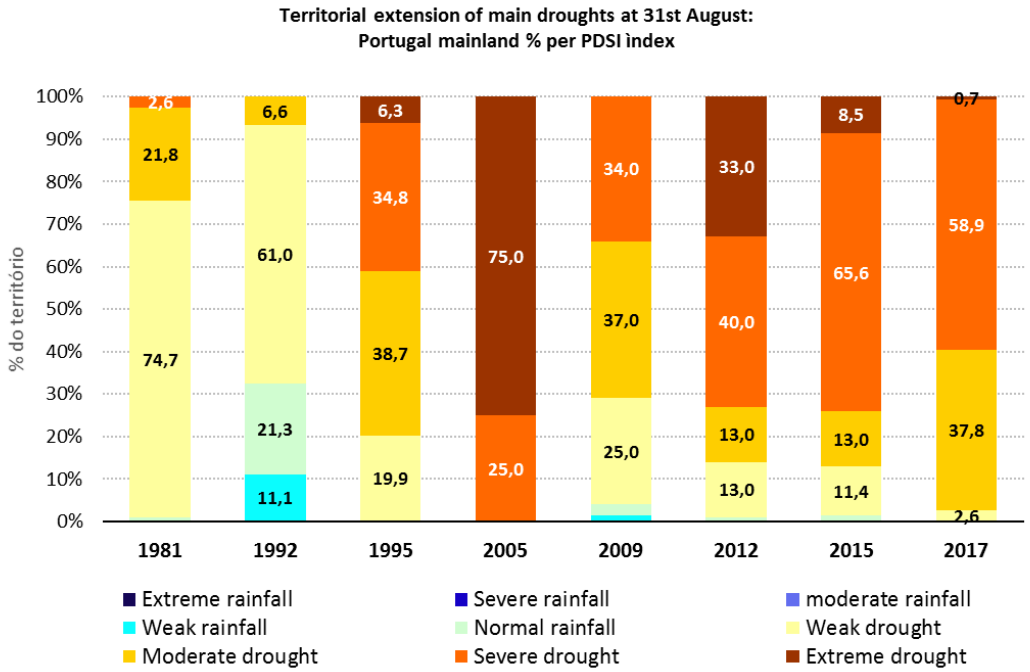


Figure 2.10.2
Percentage of mainland Portugal according to PIDS
Source, GPP, based on IPMA, 2017

Relevance of national agricultural activity for each NUTS I

The mainland accounts for approximately 97 % of the national utilised agricultural area (UAA), the ARA for around 3 % and the ARM for around 0.1 %.

Table 2.10.8
UAA composition (ha) per NUTS I, comparison 1990-2015

UAA (ha)	Mainland		ARA		ARM	
	1990	2015	1990	2015	1990	2015
Arable land	2 330 327	1 081 311	12 607	17 345	2 722	2 205
Kitchen gardens	31 765	14 473	562	762	162	146
Permanent crops	780 966	704 302	4 769	2 073	3 679	2 389
Permanent grassland	736 521	1 717 653	101 044	98 410	449	522
TOTAL	3 879 579	3 517 740	118 983	118 859	7012	5 262

Source: National Statistical Institute (INE), 2017

Permanent grassland in the ARA covers the majority of the UAA in the region (85 % in 1990, 83 % in 2015), which is mainly associated with the production of bovine animals. The main crops are forage grain maize and potatoes.

UAA in the ARM is divided mainly between temporary crops (39 % in 1990 and 41 % in 2015) and permanent crops (53 % in 1990 and 46 % in 2015). The potato and banana production takes up the largest area.

The characterisation of the mainland is practically the same as the national characterisation addressed in the previous section, given the fact that around 97 % of the UAA is located in this territorial unit.

In terms of livestock numbers, the ARA has some weight in the national dairy cattle (19 % in 1990 and 37 % in 2015), followed by cattle for fattening (10 % in 1990 and 14 % in 2015). For all other species, it represents between 1 % and 2 % both in 1990 and in 2015.

Livestock numbers in the ARM, when compared to the national total, have a very low or even non-existent weight for statistical purposes.

Table 2.10.9
Livestock numbers (1000 units) per NUTS I, comparison 1990-2015

Species	Mainland		ARA		ARM	
	1990	2015	1990	2015	1990	2015
Dairy cattle	319	152	78	91	5	-
Other bovines	878	1 173	105	186	7	4
Sheep	3 333	2 035	3	3	11	4
Goats	834	359	11	7	12	7
Pigs	2 546	2 212	44	30	28	5
Equidae	148	43	8	3	-	-
Poultry	30 141	27 763	607	476	404	376
Rabbits[1]	474	165	3	2	3	2

[1] Rabbit breeding does

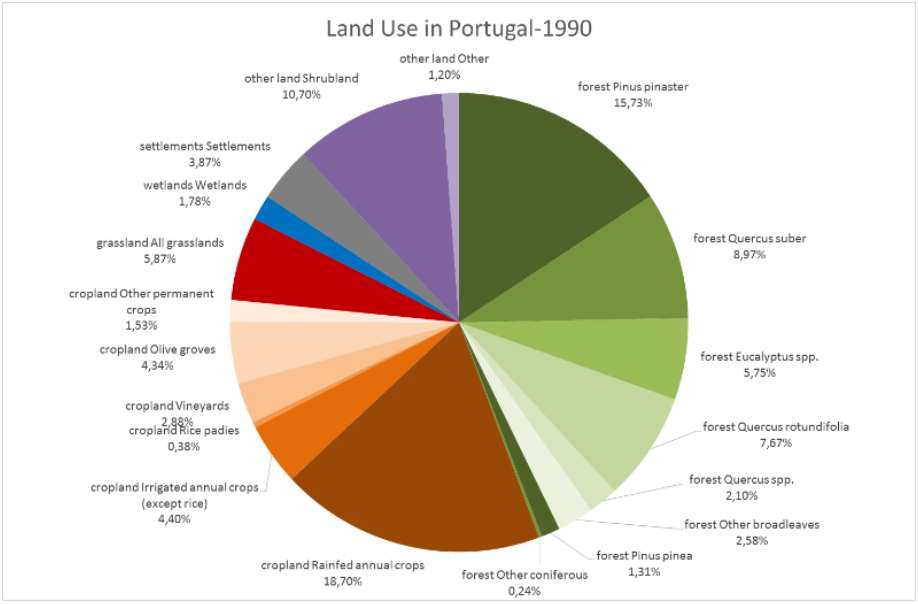
Source: National Statistical Institute (INE), 2017

2.11. Land Use, Land Use Change and Forest

As mentioned in the National Inventory Report, the current main land-uses in Portugal (2015) are Forest Lands (47%) and Croplands (26%). Grasslands (7%), Settlements (5%) and Wetlands (2%) occupy relatively small portions of the territory and Shrublands and other Lands makeup the rest of the territory (12%).

As in most countries, land-use in Portugal is dynamic, but changes are relatively small on a year-to-year basis. The main accumulated changes over the period 1990-2015 are an increase in forest area, grasslands, settlements and shrublands and a decrease in cropland[32].

[32] Portugal's National Inventory Report 2017.



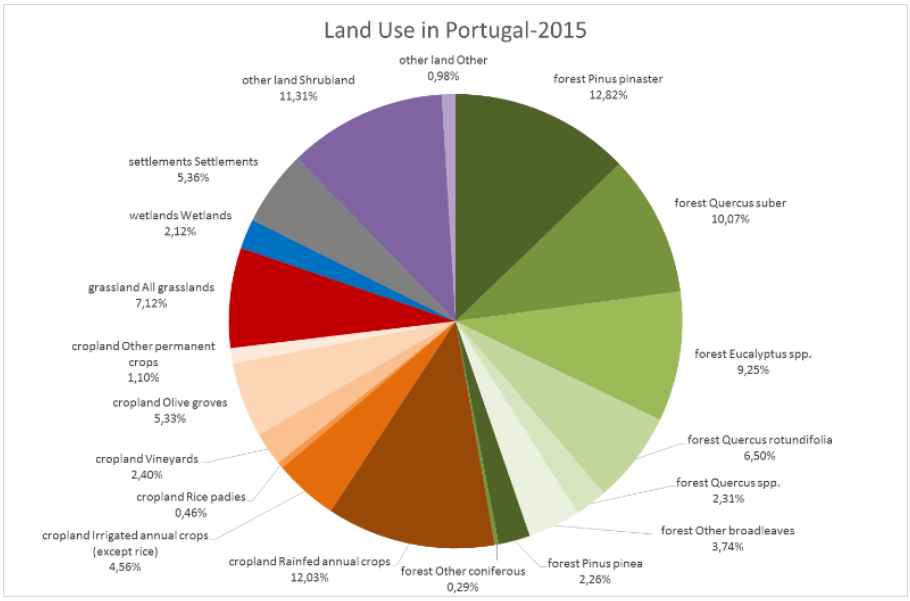


Figure 2.11.1
Land-Use in 1990 and 2015 in Portugal
Source: DGT, 2015

The increases in forest land are due to afforestation policies natural evolution/succession of shrubland, and to private investments in forestry, the later mainly in eucalyptus plantations. Forest composition has also been evolving, the main changes being an increase in the areas in most forest types, especially Eucalyptus and Cork-oak (Quercus suber), and a reduction in the areas of Maritime pine (Pinus pinaster) and Holm oak (Quercus rotundifolia).

The increase in Eucalyptus is driven mostly by small private owners, who look for the short rotation period and the existence of a solid wood market for this species as a good investment. Cork-oak increases are mostly driven by public support schemes for private owners, including afforestation of former agricultural lands. The decreases in Maritime Pine are mostly driven by forest fires and pinewood nematode.

The main forest industries contribute significantly to the Portuguese economy. They represent 14,9% of the Gross Added Value (GAV) of Transforming Industries in 2014 with the total forest GAV being distributed amongst the main forest based chains as follows:

Table 2.11.1

	(% of forest sector GVA in 2014)
Forestry, logging and related activities	27
Industries of wood and cork	29
Wooden furniture	20
Industries of pulp, paper and paperboard	24

Forest Industries in Portugal are strongly linked to the main 3 forest species and are dominantly supplied by domestic raw material (namely wood and cork):

- Eucalyptus is mostly used for pulp and paper (with minor utilizations in other industries like wood panels) and comprises pulp production (3rd largest producer in Europe), printing and writing paper (2nd largest producer in Europe), tissue papers, and packaging papers and boards.
- Cork-oak (*Quercus suber*) is mainly used for extracting cork for supply the national cork industries. Cork Industries comprise cork preparation, cork stoppers and other cork products (which include a wide variety of products from construction insulation materials, to flooring, or even cork based textiles). However, almost half of the value added is in the cork stoppers sub-group.
- Maritime pine (*Pinus pinaster*) is mostly used in the wood and furniture industries (with minor utilizations in other industries like pulp). Wood industries comprise sawmills, wood panels, carpentry and construction, wood packaging, parquet and other wood industries. Furniture has about half of the value added of the sub-sector.

The decrease in cropland reflects the loss of economic competitiveness of rainfed crops which are responsible for most of the area loss and changes in the European Union's Common Agriculture Policy. Rainfed crops are being replaced by grasslands, forests, irrigated crops, permanent crops, or, in more marginal soils, be abandoned and naturally evolve into shrublands.

The area of permanent crops has been relatively stable, although some loss of area can be identified, mostly of traditionally managed permanent crops, which is compensated by increases in more intensive systems. This is particularly visible in the case of Olive Groves, which have met a considerable increase over the last years.

The increase in grasslands follows a trend towards extensification of part of the animal/meat production, which is becoming more supported in rainfed and irrigated pastures and less on very intensive systems. The animals being produced in this way are mostly cows (for meat production) but also to sheep, goat and black Iberian pig (a traditional breed that is raised in pastures and open forests).

The increase in wetlands is mostly due to the expansion of water reservoirs, which support multiple functions such as water supply to both human populations and industry, renewable energy production and irrigation for agriculture. Several water dams have been built since 1990, the most notable of which is the dam of Alqueva, concluded in 2002 and situated in the South of Mainland Portugal (250km^2 of flooded area).

The increase in the area of Settlements reflects fundamentally urban expansion, but also includes expansion in other infrastructure, mostly roads and highways, whose network has expanded and increased considerably since 1990.

Finally, the area of shrublands has increased mostly through degradation of former agricultural land (mostly marginal soils) and some loss of forest land, mostly following forest fires and where natural or artificial regeneration did not occur. Abandonment of both croplands and forest lands is relatively common in mountainous areas of the country with more shallow soils, prone to droughts and fires and with an aging population.

In the period 1971-2000, the Mean Annual Temperature in Portugal was 15.2oC, and the Mean Annual Precipitation 882mm[33]. The most representative climate type in Portugal is the Mediterranean Climate. This means that rain mostly occurs during winter (353mm) and spring (211mm), accompanied by relatively mild temperatures (average minimum winter temperature 5.3oC), while the summers are usually very hot (average maximum temperature 27.6oC) and dry (60mm). The Mediterranean climate is also marked by a strong inter-annual variability, particularly in precipitation, which means that drought, and occasionally flooding, are relatively common phenomenon observed in the region.

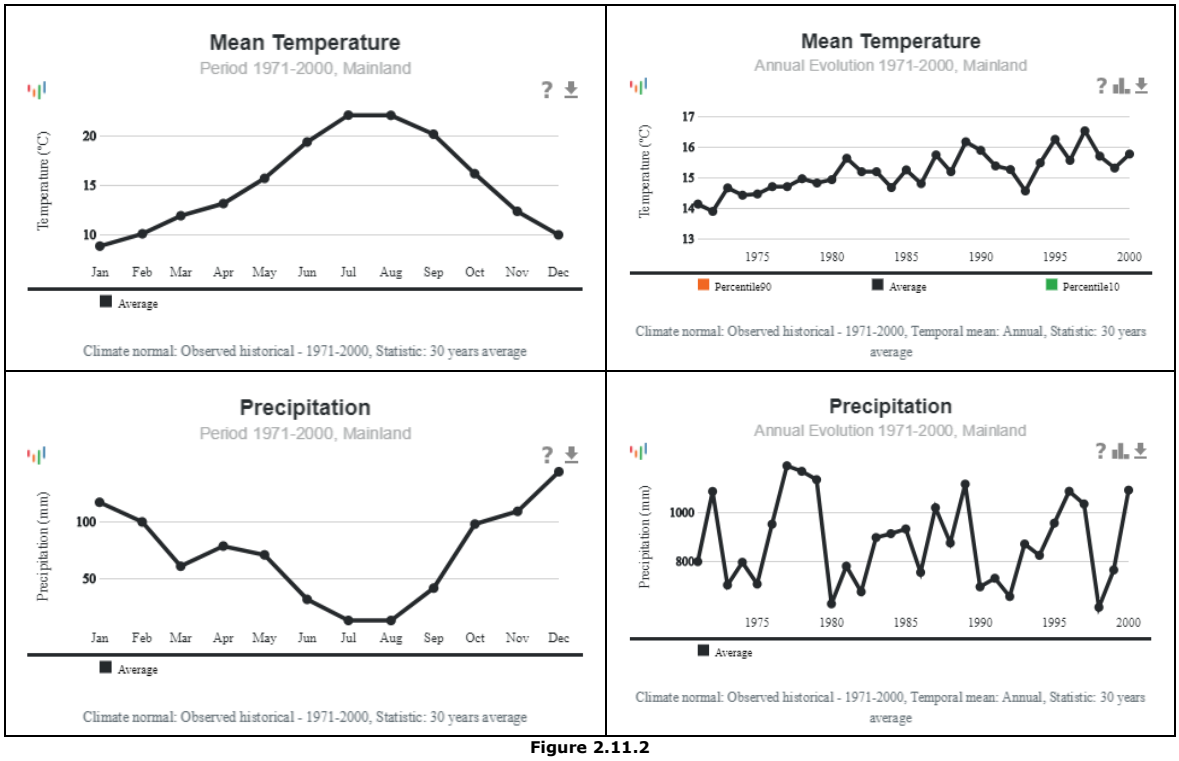


Figure 2.11.2
Average Temperature and Precipitation in Portugal (1971-2000)

Another consequence of the frequent hot dry summers is the increase in conditions for extreme wildfires, which are a common feature every year, particularly during summer, but ravage the country in years where conditions of temperature/wind/drought are particularly severe. Fires affect mostly forest and shrubland areas, and in smaller proportions cropland and grassland.

[33] Portal do Clima http://portaldoclima.pt/en/

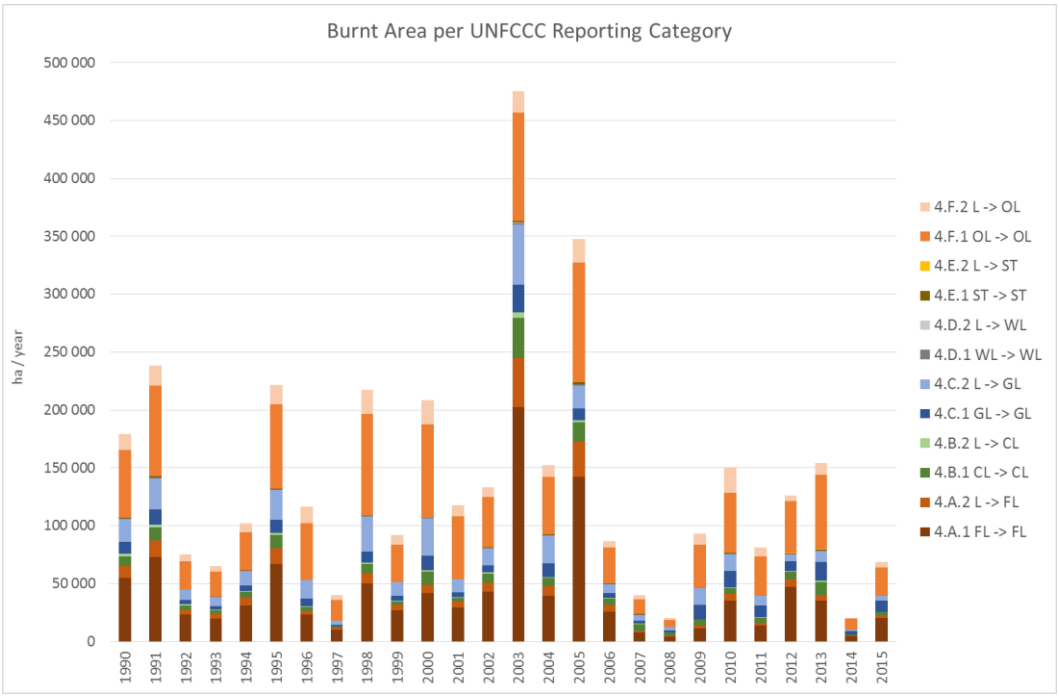


Figure 2.11.3
Burnt area by UNFCCC reporting category 1990-2015
Source: APA, bsed on ICNF forest fires data

3. Greenhouse Gases Inventory Information, including on National Systems and the National Registry

3.1. Summary Tables

Sumary tables are presented in 3.1. 3.2 and 3.3. For more information, please see tables in the Annex III.

3.2. Descriptive Summary

Portugal, as a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, is required to produce and regularly update its inventory of emissions and removals of greenhouse gas (GHG) not controlled by the Montreal Protocol.

The GHG emission inventory is the official annual accounting of all anthropogenic emissions and removals of greenhouse gases in Portugal. The inventory measures Portugal's progress against obligations under the United Nations Framework Convention on Climate Change (Climate Change Convention), the Kyoto Protocol and the European Union's Climate and Energy obligations.

As a general rule the inventory covers emissions occurring in the all of the Portuguese territory, i.e., mainland Portugal and the two autonomous regions of Madeira and Azores.

This chapter summarizes the latest information (May 2017) on Portuguese GHG emissions (1990-2015), communicated to the UNFCCC through the compilation of the Common Reporting Format (CRF) and the National Inventory Report (NIR), and available at:

https://www.apambiente.pt/index.php?ref=17&subref=150 .

This chapter also outlines the main components of the Portuguese national system, and a description of the structure and functions of the national registry (Portuguese National Registry of Emissions Units).

Greenhouse Gas Emissions by Gas

In 2015, total Portuguese GHG emissions, including indirect CO_2, without land-use, land-use change and forestry (LULUCF) were estimated at about 68.9 Mt CO_{2e}, representing an increase of 15.7 % compared to 1990 levels and an increase of 7.1 % compared to the previous year (2014).

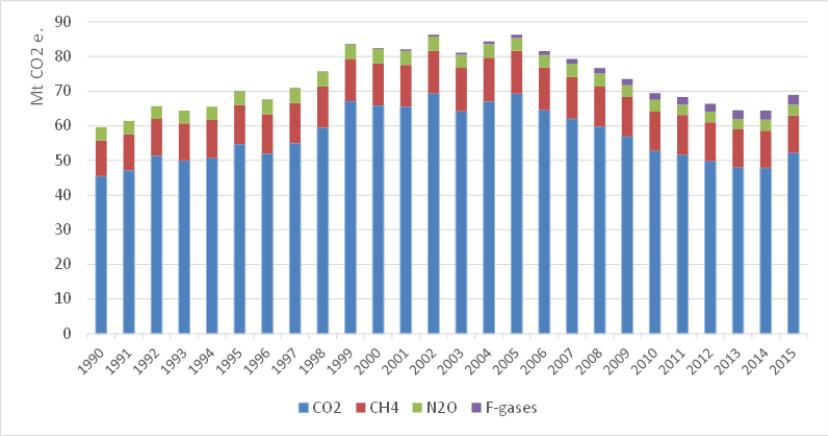


Figure 3.1
Greenhouse Gas Emissions by Gas (without LULUCF).

CO_2 is the primary GHG, accounting for about 76% of Portuguese emissions on a carbon equivalent basis in 2015 (LULUCF excluded), and having registered an increase of 15% between 1990 and 2015. The second most important gas is CH4, followed by N_2O, representing, respectively, 16% and 4% of total emissions in 2015. CH_4 emission levels have risen by 6.0% from 1990 to 2015, while N_2O has decreased by about 17%. F-gases have been increasingly important particularly in latest years, representing in 2015 4% of the total emissions. NF3 emissions do not occur in Portugal.

The largest GHG gas emitted - CO_2 - is mainly generated from fossil fuel combustion in energy-related activities (categories 1A), as illustrated in the figure below. The increase of CO_2 emissions since 1990 is driven by the growth of energy industries and transport that have registered, respectively, a 12% and 62% growth from 1990 to 2015.

Some other non-energy production processes, such as cement production (included in category 2A), are also responsible for considerable quantities of CO_2 emissions. Manufacturing industries and construction, and other subsectors (e.g chemical) which appear among the most significant CO_2 sector emitters have lost importance since 1990.

Fugitive emissions resulting from oil refining, transport and distribution of fossil fuels, as well as storage and transportation of natural gas, have become more relevant in recent years, presenting an increase of approximately 900% since 1990.

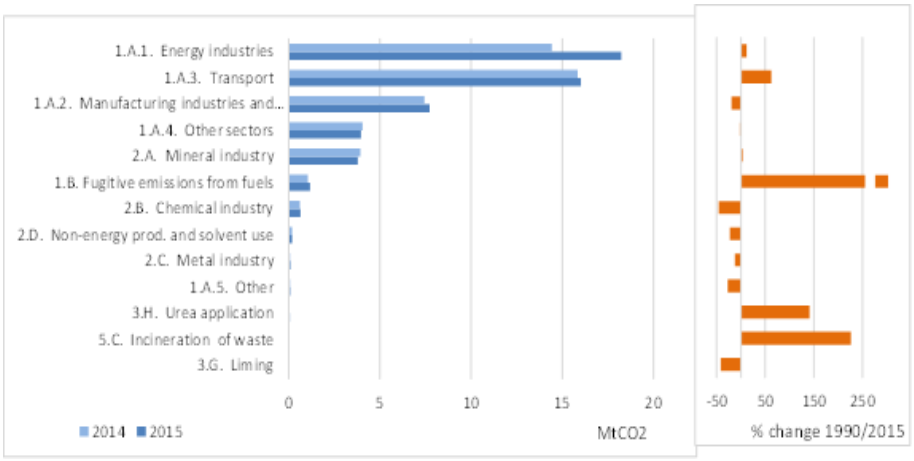


Figure 3.2
Source categories of CO_2: 2014, 2015 and per cent change 1990-2015.

CH_4 is primarily generated through anaerobic decomposition of organic matter in biological systems, like the decay of municipal and animal wastes, waste-water handling systems, or enteric fermentation in animals. Other sources are also responsible for these emissions, such as biomass burning, the distribution of natural gas and petroleum, and the incomplete combustion of fossil fuel. The overall growth of CH_4 emissions (6% since 1990) was determined by the importance of deposition of waste on land disposal sites.

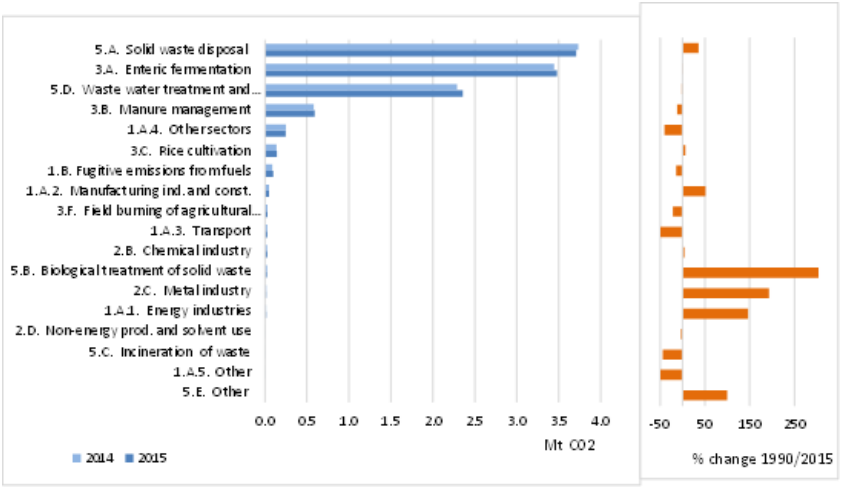


Figure 3.3
Source categories of CH_4: 2014, 2015 and per cent change 1990-2015.

N_2O emissions registered an overall decreasing trend of 17% in the period 1990-2015, and are associated with direct and indirect emissions from agricultural soils, mainly related to the use of synthetic and organic fertilizers, manure deposition by livestock in the soil, nitrogen fixation by N-fixing crops (leguminous plants), and incorporation of crop residues into soils.

Other significant sources are:

- Fossil fuel combustion, particularly in the transport sector. In this sector N2O emissions have increased by 64% in the period 1990-2015, which relates primarily to the road transport sector and is explained by the introduction of catalytic converters;
- Chemical industry (nitric acid production), which reduced emissions due to the implementation of new catalytic (Platinum-rhodium alloy catalysts) in 2011;
- Wastewater treatment; and
- Biomass burning, including the burning of agricultural residues, residential combustion, and waste incineration.

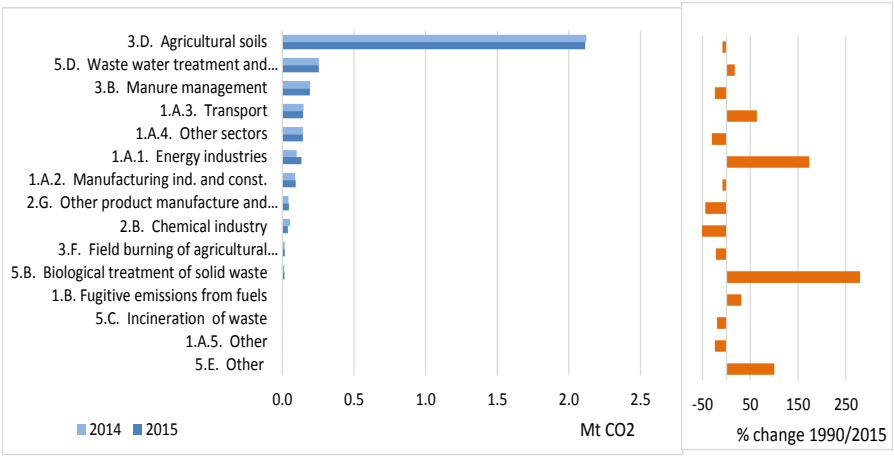


Figure 3.4
Source categories of N_2O: 2014, 2015 and per cent change 1990-2015.

Fluorinated gases have become increasingly important since 1995, driven by the gradual replacement of fluorinated gases as substitutes for substances that deplete the ozone layer in refrigeration, air conditioning, foam, asthma inhalers and fire protection systems.

The most relevant sectors are: fixed Air Conditioning (36%), commercial refrigeration (34%) and mobile Air Conditioning (21%).

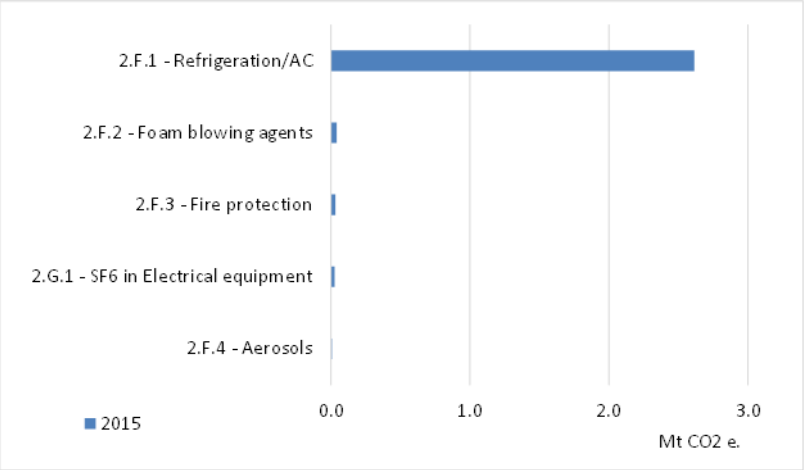


Figure 3.5
Source categories of F-gases: 2015.

Table 3.1 Summary of GHG emissions and removals in Portugal by gas.

GHGs EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	CO_2 equivalent (Gg)												
CO2 emissions without net CO2 from LULUCF	45,371	46,992	51,226	49,829	50,570	54,533	51,827	54,824	59,297	66,911	65,683	65,362	69,199
CO2 emissions with net CO2 from LULUCF	46,260	47,915	47,616	45,129	45,166	49,741	43,353	45,436	51,163	58,151	59,684	56,005	60,299
CH4 emissions without CH4 from LULUCF	10,201	10,399	10,558	10,685	10,953	11,288	11,359	11,587	11,899	12,042	12,105	12,109	12,297
CH4 emissions with CH4 from LULUCF	10,565	10,887	10,712	10,818	11,163	11,740	11,592	11,676	12,350	12,239	12,510	12,372	12,586
N2O emissions without N2O from LULUCF	3,831	3,799	3,768	3,749	3,781	3,966	4,200	4,188	4,149	4,234	4,204	4,068	4,112
N2O emissions with N2O from LULUCF	4,420	4,393	4,277	4,235	4,270	4,499	4,687	4,645	4,673	4,704	4,711	4,543	4,588
HFCs	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	35	59	101	146	212	281	365	481
PFCs	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO	NO	0	0	1	1	2	2
Unspecified mix of HFCs and PFCs	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO	NO	NO	NO	NO	NO	NO	NO
SF6	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	14	14	15	16	17	17	18	18
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (without LULUCF)	**59,403**	**61,190**	**65,552**	**64,263**	**65,304**	**69,836**	**67,459**	**70,715**	**75,508**	**83,416**	**82,291**	**81,924**	**86,109**
Total (with LULUCF)	**61,245**	**63,194**	**62,606**	**60,182**	**60,599**	**66,030**	**59,705**	**61,874**	**68,348**	**75,323**	**77,204**	**73,304**	**77,974**
Total (without LULUCF, with indirect)	**59,584**	**61,365**	**65,747**	**64,454**	**65,509**	**70,035**	**67,656**	**70,920**	**75,714**	**83,627**	**82,502**	**82,101**	**86,278**
Total (with LULUCF, with indirect)	**61,426**	**63,370**	**62,800**	**60,373**	**60,804**	**66,229**	**59,902**	**62,078**	**68,554**	**75,533**	**77,416**	**73,482**	**78,143**

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% change
	CO_2 equivalent (Gg)													1990-2015
CO2 emissions without net CO2 from LULUCF	64,076	66,860	69,142	64,429	61,937	59,634	56,801	52,616	51,471	49,658	47,866	47,741	52,017	**14.6**
CO2 emissions with net CO2 from LULUCF	65,147	58,949	69,257	55,571	49,352	45,617	42,770	41,006	39,895	40,391	39,065	37,645	43,044	**-7.0**
CH4 emissions without CH4 from LULUCF	12,525	12,680	12,293	12,215	12,032	11,555	11,340	11,346	11,457	11,209	10,925	10,703	10,812	**6.0**
CH4 emissions with CH4 from LULUCF	13,470	12,950	13,134	12,403	12,104	11,592	11,500	11,642	11,610	11,502	11,250	10,744	10,953	**3.7**
N2O emissions without N2O from LULUCF	3,745	3,900	3,762	3,638	3,807	3,710	3,403	3,377	3,101	3,113	3,109	3,179	3,192	**-16.7**
N2O emissions with N2O from LULUCF	4,345	4,364	4,326	4,062	4,187	4,061	3,779	3,781	3,477	3,518	3,521	3,535	3,559	**-19.5**
HFCs	617	731	907	1,088	1,321	1,569	1,764	1,910	2,078	2,216	2,383	2,535	2,679	**100.0**
PFCs	2	3	3.30	3.99	4.74	5.58	6.61	7.93	9.05	10.18	11.36	12.59	13.89	**100.0**
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	**0.0**
SF6	22	27	27	28	31	30	33	35	29	30	31	26	26	**100.0**
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	**0.0**
Total (without LULUCF)	**80,986**	**84,200**	**86,134**	**81,403**	**79,133**	**76,503**	**73,347**	**69,292**	**68,145**	**66,238**	**64,325**	**64,196**	**68,740.8**	**15.7**
Total (with LULUCF)	**83,602**	**77,024**	**87,654**	**73,156**	**67,000**	**62,875**	**59,852**	**58,381**	**57,098**	**57,668**	**56,260**	**54,498**	**60,275.5**	**-1.6**
Total (without LULUCF, with indirect)	**81,157**	**84,377**	**86,308**	**81,575**	**79,309**	**76,675**	**73,507**	**69,459**	**68,304**	**66,399**	**64,494**	**64,360**	**68,915.7**	**15.7**
Total (with LULUCF, with indirect)	**83,773**	**77,201**	**87,828**	**73,328**	**67,175**	**63,048**	**60,012**	**58,549**	**57,257**	**57,828**	**56,429**	**54,662**	**60,450.4**	**-1.6**

NA- Not applicable; NE - Not estimated; NO - Not occurri

GHG emissions by sector

According to the UNFCCC Reporting Guidelines, emissions estimates are grouped into five large IPCC categories: Energy, Industrial Processes and Product Uses (IPPU), Agriculture, Land-Use, Land-Use Change and Forestry (LULUCF), and Waste.

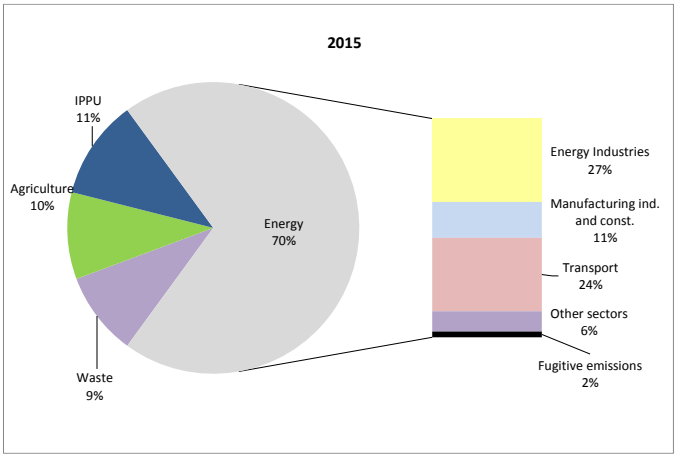


Figure 3.6
GHG emissions in Portugal by sector: 2015.

Energy is by far the most important sector, accounting for 70 % of total emissions in 2015, followed by IPPU (11%), agriculture (10%) and waste (9%).

Within the Energy sector, energy industries (in particular, public electricity and heat production) and transport are the two most important sub-sources representing, respectively, 27% and 24% of total emissions.

The trend of emissions by sector is shown in the figure below.

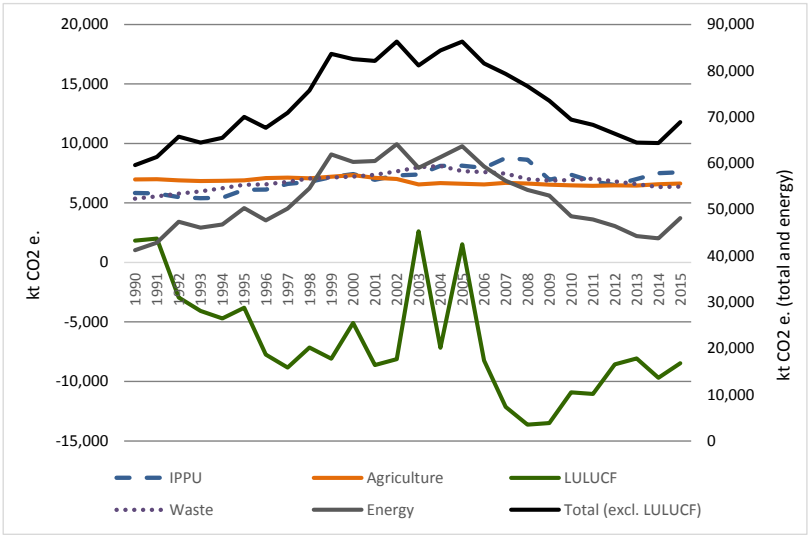


Figure 3.7
Trends in GHG emissions and removals: total and by sector.

The total emissions trend presents different phases along the time. The steady increase of emissions during the 90s, was followed by a more moderate rate and started to stagnate in the early 2000s, registering thereafter, in particular after 2005, a decrease.

As illustrated in the previous figure, the overall trend of emissions echoes essentially the evolution of the energy sector, which presented a 17% increase over the 1990-2015 period, and reflects the country's important dependence on fossil fuels for electricity generation and transportation and, more recently, the results of large scale investments in renewable energy and energy efficiency.

As shown in the figure below, the trend of CO2 emissions follows to a large extent the evolution of energy consumption. Nevertheless, a decoupling between CO2 emissions and energy consumption can be observed in the figure bellow, that shows a decrease of CO2 intensity (GHG emissions per total energy consumption) since the early 2000s. The decline of this trend relates to the implementation of several measures, such as the introduction of natural gas (1997), the installation of combined cycle thermoelectric plants using natural gas (1999), the progressive installation of co-generation units, the amelioration of energetic and technologic efficiency of industrial processes, the improvement in car efficiency, the improvement of fuels quality, and the expansion of renewable energy in electricity production.

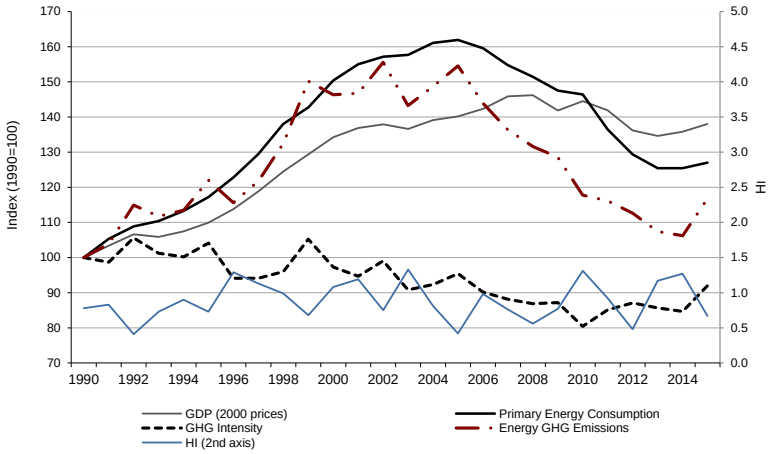


Figure 3.8
Trends in GHG emissions, GDP and energy consumption.

Furthermore, the continuous decline of energy consumption and consequent decrease of emissions verified in the country since 2005, with a bigger expression after 2010, can also be explained by the internal economic recession, along with the European economic and financial crisis. In 2015, there was however an inversion of the emissions declining trend, with an emissions increase of 7.1% compared to the 2014. This growth reflects in part the positive variation of GDP, that was first verified in 2014 (0.9% growth) and was accentuated in 2015 (1.6%).

The level of emissions show however significant inter-annual variations, which are mostly occurring in the power sector and are related to the pronounced fluctuations of hydroelectric power generation that is highly affected by annual variations in precipitation. The growth in emissions verified in 2015, results also from the particularly unfavourable hydrologic conditions which contributed to a greater use of coal and natural gas in the electro producer sector.

Mobile sources, which are largely dominated by road traffic, are one of the sectors that have risen faster. In the period 1990-2015 the emissions of transportation sources increased 61 %, due to the steady growth of vehicle fleets (in particular with more powerful engines) and road travel from 1990 to the early 2000s, reflecting the increase in family income and the strong investment in the road infrastructure of the country in the 1990s decade. Indirectly, the increase in road traffic activity also augmented the emissions from fossil fuel storage, handling and distribution. The situation seems however to have stabilized in the early 2000s and

then started to decline since 2005. An inversion of this tendency is registered in the most recent years, with an increase in transport emissions of 3.4 % from 2013 to 2015.

Combustion in manufacturing industries and construction registered a 19% decrease of emissions since 1990, reflecting the reduction of production in some subsectors (e.g iron and steel, construction) due to the effects of the recession of the Portuguese economy, which has been accompanied by the slowdown of industrial activity and consequent reduction in fuel consumption.

Still within the energy sector, the category "other sectors", which include the residential and commercial activities, registered also a significant increase of emissions in the 1990-2005 period (with almost 55% rise), but this tendency has decelerated (7% decrease in the 1990-2015 period), due to the implementation energy conservation measures, but in the most recent years also to the stagnation of the economic growth and recession.

Industrial processes represented 11 % of the Portuguese emissions in 2015, and have grown 30% since 1990. These emissions which are generated as by-product of many non-energy-related activities, are mostly related to the increase of cement production, road paving, limestone and dolomite use, lime and glass production. There is also a relevant increase in sub-category 2F, consumption of Halocarbons and SF6, which represents in 2015 about 35.9% of total GHG emissions from this source sector, and shows a fast grow over the years.

Agriculture was, in the period analysed, a significant source of GHG emissions, responsible for 10 % of the Portuguese emissions in 2015, corresponding to a decrease of 5 % since 1990. This fact is related to the relatively decrease of importance of the sector in terms of the national economy, and also associated with the reduction of the livestock production of certain categories of animals (e.g. swine), the extensification of cattle production and the decrease of fertilizer consumption, and, to a certain extent, to the conversion of arable crops to pastures.

Waste represented approximately 9 % of Portuguese emissions in 2015, recording an increase of approximately 19 % since 1990. This increase in emissions is primarily related to the rise of waste generation, associated with the development of family income and the change in consumption patterns, in particular in the years following the Portuguese accession to the EU in 1986. This trend was accompanied by the growth of urbanization registered in the country during the last decades. The increase of the emissions is related in majority to the CH4 emissions generated in Municipal Solid Waste landfilling, which represent 37% of the sector emissions in 2015 and have registered a 92% increase since 1990, and relates to the fact that until the late '90s, landfilling remained almost exclusively the main waste disposal practice. With the start of operation of two incineration units in 1999/2000, waste start to be diverted from Solid Waste Disposal Sites.

The strongest increase of emissions occurred until 2004. In mid-2000's, emissions have first stabilized and started after to decrease, due in particular to the increasing importance of biogas recovery in several units which produce and sell electricity to the grid.

Estimates of emissions and sinks from land use change and forestry category show that this category has changed from being a net emitter in 1990 (1.8 Mt CO2e) to a carbon sink in 1992. This situation was again reverted in the years 2003 and 2005 due to the severe forest wildfires events registered in these years. In 2015 this sector represents a net sink of -8.5 Mt CO2e.

Table 3.2

Trends in GHG emissions and removals by sector.

GHGs SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	CO_2 equivalent (Gg)												
1. Energy	41,222	42,838	47,376	46,063	46,768	50,291	47,655	50,209	54,603	61,907	60,311	60,493	64,129
2. Industrial processes and product use	5,839	5,801	5,504	5,398	5,429	6,107	6,131	6,608	6,772	7,168	7,421	6,956	7,319
3. Agriculture	6,981	7,001	6,891	6,838	6,864	6,903	7,100	7,124	7,071	7,203	7,344	7,113	7,007
4. Land use, land-use change and forestry(5)	1,842	2,004	-2,946	-4,081	-4,705	-3,806	-7,754	-8,842	-7,160	-8,094	-5,087	-8,620	-8,135
5. Waste	5,361	5,550	5,782	5,965	6,243	6,535	6,573	6,775	7,063	7,139	7,215	7,361	7,654
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

GHGs SOURCE AND SINK	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% change
	CO_2 equivalent (Gg)													1990-2015
1. Energy	59,038.61	61,303.39	63,708.45	59,317.52	56,210.27	54,241.84	52,998.33	48,530.40	47,870.85	46,422.83	44,280.28	43,786.66	48,157.50	**16.8**
2. Industrial processes and product use	7,390.74	8,112.36	8,138.95	7,934.81	8,788.26	8,623.19	6,943.93	7,367.93	6,788.13	6,514.21	7,002.50	7,503.08	7,578.89	**29.8**
3. Agriculture	6,552.93	6,663.75	6,613.00	6,551.88	6,681.10	6,630.12	6,541.58	6,472.12	6,436.58	6,481.31	6,468.34	6,566.04	6,623.53	**-5.1**
4. Land use, land-use change and forestry(5)	2,615.94	-7,175.93	1,519.85	-8,247.42	-12,133.60	-13,627.95	-13,494.53	-10,910.43	-11,046.82	-8,570.65	-8,065.17	-9,698.01	-8,465.34	**-559.7**
5. Waste	8,004.04	8,120.72	7,674.08	7,599.01	7,453.69	7,008.20	6,862.70	6,921.27	7,049.17	6,819.89	6,574.23	6,339.83	6,380.89	**19.0**
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**

NA- Not applicable; NE - Not estimated; NO - Not occurring

Indirect GHG and SOx emissions

Several gases do not have a direct influence in climate change but affect the formation or destruction of other GHG. CO, NOx, and NMVOC are precursor substances for ozone which is a GHG. SOx produce aerosols, which are extremely small particles or liquid droplets that can also affect the absorptive characteristics of the atmosphere.

In 2015, all these gases emissions have decreased from 1990 levels: SOx -85 %, CO -67 %, NMVOC -35 % and NOx -28 %.

Energy is the major responsible sector for emissions of NOx, SOx and CO. Its contribution for NMVOC emissions is also significant, together with Industrial processes and Product use sector.

Within energy, transportation is responsible for the major share of NOx, emissions, approx. 46% of 2015 totals. Despite the fast growing trends of the transport sector (mainly road) since the 90s, the introduction of new petrol-engine passenger cars with catalysts converters and stricter regulations on diesel vehicles emissions, limited the growth of these emissions or even resulted in its decrease. In fact, the situation started to change in the last years, as transport emissions growth has first stabilized and started to decline since 2005. In the most recent years the situation has been inversed with an increase of emissions after 2013. In the period analysed, 1990-2015, NOx emissions from transport decreased -10%; and CO and NMVOC emissions registered reductions of more than -85%.

Other sectors (commercial/institutional, residential and agriculture/forestry) are a primary source of CO emissions representing 51 % of the 2015 total.

SOx emissions are mainly generated in the energy industry sector (approximately 30% of total emissions in 2015) and combustion in manufacturing industries (approximately 35% of total emissions in 2015), which are major consumers of fossil fuels. Oil and coal represent the biggest share of the fuel mix used in thermal electrical production in the country, and they are mostly imported. The situation is however improving with a significant development of renewable sources (mainly wind and hydro) and energy efficiency measures, among other factors as reflect the introduction of new stricter laws regulating the residual fuel oil (Decree-Law 281/2000 from November 10th). The introduction of natural gas and its increasing use, since 1997, is also another positive factor that has contributed to control of SOx emissions. The emissions variation in the period 1990-2015 shows a substantial decrease in SOx emissions in both sub-categories: energy industries and manufacturing industries -93% and -79%. Since 2007, SOx emissions from the energy industries registered a significant reduction (approximately -87%) which is explained by the implementation of two new abatement systems (desulfurization in two Large Point Source Energy Plants in Mainland Portugal).

Table 3.3

Trends in Indirect GHGs and SOx emissions: 1990-2015.

Gas emissions	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	(Gg)												
CO	801	815	853	832	812	800	787	752	728	702	651	570	552
NOx	245	256	275	266	266	276	264	262	269	277	274	273	280
NMVOC	275	281	287	277	279	274	276	275	276	270	259	249	248
SO2	324	315	376	320	296	332	273	288	336	303	264	250	250

Gas emissions	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% change
	(Gg)													1990-2015
CO	512	480	440	409	385	360	340	323	303	288	281	274	268	**-66.5**
NOx	256	262	267	245	240	214	203	189	180	173	171	170	176	**-28.0**
NMVOC	234	227	215	209	204	195	185	186	178	174	175	174	180	**-34.6**
SO2	191	193	195	170	163	114	79	70	65	60	54	48	50	**-84.7**

National inventory system

The newest legal national arrangement for a National Inventory System was adopted in 2015 (Council of Ministers Resolution no. 20/2015). It builds on the previous version (DATA), which has been revised and reorganized to take into account the developments at international level relating to the UNFCCC and the Kyoto Protocol, and the monitoring and reporting requirements under the EU Regulations.

The new Council of Ministers Resolution, restructures and elaborates the previous legal framework on the National System (SNIERPA), specifying its 4 different components:

i) a calculation and archiving system of the national inventory;

ii) the QA\QC System;

iii) the Methodological Development Plan (PDM);

iv) the Archiving System.

Furthermore, it identifies the several outputs and formats of reporting to the international bodies, and specifies the functions of the entities making part of SNIERPA:

i) the coordinating entity;

ii) the sectorial Focal Points;

iii) the Involved Entities.

APA is the Responsible Body for: the overall coordination and updating of the National Emissions Inventory (INERPA); the inventory's approval, after consulting the Focal Points and the involved entities; and its submission to EC and international bodies to which Portugal is associated, in the several communication and information formats, thus ensuring compliance with the adopted requirements and directives.

APA's Climate Change Department (DCLIMA) is the unit responsible for the general administration of the inventory and for all aspects related to its compilation, reporting and quality management. Data from different sources are collected and processed by the inventory team, who is also responsible for the application of Quality Assurance / Quality Control procedures, the assessment of uncertainty and key category analysis, the compilation of the Common Reporting Format tables, the preparation of the National Inventory Report, the response to the International and European review processes and data archiving and documentation.

The sectorial Focal Points work with APA/DCLIMA in the preparation of INERPA, and are responsible for fostering intra and inter-sectorial cooperation to ensure a more efficient use of resources. Their main task includes coordinating the work and participation of the relevant sectorial entities over which they have jurisdiction. It is also a Focal Points duty to provide expert advice on methodological development, emission factor determination and accuracy of the activity data used. Focal Points play a vital role in sectorial quality assurance and methodological development. They are also responsible for the production of statistical information and data publication that are used in the inventory estimates.

The involved entities are public or private entities which generate or hold information which is relevant for the INERPA, and which actions are subordinate to the Focal Points or directly to the Responsible Body.

All governmental entities have the responsibility to ensure, at a minimum, co-funding of the investment needed to ensure the accuracy, completeness and reliability of the emissions inventory in their respective sectors.

Following the publication of the Council of Ministers Resolution No. 20/2015 of 14 April, which restructured the SNIERPA, a set of implementing procedures were agreed within SNIERPA to facilitate the good functioning of the national system, defining in more detail some competences, such as the regularity of the meetings and the deadlines for the information´ transmission, among other issues.

Next figure presents the main entities that make part of the national system.

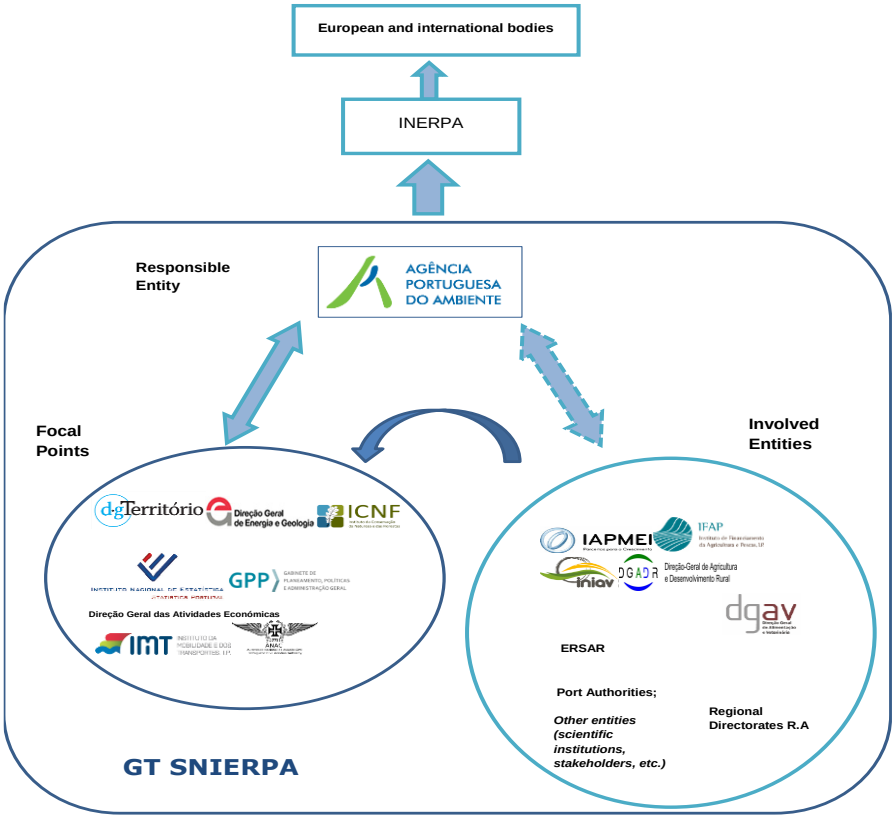


Figure 3.9
Main bodies of national system (SNIERPA)

Institutional arrangements for Kyoto Protocol

Additional provisions to deal with the supplementary information under Kyoto Protocol refers mainly to arrangements to account for further requirements concerning National implementation of Articles 3.3 and 3.4.

An inter-institutional panel was created in the scope of the SNIERPA in order to work on the definition of the methodology to identify the areas and account for the emissions/removals.

The representation of these multiple entities in this inter-institutional panel aims at gathering the necessary competences, data and knowledge required to comply with the reporting and accounting requirements of these activities.

Overview of inventory planning

All the participating organizations represented in SNIERPA support the annual production of the national inventories and the fulfilment of the reporting requirements.

Future planned improvements are compiled annually for each sector by the relevant inventory experts and the inventory coordinator, having as a basis the issues raised and the recommendations from the annual review processes and the problems identified from the application of QA/QC procedures, as well as future new reporting obligations. All identified items are gathered in a Methodological Development Plan (PDM – Plano de Desenvolvimento Metodológico) which is updated every year. A priority level is attributed to each issue identified, considering their importance in terms of the contribution to total GHG emissions, the level of uncertainty associated and the economic and technical resources available.

Each year, and according to the agreed calendar of INERPA (typically in June), APA, as coordinator of SNIERPA, organizes a kick-off meeting to plan and launch, in coordination with the sectoral focal points and

the involved entities, the work for the following inventory submission(s). Bilateral meetings occur as necessary as consequence of this meeting aiming at discussing the specific issues related to each sector and to agree on the actions to be implemented in the framework of SNIERPA during this inventory compilation regarding the next submission.

The following table presents the overall calendar of the INERPA's elaboration process, which includes four main phases: planning, compilation, QA/QC verification and improvement (PDM activities).

Table 3.4
Calendar for the inventory process.

Date	Task	Process	Tasks
May - June	- Elaboration of QA/QC plan - Definition/update of inventory development priorities (PDM)	Inventory Planning	- setting of quality objectives - identification of priorities taking into account the latest reviews and QA/QC checks
June	Kick-off meeting of SNIERPA WG for the launch of the annual inventory work	Inventory Planning	- discussion of the QA/QC plan - discussion and of the inventory development priorities (PDM)
June - December	- end September: deadline for rotine data collection/ delivery by FP and/or IE to the APA - end October: deadline for the implementation of Methodological Development Plan (PDM) improvements	Inventory Compilation/ Improvement/ Verification	- approval of the QA/QC plan and of the PDM - collection of activity data and EFs update - implementation of methodological improvements - estimation of emissions/ removals - aplication of QA/QC checks - uncertainty and KC assessment - archiving of information - preparation of submissions by the inventory team
15 January	*Preliminary CRF and Short NIR submission to EC (DG CLIMA) [Monitoring Mech. of GHG under EU]*	*Reporting*	-
	Preparation of NFR submission	Inventory Verification/ Improvement	- aplication of QA/QC checks - implementation of corrections and late data updates
14 February	*Official consideration/approval of the NFR submission to UNECE [CLRTAP]*	*Approval*	*Approval by President of APA*
15 February	*Official NFR submission to NECD [EU] and UNECE [CLRTAP]*	*Reporting*	-
	- Revision of CRF submission - Preparation of NIR and IIR - Circulation of NIR and IIR comments among FP and/or IE	Inventory Verification/ Improvement	- aplication of QA/QC checks - implementation of corrections and late data updates
9 March	- Deadline for NIR and IIR comments from FP and/or IE	Inventory Verification	-
14 March	*Official consideration/approaval of the CRF and NIR submission to EC (DG CLIMA) [Monitoring Mech. of GHG under EU]*	*Approval*	*Approval by President of APA*
15 March	*Submission of CRF and NIR (final versions) to the EC (DG CLIMA) [Monitoring Mech. of GHG under EU]*	*Reporting*	-
15 March	*Submission of IIR to NECD [EU] and UNECE [CLRTAP]*	*Reporting*	-
	- Implementation of QA/QC checks	Inventory Verification	- aplication of QA/QC checks including the NIR
15 April	*Submission of CRF and NIR (final version) to the UNFCCC [UNFCCC and Kyoto Protocol]*	*Reporting*	-
8/27 May	*Resubmission (if needed) of CRF and NIR (final version) to the EC and UNFCCC [UNFCCC and Kyoto Protocol]*	*Reporting*	-

Inventory Preparation Process

Responsibility

As referred in section 1.2.1 APA is the national entity responsible for the overall coordination of the Portuguese inventory of air pollutants emissions. According to these attributions, APA makes an annual compilation of the Portuguese Inventory of air emissions which includes GHG's sources and sinks, acidifying substances as well as other pollutants. The reporting obligations to the EU and the international instances are also under the responsibility of APA.

The designated representative is:

Agência Portuguesa do Ambiente

Departamento de Alterações Climáticas (DCLIMA)

Address: Rua da Murgueira, 9/9A, 2610-124 Amadora, Portugal

Telephone: +351 21 472 82 93

Fax: + 351 21 471 90 74

Contact: Eduardo Santos – eduardo.santos@apambiente.pt (Head Department)

Calculation, data archiving and documentation system

The emissions calculations are performed by APA/DCLIMA. However many other institutions and agencies contributed to the inventory process, providing activity data, sectorial expert judgment, technical support and comments. All calculation and reporting rely in a set of different Excel workbooks which have been developed in order to guarantee that all information and calculations occur automatically. The structure of the information system is outlined in the figure below.

The information received from several data suppliers is stored in its original format (paper or electronic). A copy of this information is converted into the working workbooks, where data is further processed, linkage made and calculations performed, maintaining hence the integrity of the original data sources.

The IT system has been developed to answer to the various international obligations and national needs. At present, the different demands refer to: UNFCCC (CRF format); UNECE/CLRTAP (NFR format); LCP Directive (NFR format); as well national needs such as the State of Environment Reports. There is independency between emission calculations and the required structure necessary for each obligation which allows flexibility in the inventory.

The information is archived in a way that enables each inventory estimate to be fully documented and reproduced if necessary. When major changes are done in methodology and emission factors, and particularly after each reporting cycle, the older spreadsheets are archived ("frozen") and work restarts with copies of those spreadsheets, making a clear reference to the period when they were used. Minor corrections, which do not affect the estimations, are not stored due to storage area limitations.

All the inventory material, calculation files and reported tables, as well as the underlying data, the scientific documentation and studies used are stored and archived electronically.

Furthermore, the present system existing in APA is considered to ensure the basic requirements/functions of an IT system: centralized data processing and storage.

In the latest years an effort has been made by the inventory team in order to better document and explain the calculation process and data sources used and procedures applied during an annual cycle for each sector. The several documents produced are stored in the inventory IT area, enabling a smoother transmission of knowledge and facilitation the continuity of the inventory compilation process in case of changes within the inventory team.

The following table presents a summary of the activity data and sources used.

Table 3.5
Main data sources used in the Portuguese inventory

IPCC Sector	Activity Data	Data Sources
1. ENERGY		
1 A – Energy. Fuel Combustion		
1A1 – Energy Industry		- Large Point Source Surveys (LPS)
		- Large Combustion Plants (LCP)
		- EDP Sustainability Annual Reports
	Fuel sales	- Energy Balance - General Directorate for Geology and Energy (DGEG)
		- Autonomous Gov. of Azores
		- National Statistical Institute (INE)
		- European Emissions Trading Scheme - APA
1A2 - Manufacturing Industries and Construction		- LPS, LCP, EPER/PCIP
		- Energy Balance (DGEG)
		- European Emissions Trading Scheme - APA
1A3 – Transport	Fuel sales	- Energy Balance - General Directorate for Geology and Energy (DGEG)
	Vehicle sales	- ACAP
		- INE
		- IMT
		- ANAC
1A4 – Other Sectors	Fuel sales	- Energy Balance (DGEG)
	Equipments and fuel used	- Survey on Energy Consumption in the Residential Sector (DGEG)
1A5 – Other	Fuel sales	- Energy Balance (DGEG)
1 B – Fugitive Emissions from Fuels		- Energy Balance and statistical yearbooks (DGEG)
		- GALP
2 - IPPU		
2A - Mineral industry		- LPS, LCP
		- CIMPOR, SECIL
		- Energy Balance (DGEG)
		- Portuguese Association of Producers of Bitumen Materials (APORBET)
		- European Asphalt Pavement Association (EAPA)
		- Technology Centre for Ceramics and Glass (CTCV)
		- European Emissions Trading Scheme - APA
2B - Chemical industry		- Energy Balance (DGEG)
		- LCP
		- INE
2C - Metal industry		- Energy Balance (DGEG)
		- LCP
		- INE
		- SN
2D - Non-energy products from fuels and solvent use		- Energy Balance (DGEG)
		- Gen-Dir for Economic Activities Enterprise (DGAE)
		- INE
2F - Product uses as ODS substitutes		- INE
		- APIRAC
		- Data from Industry Importers
		- EDP, REN
		- Fluorinated Gas Inquiry (APA)
2G - Other product manufacture and use		- LCP
		- Energy Balance (DGEG)
3 – Agriculture		INE - Statistical data (animal and crop production, fertilizer consumption)
		IFAP
		GPP
		APA
5 – Land Use, Land Use Change and Forestry	Biomass increment, Burnt area, Harvest	- ICNF
	Land use area, LUC	- COS cartography (DGT)
	Biomass increment	- ISA
5 – Waste		
5A – Solid Waste Disposal on Land	Amount of Waste (Municipal)	APA
	Amount of Waste (Industrial)	APA-INE
5B – Biological Treatment	Amount of Waste	APA
5C – Waste Incineration	Amount of Waste	APA
5D – Wastewater Handling		APA
	Industrial Production, Protein consumption	INE

3.3. National Registry

This section of the National Communication summarises the national registry of Portugal. Further details can be found in Chapter 14 of the Portuguese NIR.

Directive 2009/29/EC adopted in 2009, provides for the centralization of the EU ETS operations into a single European Union registry operated by the European Commission as well as for the inclusion of the aviation sector. At the same time, and with a view to increasing efficiency in the operations of their respective national registries, the EU Member States who are also Parties to the Kyoto Protocol (26) plus Iceland, Liechtenstein and Norway decided to operate their registries in a consolidated manner in accordance with all relevant decisions applicable to the establishment of Party registries - in particular Decision 13/CMP.1 and Decision 24/CP.8.

The consolidated platform which implements the national registries in a consolidated manner (including the registry of the EU) is called the Union registry and was developed together with the new EU registry on the basis the following modalities:

- Each Party retains its organization designated as its registry administrator to maintain the national registry of that Party and remains responsible for all the obligations of Parties that are to be fulfilled through registries;
- Each Kyoto unit issued by the Parties in such a consolidated system is issued by one of the constituent Parties and continues to carry the Party of origin identifier in its unique serial number;
- Each Party retains its own set of national accounts as required by paragraph 21 of the Annex to Decision 15/CMP.1. Each account within a national registry keeps a unique account number comprising the identifier of the Party and a unique number within the Party where the account is maintained;
- Kyoto transactions continue to be forwarded to and checked by the UNFCCC Independent Transaction Log (ITL), which remains responsible for verifying the accuracy and validity of those transactions;
- The transaction log and registries continue to reconcile their data with each other in order to ensure data consistency and facilitate the automated checks of the ITL;
- The requirements of paragraphs 44 to 48 of the Annex to Decision 13/CMP.1 concerning making non-confidential information accessible to the public is fulfilled by each Party through a publicly available web page hosted by the Union registry;
- All registries reside on a consolidated IT platform sharing the same infrastructure technologies. The chosen architecture implements modalities to ensure that the consolidated national registries are uniquely identifiable, protected and distinguishable from each other, notably:
    a. With regards to the data exchange, each national registry connects to the ITL directly and establishes a secure communication link through a consolidated communication channel (VPN tunnel);
    b. The ITL remains responsible for authenticating the national registries and takes the full and final record of all transactions involving Kyoto units and other administrative processes such that those actions cannot be disputed or repudiated;
    c. With regards to the data storage, the consolidated platform continues to guarantee that data is kept confidential and protected against unauthorized manipulation;
    d. The data storage architecture also ensures that the data pertaining to a national registry are distinguishable and uniquely identifiable from the data pertaining to other consolidated national registries;
    e. In addition, each consolidated national registry keeps a distinct user access entry point (URL) and a distinct set of authorisation and configuration rules.

Following the successful implementation of the Union registry, the 28 national registries concerned were re-certified in June 2012 and switched over to their new national registry on 20 June 2012. Croatia was migrated and consolidated as of 1 March 2013. During the go-live process, all relevant transaction and holdings data were migrated to the Union registry platform and the individual connections to and from the ITL were re-established for each Party.

The following changes to the national registry have occurred since the last National Communication report.

Table 3.6
Changes to the EU national registry in 2015

Reporting Item	Description
15/CMP.1 Annex II.E paragraph 32.(a) Change of name or contact	No change of name and contact occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	In 2016 new tables were added to the database for the implementation of the CP2 functionality. Versions of the Union registry released after 6.1.6 (the production version at the time of the last NC submission) introduced other minor changes in the structure of the database. These changes were limited and only affected EU ETS functionality. No change was required to the database and application backup plan or to the disaster recovery plan. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(d) Change regarding conformance to technical standards	Each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and were successfully carried out prior to each release of a new version in Production. Annex H testing is carried out every year. No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 Annex II.E paragraph 32.(e) Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.
15/CMP.1 Annex II.E paragraph 32.(f) Change regarding security	The mandatory use of hardware tokens for authentication and signature was introduced for registry administrators.
15/CMP.1 Annex II.E paragraph 32.(g) Change to list of publicly available information	Publicly available information is provided via the Union registry homepage for each registry[34].
15/CMP.1 Annex II.E paragraph 32.(h) Change of Internet address	No change of the registry internet address occurred during the reporting period.
15/CMP.1 Annex II.E paragraph 32.(i) Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 Annex II.E paragraph 32.(j) Change regarding test results	Both regression testing and tests on the new functionality are carried out prior to release of the new versions in Production. The site acceptance tests are carried out by quality assurance consultants on behalf of and assisted by the European Commission. Annex H testing is carried out on an annual basis.

[34] e.g.: https://ets-registry.webgate.ec.europa.eu/euregistry/PT/public/reports/publicReports.xhtml.

4. Policies and Measures

4.1. Policy-making process

In the last few years, Portugal reached a more mature stage of climate policy with the completion of a cycle regarding the implementation of the main climate policy instruments in terms of mitigation and adaptation, in particular the National Programme for Climate Change (PNAC – Programa Nacional para as Alterações Climáticas)[35] and the National Strategy for Adaptation to Climate Change (ENAAC – Estratégia Nacional de Adaptação às Alterações Climáticas)[36].

We are now faced with a new generation of climate policy instruments which should respond to the ambition of a forward-looking climate policy that enables the achievement of the targets set for Portugal in this context. To this end, it has become necessary to coordinate objectives, instruments and institutions, recognising the cross-cutting nature of climate policies. The goal was to take a more dynamic approach to planning, with a view to increase the involvement of the different sectors and to promote their accountability, in order to integrate climate policy into sectoral policies.

The broad lines for the post-2012 climate policy instruments in their mitigation and adaptation dimensions were launched by Resolution of the Council of Ministers No 93/2010, of 26 November, which established the preparation of the National Low-Carbon Roadmap (RNBC 2050 – Roteiro Nacional de Baixo Carbono)[37], finalised and subject to public consultation in 2012.

The RNBC 2050 was a forward-looking instrument of utmost relevance, which presented strategic guidelines for the shift to a competitive low-carbon economy and served as a reference to other subsequent climate policy instruments.

With the aim of laying the foundations to boost the transition to a development model capable of reconciling the indispensable economic growth with lower consumption of natural resources, people's quality of life and social and territorial inclusion, the Commitment for Green Growth (CCV – Compromisso para o Crescimento Verde) was established.

The CCV, adopted by Resolution of the Council of Ministers No 28/2015, of 30 April, established GHG emission reduction targets, as well as quantified targets in the field of energy with a view to increasing the share of renewable energy in final energy consumption, and targets for energy efficiency (for 2020 and 2030).

In the framework of the green tax reform, approved by Law No 82-D/2014, of 31 December, in particular with regard to the areas of energy, emissions and transport, the following measures are highlighted[38]:

- Introduction of carbon taxation in the non-ETS sectors at a rate associated to the carbon price in the ETS sector (carbon tax);
- Measures to encourage electric mobility;
- Increased vehicle tax rates according to CO_2 emissions;
- Measures to promote the use of public transport;
- A scheme to encourage end-of-life vehicle scrapping.

The ambition of a competitive, resilient and low-carbon economy also required the creation of an integrated, complementary and coordinated framework of climate policy instruments for 2020/2030, which was adopted by Resolution of the Council of Ministers No 56/2015, of 30 July, as part of the review of the National Programme for Climate Change (PNAC 2020/2030) and the 2nd stage of the National Strategy for Adaptation to Climate Change (ENAAC 2020). It also established a National System of Policies and Measures

[35] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=117&sub3ref=1376

[36] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=118&sub3ref=955

[37] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=117&sub3ref=301

[38] It should be noted that the effects of the measures included in the environmental tax reform were not considered in the policy scenarios used for the projections, since they were adopted after those projections had already been completed.

(SPeM)[39], a tool which was subsequently regulated by Resolution of the Council of Ministers No 45/2016, of 26 August.

The objectives were as follows:

a) To promote the shift to a low-carbon economy, generating more wealth and jobs and contributing to green growth;

b) To ensure a sustainable path in the reduction of GHG emissions;

c) To strengthen national resilience and adaptability;

d) To ensure a committed participation in international negotiations and in cooperation issues;

e) To foster research, innovation and knowledge production;

f) To involve society in the challenges of climate change, helping to increase individual and collective action;

g) To enhance the effectiveness of information, reporting and monitoring systems;

h) To ensure funding conditions and increase investment levels;

i) To guarantee conditions for effective governance and ensure the mainstreaming of climate objectives into sectoral areas.

It therefore takes up the challenge of identifying policy options to meet the objectives and targets already established within the framework of the CCV.

The Inter-ministerial Commission for Air and Climate Change (CIAAC) was also created in this context, as a political structure in charge of monitoring climate policy and sectoral policies with an impact on national targets for air and climate change, given the existing synergies between these two areas. CIAAC is chaired by the member of government responsible for the environment and it is integrated in the government departments of energy, spatial planning, finance, agriculture, maritime policy, economy, innovation, transport, health, tourism, civil protection, regional development, local government, foreign affairs and cooperation, education and science, as well as in coordination with representatives of the regional governments of the Azores and Madeira.

With the adoption of the strategic framework and related legislative package, Portugal now has a renewed integrated framework of climate policy instruments, which increases its capacity to address the challenges of climate change.

The year 2015 was also characterised by governmental changes stemming from the setting up of the 21st Constitutional Government (which took office at the end of 2015), whose Organic Law was passed by Decree-Law No 251-A/2015, of 17 December.

Consequently, in the process of reorganising public services and other entities, the structure of the Ministry of Environment[40] was changed, no longer being responsible for energy issues, since these were transferred to the Ministry of Economy. In the current 21st Government, the mission of the Ministry of Environment consists of designing, steering and evaluating policies relating to environment, spatial planning, cities, housing, urban, suburban and road passenger transport, climate and nature conservation, from the point of view of sustainable development and social and territorial cohesion. The incorporation of responsibilities for the transport sector is an innovative feature compared to the previous structure, and falls within the logic of an integrated vision of sustainability,taking into account the role played by the transport sector in the future decarbonisation of our economy, also from the point of view of territorial and social cohesion.

This responsibility for the transport area is also shared with the Ministry of the Interior, the Ministry of Planning and Infrastructure and the Ministry of the Sea concerning issues related to the respective areas. This shared vision also extends to issues necessary for the conservation of nature and forestry, namely with the Ministry of Agriculture, Forestry and Rural Development.

[39] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=117&sub3ref=1379

[40] Organisational chart can be found in the appendix.

The Portuguese Environment Agency (APA) remains under the Ministry of Environment, and it also retains the powers to propose, develop and monitor the implementation of environmental policies, notably in the fight against climate change, an area for which the Minister of Environment is now directly responsible.

In addition, and with regard to financial mechanisms, it was established that the Government's programme should provide for the creation of a single Environmental Fund by aggregating resources from existing funds, so as to obtain an instrument with greater financial capacity and more adaptability to challenges.

To this end, the Environmental Fund was set up by Decree-Law No 42-A/2016, of 12 August, with effect from 1 January 2017, thus terminating the Portuguese Carbon Fund (FPC), the Environmental Action Fund, the Fund for the Protection of Water Resources and the Fund for the Conservation of Nature and Biodiversity. As a consequence, the Environmental Fund takes up all responsibilities inherent to the former funds, aiming to support environmental policies in order to achieve the sustainable development goals, thus helping to meet national and international objectives and commitments, including those related to climate change, water resources, waste and conservation of nature and biodiversity.

Following the reorganisation process mentioned above, the Environmental Fund is now under the direct responsibility of the Ministry of Environment and its day-to-day management is performed by the Secretary General of the Ministry of Environment.

Emission reduction targets

For 2020, the EU has set a EU GHG emission reduction target of at least 20 % when compared to 1990. At European level, sectors covered by the EU Emissions Trading Scheme (EU ETS) should reduce their emissions by 21 % compared to 2005 levels and other sectors not covered by the EU ETS (non-ETS) should reduce their emissions by 10 % in relation to 2005 levels. Within the scope of the Climate and Energy Package for 2020, this emission reduction target was coupled with the establishment of EU targets of 20 % share of renewable energy in final energy consumption and an increase in energy efficiency by 20 % (EE).

In the context of the Climate and Energy Package for 2020, Portugal should limit the rise of GHG emissions from non-ETS sectors to 1 % between 2013 and 2020, as compared to 2005, and set annual ceilings for non-ETS emissions during that period. Portugal has also set itself a target of 31 % of energy from renewable sources in gross final energy consumption, of which 10 % in transport, as well as an overall goal of 25 % EE (more ambitious than the 20 % goal set at EU level) and a specific target of 30 % EE for Public Administration (Figure 4.1.1).

Reduction Target of 20% (21% from EU-ETS & 10% from Non-EU ETS comparing to 2005)	**Renewables Binding Target of European Union of 20% from which 10% are from Transports**	**Energy Efficiency Binding Target of European Union of 20%**
National Target Non-EU ETS of +1% comparing to 2005	**Renewables National Target of 31% from which 10% are from Transports**	**Energy Efficiency National Target of 25% & specific goal of 30% are from Public Administration**

Figure 4.1.1

EU and national targets in the context of the Climate and Energy Package for 2020.

For the period 2021-2030, targets at EU level were adopted by the European Council of October 2014 in the framework of the Climate and Energy Package for 2030, establishing the following:

a) An emission reduction of at least 40 % compared to 1990 (43 % reduction in ETS and 30 % in non-ETS compared to 2005 levels);

b) A target of at least 27 % of energy from renewable sources in gross final energy consumption by 2030;

c) An indicative EE target of 27 % to be reviewed in 2020;

d) A target of 15 % of interconnection capacity for energy interconnections, so as to ensure the full participation of all Member States in the internal energy market.

Emission targets have also been set for the national economy as a whole by 2020 (-18 % to -23 % compared to 2005) and by 2030 (-30 % to -40 % compared to 2005), ensuring the fulfilment of national commitments in terms of mitigation and placing Portugal in line with the European objectives.

In this context, PNAC 2020/2030 constitutes the core instrument of mitigation policies, also aiming specifically at promoting the integration of mitigation measures into sectoral policies and ensuring the fulfilment of national commitments within the above mentioned EU and international frameworks.

PNAC 2020/2030 establishes a set of specific guidelines for the transition to a low-carbon economy while aggregating input from sectoral policies. Although it is a national plan, thereby covering the total of national emissions, its priority focus in terms of public policy is directed at the sectors not covered by the EU ETS (non-ETS sectors) by establishing sectoral reduction targets as shown below.

Table 4.1.1

PNAC sectoral targets[41] for sectors not covered by the EU ETS compared to 2005.

Sector	2020 targets	2030 targets
Services	-65%	-69%
Households	-14%	-15%
Transport	-14%	-26%
Agriculture	-8%	-11%
Waste*	-14%	-26%

* Including wastewater.

The EU ETS remains a key instrument of climate change mitigation policy, both at national and at EU level, mainly targeted at industry and energy production.

To ensure the shift to a low-carbon economy, it is also essential to align energy policy objectives with climate policy objectives, in particular regarding the level of ambition set for EE and market penetration of renewable energy sources, harvesting their benefits in terms of energy security, balance of payments of petroleum products and the path to a low-carbon future. Climate and energy objectives are mutually reinforcing and this is why the PNAC must also integrate and accommodate sectoral policies and measures allowing to achieve a reduction of 30 % on the energy baseline and 40 % of renewable energy sources in final energy consumption by 2030.

Table 4.1.2

Summary of PNAC objectives and targets related to climate policy.

Objectives*	2020	2030*	Comments
Reducing CO_{2e} emissions (without LULUCF) (Mt CO_{2e})	68 – 72	52,7 – 61,5	Alignment with EU 2030 targets Reduction of 18-23 % by 2020 (compared to 2005) Reduction of 30-40 % by 2030 (compared to 2005)
Strengthening the share of renewable energy (% in gross final energy consumption)	31%	40%	Compliance with PNAER by 2020 Alignment with the objective set in the PT proposal within the Climate and Energy Package 2030
Increasing EE (energy intensity toe/M€GDP)	122	101	Compliance with PNAEE by 2020 Reduction of 30 % on baseline energy by 2030

* Depending on the results of European negotiations

Source: PNAC

Low-carbon policies and measures identified in the PNAC for these non-ETS sectors, in the 2020/2030 horizon, were based on relevant sectoral policy documents, guidelines drawn from modelling exercises undertaken under the PNAC and contributions from the different sectors.

In this context, the following instruments of national policy are are highlighted due to their relevance:

[41] The sectoral reduction targets were established by maintaining in 2020 the emission levels of 2012, with the exception of the waste sector, where the emission reduction target laid down in the National Waste Management Plan 2014-2020 (PNGR) was applied. For 2030 the average emission reduction levels for the policy scenarios examined were considered.

a. Commitment for Green Growth (CCV);
b. Green tax reform (RFV);
c. National Action Plan for Energy Efficiency (PNAEE);
d. National Action Plan for Renewable Energy (PNAER);
e. Strategic Plan for Municipal Solid Waste (PERSU 2020);
f. National Waste Management Plan 2014-2020 (PNGR);
g. PENSAAR 2020 – A New Strategy for the Water Supply and Sewage Treatment Sector;
h. Rural Development Programme for 2014-2020 (RDP 2020);
i. National Strategy for Forests (ENF);
j. National Strategy for the Sea 2013-2020 (ENM 2013-2020);
k. Strategic Plan for Transport and Infrastructure (PETi3+);
l. National Strategy for Sustainable Cities 2020;
m. National Smart Specialisation Strategy for Research and Innovation;
n. National Action Plan for Circular Economy (PNAEC);
o. National Programme for Spatial Planning Policy (PNPOT).

The programmes listed provide for and are consistent with the established decarbonisation objectives, as they include low-carbon options and integrate climate change mitigation measures, some of which are listed in the PNAC.

It is also important to highlight the alignment between the PNAC and the National Strategy for Air (ENAR 2014-2020), which was developed in parallel with the PNAC, based on the same scenarios for energy demand and with some common measures regarding sectoral initiatives for atmospheric emissions. The methodology used to identify policy options and low-carbon measures was underpinned whenever possible by the cost-effectiveness criterion, which was taken into account in modelling exercises carried out. For each non-ETS sector, a set of efficient measures of technological nature was identified, which were at the same time considered the most effective and as having the greatest impact on building a low-carbon economy, given the state-of-the-art of (sectoral) policies and measures in force (more effective because they have a higher reduction potential; greater impact given their effects on the economy, integration in other sectoral policies and potential to induce behavioural change).

These measures are included in the PNAC, in a non-exhaustive list of options considered interesting and feasible in the context of the transition to a low-carbon economy. These proposed policies and measures constitute therefore a starting point for the design and establishment of cost-effective measures to be implemented by sectors in the context of SPeM for 2020/2030.

Policies and measures in the PNAC are organised around sectoral axes and transversal axes. Sectoral axes include initiatives in the following sectors:

a. Transport and mobility;
b. Service and residential buildings;
c. Industry;
d. Waste and wastewater;
e. Agriculture;
f. Land use, land-use change and forestry.

Transversal axes consider measures which fall under the following areas:

a) Research, development and innovation (RD&I);

b) Knowledge, information and awareness;

c) Green taxation.

In order to organise the measures in a way that is more focused on their implementation, another two integrated policy areas were also taken into account, in which some of the sectoral measures may also be included:

a) Public Administration;

b) Sustainable Cities.

The sectoral targets to be achieved, the means of delivery and the measures to be taken are set out for each sector.

More recently, in Marrakech, the Portuguese Government committed to the national objective of reaching carbon neutrality by 2050.

For that purpose, a new modelling exercise for the 2050 horizon is being prepared, aiming at identifying and analysing the implications of cost-effective paths on the pursuit of this national objective, as well as identifying the main related means of decarbonisation within the framework of the development of a Roadmap to Carbon Neutrality 2050 in Portugal.

The aim is also to perform an assessment for the year 2030 to the same level of detail as for 2050. This exercise should take place during 2017-2018.

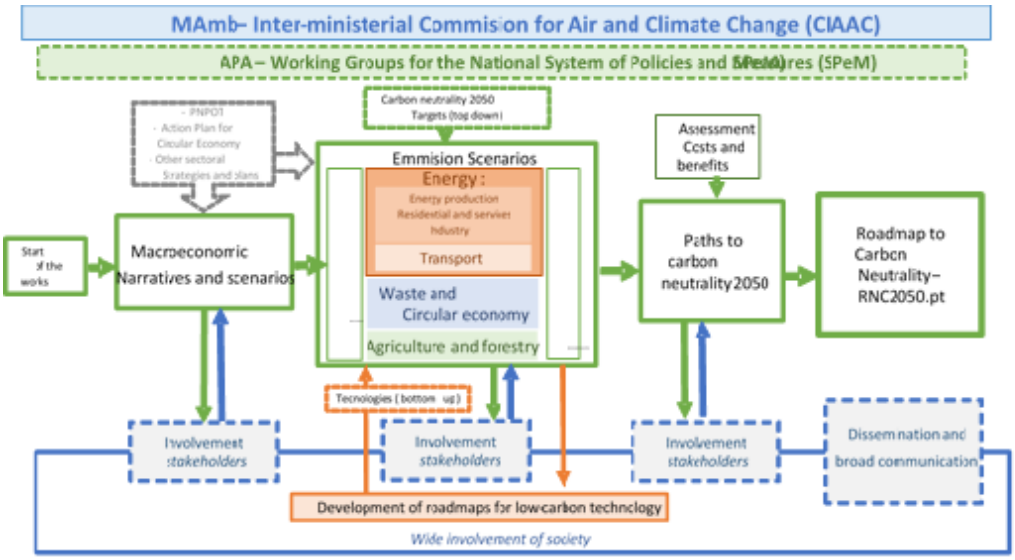


Figure 4.1.2
Schematic representation of the work to be undertaken for the Roadmap to Carbon Neutrality.

Reporting and monitoring the implementation of climate policy and measures adopted

Monitoring the implementation of national policies and measures adopted by Portugal in the framework of its participation at EU and international level is one of the key elements of climate policy in so far as it allows to monitor its progress and ensure the fulfilment of the obligations at the UNFCCC and EU level.

Therefore, following the review of climate policy instruments for 2020/2030, the National System of Policies and Measures (SPeM) was established.

The SPeM, which was approved by Resolution of the Council of Ministers No 45/2016, of 26 August, aims to streamline progress assessment in the implementation of sectoral mitigation policies and measures, enhancing the involvement and strengthening the accountability of the sectors in terms of integrating the climate dimension into sectoral policies, with the objective of helping to meet the requirements laid down in Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 (MMR).

This legal instrument ensures:

a. The management of the process of identifying and designing policies and measures, or groups of policies and measures, that limit or reduce greenhouse gas emissions and other air pollutants by sources or enhance removals by sinks, in order to fulfil national obligations;

b. The follow-up, monitoring and reporting of the implementation of policies and measures and their effects, as well as the reporting of projections, in accordance with the requirements and guidelines at European and international level;

c. The preparation of national projections of greenhouse gas emissions and other air pollutants by sources and their removals by sinks, as well as of the expected effects of policies and measures under implementation and to be implemented, in accordance with the requirements and guidelines at European and international level;

d. The evaluation of the fulfilment of national obligations, including sectoral targets under the Climate and Energy Package of the European Union and air policies for 2020, 2025 and 2030, as set out in the national strategic documents for climate change and air policies.

The SPeM, which is coordinated by the Portuguese Environment Agency (APA), identifies the entities that should serve as focal points (one for each action line) and the entities involved.

In managing the process of identifying and designing policies and measures, the APA, coordination with the focal points, identified the list of cross-cutting policies and measures which are relevant for the fulfilment of national obligations, based on the policies and measures under implementation and those identified in the national strategic documents for climate change and air policies, in particular those established within the national strategic framework.

Focal points are supposed to ensure, wherever possible, an assessment of the effects of policies and measures on the fulfilment of national obligations, notably taking into account possible synergies and conflicts, and this assessment should include information on costs and benefits; alternatively, an assessment of the cost-effectiveness of the measures should be carried out. This work is currently on-going, so not all information mentioned is yet available.

The consolidated list of policies and measures within the SPeM is approved by CIAAC, which can start a process to change it whenever new policies and measures are not considered in the consolidated list, whenever there are proven difficulties in operation and/or implementation of any policy(ies) and measure(s) or whenever the evaluation of the implementation of policies and measures demonstrates that their benefits or their effectiveness fall short of the expected and/or their cost does not justify keeping them.

Under the SPeM a new platform for the management of information will also be developed, in order to facilitate the identification, follow-up, monitoring and reporting of the implementation of policies and measures and their effects, as well as the projections and the assessment of the fulfilment of national obligations. This platform will replace the previous CumprirQuioto.pt platform, which is currently inactive.

The list of policies and measures reported in this Chapter should thus be considered in the light of an ongoing process involving all sectors, of which we present the ones considered most relevant.

4.2. Policy and Measures and their Effects

Energy

Portugal is in the lead regarding the focus on renewable energy, having achieved very positive results in recent years. This is reflected in the reduction of foreign energy dependency (-5.6 p.p. compared to? 2006), in the increase in domestic energy production, which together ensure a higher level of security of supply (24 % of total primary energy consumption in 2015 against 16.5 % in 2006), and in the reduction of GHG emissions (-26.7 % in 2014 compared to 2005). The contribution of the renewable energy sector to the Portuguese economy also needs to be highlighted, in that it generates a whole new industrial and business strand which creates jobs, promotes regional development, boosts exports of goods and services, drives

innovation and scientific research, and is able to attract international investment and stimulate the internationalisation of national businesses.

Residential and services subsector

Attention should be drawn to policies and measures already implemented which have contributed to the reduction of emissions in the residential and services sector, namely the increase in the use of natural gas and energy from renewable sources, as well as energy efficiency improvements resulting from the use of more efficient equipment and implementation of instruments such as the System for the Certification of Buildings, advocated in the PNAEE and PNAER. Also noteworthy is the scheme for electricity production for own consumption.

The primary means of decarbonisation identified in the framework of this exercise were as follows:

a) Energy efficiency leading to a significant reduction in energy consumption;

b) Increasing electrification, in particular in services;

c) Adoption of solar thermal energy, especially for heating water;

d) Adoption of heat pumps for space heating;

e) Adoption of heating inserts for space heating, replacing traditional fireplaces in the residential sector;

f) Adoption of isolation measures in the residential sector.

Table 4.2.1

Policies and measures for the energy sector[42]

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Promotion of energy efficiency in the agricultural sector	Establishment of incentives for energy efficiency measures in the sector, including irrigation, associated with improvements in water efficiency, aimed at reducing the energy intensity of the sector by 2030. Monitoring of GHG in systems for monitoring policies and measures to encourage energy efficiency, Using methodologies compatible with the emissions inventory.	Demand management/reduction (Energy consumption); Energy efficiency in the agricultural sector (Other energy consumption)	CO_2	Regulatory; Planning; Economic	Common Agricultural Policy (CAP) Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013, and their transitory measures for 2014 (Regulation 1310/2013, 2006/144/EC; Other EU:Cohesion Policy - Operational Program for Sustainability and Efficiency in the Use of Resources (POSEUR)	Implemented	Rural Development Program Management Authority (2014-2020) (Government)	WEM	N.A.	N.A.
Promotion of renewables in the agricultural sector	Establishment of incentives for production by the agricultural sector of renewable energies (solar thermal, green heat, biomass, minicompanies, biomethane, others). Monitoring of GHG in the monitoring systems of policies and measures to encourage the use of renewable energy in the sector, using methodologies compatible with the inventory of emissions.	Increase in renewable energy (Energy supply); Efficiency improvement in industrial end-use sectors (Energy consumption); Demand management/reduction (Energy consumption)	CO_2	Regulatory; Planning; Economic	Common Agricultural Policy (CAP) Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013, and their transitory measures for 2014 (Regulation 1310/2013, 2006/144/EC; Other EU:Cohesion Policy - Operational Program for Sustainability and Efficiency in the Use of Resources (POSEUR)	Implemented	Rural Development Program Management Authority (2014-2020) (Government)	WEM	N.A.	N.A.
Decarbonization Public Administration buildings	Promoting energy efficiency measures targeting the Public Administration: - Energy certification of State buildings and energy efficiency management contracts - Action Plan for Energy Efficiency in Public Administration (ECO.AP) - More efficient public administration transport - Efficient public lighting	Efficiency improvements of buildings (Energy consumption); Demand management/reduction (Energy consumption)	CO_2	Regulatory; Planning	Energy Efficiency Directive 2012/27/EU	Implemented	Directorate-General for Energy and Geology (DGEG) (Government)	WEM	N.A.	N.A.
Promotion of production and self-consumption of renewables	Increase the introduction of renewable energies in final energy consumption, reducing the carbon intensity of the building stock (residential and commercial), through the following actions: promoting the integration of solar thermal collectors in the built-up park and building and renovation of the Park of existing equipment at end of life and promotion of the production of electricity for self consumption from renewable sources.	Increase in renewable energy (Energy supply)	CO_2	Economic; Regulatory	RES directive 2009/28/EC; Other EU:Directive 2010/31/EU on the energy performance of buildings; Other EU:Directive 2009/28/EC - promotion of the use of energy from renewable sources	Implemented	Directorate-General for Energy and Geology (DGEG) (Government)	WAM	N.A.	N.A.
Energy efficiency in buildings	To increase the energy performance rating of residential buildings and services and reduce their carbon intensity by extending the system in line with the guidelines of the Energy Efficiency Directive; To reduce the energy consumption and carbon intensity of the building stock (residential and commercial) by promoting the application of efficient insulating materials (roofing, flooring and walls) in the building stock with repair and Promotion of the use of double glazing, thermal cut-off frames and efficient (low-emissivity) glass in the park of buildings with repair needs. To use energy more efficiently in the building stock (residential and commercial), through the following actions: promotion of the replacement of fireplaces by heat recuperators in residential buildings and promotion of the acquisition of heat pumps for heating in replacement of active air conditioning. To use energy more efficiently in the park of buildings (residential and commercial), through the adoption of national programs leading to the promotion of efficient lighting, through the renovation of the park by the replacement of energy-efficient lamps and their respective phase-out. To use energy more efficiently in the building stock (residential and commercial), by promoting the replacement of household appliances and other electrical equipment for essentially domestic use, reducing the specific consumption of the domestic equipment fleet.	Efficiency improvements of buildings (Energy consumption); Efficiency improvement of appliances (Energy consumption); Efficiency improvement in services/ tertiary sector (Energy consumption); Demand management/reduction (Energy consumption)	CO_2	Regulatory; Planning	Energy Efficiency Directive 2012/27/EU; Other EU:Directive 2012/27/ U of the European Parliament and of the Council of 25 October 2012 on Energy Efficiency	Implemented	Directorate-General for Energy and Geology (DGEG) (Government)	WEM	N.A.	N.A.
Phasing out fuel oil cogeneration	Reduction or phasing out of the tariff for cogeneration plants using fuel oil.	Efficiency improvement in industrial end-use sectors (Energy consumption); Switch to less carbon-intensive fuels (Energy supply)	CO_2	Economic; Regulatory	Cogeneration Directive 2004/8/EC; Directive 2006/32/EC on end-use energy efficiency and energy services	Implemented	Diretorate-General for Energy and Geology (DGEG) (Government)	WEM	N.A.	N.A.
Renewables: Heating and Cooling	Measures promoting of renewables: Thermal solar energy; Green heat; Registration of installers of small renewables systems.	Increase in renewable energy (Energy supply); Enhanced non-renewable low carbon generation (nuclear) (Energy supply)	CO_2	Economic; Regulatory	RES Directive 2009/28/EC	Implemented	Diretorate-General for Energy and Geology (Government)	WEM	N.A.	N.A.
Renewables: Electricity	Promoting renewables in the electricity sector: Introduction of a general remuneration regime; Operationalisation of the market facilitator role; Operationalisation of Origin Guarantees; Biomass power plants (decentralised network); One stop shop electricity; National Dam Plan including reinforcement of capacity and installation of pumping systems; Offshore energy pilot zone; Over-equipment for wind fams.	Increase in renewable energy (Energy supply); Switch to less carbon-intensive fuels (Energy supply); Efficiency improvement in the energy and transformation sector (Energy supply)	CO_2	Economic; Regulatory; Information; Planning	RES Directive 2009/28/EC	Implemented	Diretorate-General for Energy and Geology (Government)	WEM	N.A.	N.A.

N.A. – not available

[42] This includes PAMs related to Energy consumption (comprising consumption of fuels and electricity by end users such as households, services, industry and agriculture) and/or Energy supply (comprising extraction, transmission, distribution and storage of fuels as well as energy and electricity production).

Transport and mobility

In the area of transport and mobility at national level, achievements in the decarbonisation of the national fleet are highlighted, as Portugal is one of the European countries with lower CO_2 emissions from new vehicles placed on the market. Measures implemented by national initiative in this sector include the establishment of national targets for the incorporation of biofuels in transport, the inclusion of CO_2 in the tax on vehicles (ISV), investments in transport infrastructure, investment in cleaner vehicles for public transport fleets and the Programme for Electric Mobility – MOBI.E. The framework for electric mobility was reviewed in order to broaden and allow for more competition in the public network, also supporting charging methods in private locations.

This reinforces the commitment towards electric mobility, recognising the importance of public policies in encouraging the penetration of new technologies.

Pressures exerted on the environment by the transport sector remain significant and there is a need to find alternatives to car use, making it increasingly important to promote a modal shift to public transport and a better functioning of public transport networks. The priority of the Strategic Plan for Transport and Infrastructure (PETi3+) is to ensure mobility and accessibility for people and goods efficiently and according to needs, thus promoting social cohesion.

Initiatives were also taken into consideration which are included in the Strategic Plan for Transport and Infrastructure 2014-2020 (PETI), in 'CiclAndo' – National Plan for the Promotion of Cycling and Other Soft Modes, as well as in the Mobility Package, in particular the National Guidelines for Mobility (January 2012).

As for primary means of decarbonising, energy efficiency of vehicles was considered, resulting from technological developments and fleet renewal, the introduction of hybrid vehicles and the incorporation of biofuels.

Table 4.2.2

Policies and measures for the transport sector

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Reduction of the carbon intensity of the passenger transport system for medium and long haul	Build a low carbon mobility pattern; reduce energy intensity (GJ / pkm) and increase the efficiency of passenger and freight transport through the following actions: effective incorporation and enhancement of environmental and low carbon performance criteria in the process of contracting public passenger transport concessions; promotion of Mobility Plans of companies and generating poles and attractors of displacements.	Efficiency improvements of vehicles (Transport); Demand management/reduction (Transport)	CO_2	Regulatory	Energy Efficiency Directive 2012/27/EU	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Promotion of the use of public transport (modal shift) for passangers and freight for medium and long haul	Build a low carbon mobility pattern, reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport, including through: expansion and modernising the rail network; promoting multimodal interurban public transport (improvement of quality of service, tariff integration, intermodality, information to the public); promoting public transport on demand (flexible) in low density areas.	Modal shift to public transport or non-motorized transport (Transport)	CO_2	Planning; Regulatory	Energy Efficiency Directive 2012/27/EU	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Modal shift for rail and maritime freight transport for medium and long haul	Build a low carbon mobility pattern, reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport by: promoting initiatives to promote rail and maritime transport and remove barriers to their use, Including articulation between operators and companies with high freight transport needs.	Modal shift from road to rail or maritime (Other transport)	CO_2	Regulatory; Planning	Energy Efficiency Directive 2012/27/EU	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Reducing of the carbon intensity of the freight transport system in medium and long haul	Build a low carbon mobility pattern; Reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport through the following actions: efficient management of freight transport, including through logistics management, including reverse logistics, fleet management, route optimization, among others; optimisation of the operation of multimodal logistics chains.	Efficiency improvements of vehicles (Transport); Demand management/reduction (Transport)	CO_2	Planning; Regulatory	Energy Efficiency Directive 2012/27/EU	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Reduction of the carbon intensity of the urban and suburban transport and logistics system	Promote sustainable mobility by creating the conditions for a paradigm change in urban mobility, through the following actions: Development and implementation of Mobility and Transport Plans (PMT), Plans of Action for Sustainable Urban Mobility (PAMUS) or other Mobility Plans Sustainable Mobility by CIM/AM and municipalities with priority for those over 50,000 inhabitants or that are district capitals, or CIM/AM; Promotion of Mobility Plans of companies and poles generators and attractors of displacements and School mobility plans; Demand management (passengers and freight) and urban planning in order to reduce the volume of journeys (traffic) and distance of journeys; Creation of Zero Emission Zones (ZERs), where applicable; Encourage shared mobility initiatives such as car sharing, bike sharing and car pooling; Adoption of tools to support mobility management and information systems and technologies in support of mobility and communication - intelligent mobility - aimed at users (generalization of real-time information at stops, public information portals, mobile apps); Effective incorporation and enhancement of environmental and low carbon performance criteria in the process of contracting public passenger transport service concessions.	Modal shift to public transport or non-motorized transport (Transport); Demand management/reduction (Transport)	CO_2	Planning; Regulatory	PaM not related to Union policies	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Promotion of the use of in urban and suburban public transport (modal shift)	To promote sustainable mobility by creating conditions for the paradigm shift in urban mobility, through the following actions: Expansion and modernization of medium and large capacity transportation networks and services: electric/light rail network; Transport corridors in own place; Direct services; Public transport promotion actions (improvement of territorial coverage / density of the network, frequencies, quality of service, tariff integration, intermodality conditions, with a view to increasing the use of public transport in the modal split; Transport solutions to demand (urban lines and services in minibus, flexible transport services in areas / periods of low demand - peripheral crowns and night time - and new solutions for the organization and Taxi) Restrictions on the use of Individual Transportation (worsening of car use costs, urban design, implementation of residential areas and coexistence) Measures of positive discrimination of the use of vehicles of high environmental performance in particular electric.	Modal shift to public transport or non-motorized transport (Transport)	CO_2	Planning; Regulatory	PaM not related to Union policies	Implemented	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)	WEM	N.A.	N.A.
Adoption of low carbon technologies in road, rail and sea fleets	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low-carbon technologies, namely on the electric vehicle (VE) and adopt clean fuels, through the following actions: Reduction of the average age of the fleets of public transport vehicles of passengers and goods and establishment of age limit ; Establishment of age limit for taxis; Promotion of the acquisition of vehicles of high environmental performance, namely of low carbon by individuals and companies, in particular hybrids and electric; Encourage the use of ships and boats powered by cleaner fuels in transport and other maritime activities; Promote the reduction of emissions from ships in port.	Low carbon fuels/electric cars (Transport); Efficiency improvements of vehicles (Transport)	CO_2	Regulatory; Planning	PaM not related to Union policies	Implemented	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Metro de Lisboa (Companies);Metro do Porto (Companies); Sociedade de Transportes Coletivos do Porto, S.A. (Companies)	WEM	N.A.	N.A.
Promotion of electric mobility	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low carbon technologies, namely on the electric vehicle (EV) and adopt clean fuels, through the following actions: Consecration of the new model for electric mobility; Measures to encourage electric mobility (incentives to slaughter EV); Promotion of EV in taxi fleets; Promotion of EV in urban micrologistics; Promotion of EV of two wheels; deployment of charging infrastructure Electric mobility management structure	Low carbon fuels/electric cars (Transport); Improved transport infrastructure (Transport)	CO_2	Fiscal; Economic; Regulatory; Planning	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC; Regulation on CO2 from cars and vans (2009/443/EC, (EU) No 510/2011, (EU) No 397/2013, (EU) No 333/2014, (EU) No 253/2014, 2013/128/EU, (EU) No 396/2013, (EU) No 114/2013); RES directive 2009/28/EC	Implemented	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Sociedade de Transportes Coletivos do Porto, S.A. (Companies)	WEM	N.A.	N.A.
Promotion of the use of biofuels	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low-carbon technologies, namely on the electric vehicle (VE) and adopt clean fuels, through the following actions: Promotion of at least 10% of the incorporation	Low carbon fuels/electric cars (Transport)	CO_2	Regulatory	RES directive 2009/28/EC; Other EU:Directive (EU) 2015/1513; Other EU:Directive (EU) 2014/94	Implemented	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Sociedade de	WEM	N.A.	N.A.

	of renewable energy into final energy consumption in transport ; Increase in the quantity (tep) of advanced biofuels incorporated in road transport.						Transportes Coletivos do Porto, S.A. (Companies)			
Promotion of the development of the network of alternative fuel stations	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); To disseminate and build knowledge about low-carbon technologies, namely on the electric vehicle (EV) and to adopt clean fuels, through the following actions: Support the expansion of the electric energy charging network and the natural gas supply network for Land and sea transport; Complete regulations for the supply of LNG in seaports.	Improved transport infrastructure (Transport)	CO_2	Regulatory; Planning	PaM not related to Union policies	Planned	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government)	NIP	N.A.	N.A.
Eco-driving promotion	Promote more efficient behaviors through the following actions: Promote eco-driving courses (ecological and efficient driving); Incorporate eco-driving in the training of drivers.	Improved behaviour (Transport)	CO_2	Regulatory; Information	PaM not related to Union policies	Planned	National Institute for Transport and Mobility (IMT) (Government); Portuguese National Councils Association (ANMP) (Government); Directorate-General for Energy and Geology (DGEG) (Government); Comboios de Portugal, E.P.E. (CP) (Companies)	NIP	N.A.	N.A.
Promotion of the use of new technologies to induce sustainable mobility behavior	To promote more efficient behavior, through the following actions: Promotion of the use of information technologies to induce more sustainable behavior (of the users of the transport, systems of support to the driver and of information in travel); Support for eco-driving monitoring technologies; Reduction of the need to travel through the adoption of videoconferencing or other forms of distance communication and telework; Dissemination of information on urban mobility options.	Improved behaviour (Transport); Demand management/reduction (Transport)	CO_2	Information; Regulatory	PaM not related to Union policies	Planned	National Institute for Transport and Mobility (IMT) (Government); Portuguese National Councils Association (ANMP) (Government)	NIP	N.A.	N.A.
Plan for sustainable mobility in the public administration	Set the example by creating a low carbon transport and mobility system; Reduce energy intensity (GJ / pkm) and increase transport efficiency, through the following instruments and actions: support program for the electric vehicle in the Public Administration, promotion of the decarbonization of the State fleet through technological changes in vehicles, promotion of management Including promoting the use of public transport and car pooling and car pooling initiatives and promoting behavior change, including the development of eco-driving training actions. Main purpose: achieve a 20% reduction in fleet emissions by 2030	Low carbon fuels/electric cars (Transport); Modal shift to public transport or non-motorized transport (Transport); Efficiency improvements of vehicles (Transport); Improved behaviour (Transport); Demand management/reduction (Transport)	CO_2	Regulatory; Information; Planning	PaM not related to Union policies	Implemented	Directorate-General for Energy and Geology (DGEG) (Government)	NIP	N.A.	N.A.
CO_2 Component on Motor Vehicles Taxes	Positive discrimination on motor vehicles taxes: 1) CO2 component on registration tax; 2) CO2 component on the annual circulation tax; 3) Exemption of registration and annual circulation taxes for electric vehicles.	Efficiency improvements of vehicles (Transport); Low carbon fuels/electric cars (Transport)	CO_2	Fiscal	PaM not related to Union policies	Implemented	Ministry of Finance (Government)	WEM	N.A.	N.A.
Regulation on CO_2 for Cars and Vans	Implementation of the Regulation 2009/443/EC of the European Parliament and the Council of 23rd of April; Implementation of the Regulation 2011/510/EC of the European Parliament and the Council of 11nd of May	Efficiency improvements of vehicles (Transport)	CO_2	Regulatory	Regulation on CO2 from cars and vans (2009/443/EC, (EU) No 510/2011, (EU) No 397/2013, (EU) No 333/2014, (EU) No 253/2014, 2013/128/EU, (EU) No 396/2013, (EU) No 114/2013)	Implemented	Ministry of Finance (Government)	WEM	N.A.	N.A.

Industry

Means of decarbonisation in industry include an increased energy efficiency, an increase in the consumption of natural gas, the maintenance of electricity consumption and the increase of renewables. In some sectors there is also a reduction in the consumption of biomass, which is replaced by refuse-derived fuel (RDF), a trend that is less marked in the most ambitious scenarios, where a higher penetration of solar thermal energy is still noted.

The industrial sector is largely covered by the EU ETS, this being the most relevant instrument for climate change mitigation in this sector.

However, in the case of industry not covered by the EU ETS, measures aiming at decarbonisation of the sector by 2030 provide for the continuity of the objectives set out in the PNAEE as part of the System for the Management of Intensive Energy Consumption (SGCIE), including cross-cutting measures relating to electrical motors and heat production.

In addition to horizontal measures, the PNAEE identifies, for a significant number of industrial sectors, a set of specific or sectoral measures with possible actions, which apply only in their respective production processes.

Table 4.2.3

Policies and measures for the industry sector[43]

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
System for the Management of Intensive Energy Consumption – SGCIE	Promote energy efficiency and monitor the energy consumption of energy-intensive consumer installations. Monitoring and control; Effluent treatment; Integration of processes; Maintenance of energy-consuming equipment; Thermal insulation; Training and sensitization of human resources; Reduction of reactive energy.	Efficiency improvement in industrial end-use sectors (Energy consumption); Demand management/reduction (Energy consumption); Reduction of losses (Other energy consumption); Reduction of losses (Other industrial processes)	CO_2	Regulatory; Voluntary/negotiated agreements	Directive 2006/32/EC on end-use energy efficiency and energy services; Energy Efficiency Directive 2012/27/EU	Implemented	Directorate-General for Energy and Geology (DGEG) (Government); Portuguese Agency for Energy (ADENE) (Government)	WEM	N.A.	N.A.
Implementation of the fluorinated gas regulation	Implementation of the provisions of Regulation (EU) No. 517/2014 and adaptation of national legislation to reflect the provisions of this Regulation, including the allocation of new fines and the operationalization of the communication of purchases and sales of these gases, as well as the communication on the form Of f-gases, as well as to reduce the imported quantity of these gases and to promote their substitution by other substances with lesser or no PAG.	Replacement of fluorinated gases by other substances (Industrial processes); Reduction of emissions of fluorinated gases (Industrial processes)	HFC; PFC; SF6	Regulatory	F-gas Regulation 517/2014	Implemented	Portuguese Environment Agency (APA) (Government)	WAM	N.A.	N.A.

[43] This includes PaMs related to Industrial processes (comprising industrial activities that chemically or physically transform materials leading to greenhouse gas emissions, use of greenhouse gases in products and non-energy uses of fossil fuel carbon).

Agriculture

In the period until 2020, guidelines for the agricultural sector are essentially set out in the RDP for 2014-2020, which has the overriding principle of concentrating aid for the sector and for the production of tradable goods addressed to operators directly involved in value creation from agricultural and forestry activities, based on efficient management of resources.

The RDP strategic objectives include the "promotion of efficient management and protection of resources", which contributes to "priority 5 – Promoting resource efficiency and supporting the shift towards a low-carbon and climate-resilient economy in the agriculture, food and forestry sectors". The RDP identifies the need to continue improving EE and to promote the use/production of renewable energy on farms as well as the use of agricultural and forestry by-products for energy purposes. RDP provides also for action A3: Environment, resource efficiency and climate.

Land use, land-use change and forestry

The LULUCF sector is expected to remain a net sink throughout the entire period under analysis. As a sector of great relevance in terms of mitigation policy, measures for this sector are considered taking into account the relevant instruments agreed at national level, such as the ENF and the RDP 2020.

Table 4.2.4

Policies and measures for the agriculture sector

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Promotion of more efficient livestock effluent management systems	Reduce the carbon intensity of livestock effluents, through better management (individual and collective). Reduce the carbon intensity of livestock effluents through its better control (guarantee of application of the rules of management of licensed livestock effluents).	Improved animal waste management systems (Agriculture)	CH_4; N_2O	Regulatory; Planning	Common Agricultural Policy (CAP) Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013, and their transitory measures for 2014 (Regulation 1310/2013, 2006/144/EC	Implemented	2020 Rural Development Programme Management Authority(PDR2020) (Government); 2020 Madeira Rural Development Programme Management Authority(PRODERAM2020) (Regional); 2020 Azores Rural Development Programme Management Authority (PRORURAL2020) (Regional)	WEM	N.A.	N.A.
Incentive to reduce the use of nitrogen fertilizers	Decrease of the consumption of nitrogen fertilizers by applying mandatory standards under cross-compliance. It applies to the 1st pillar and to the beneficiaries of the agro-environment and areas subject to natural conditioning of the 2nd pillar. Monitoring of GHG in the monitoring systems of policies and measures to incentivize the reduction of the use of nitrogen fertilizers (with reference to the Code of Good Agricultural Practices) and the National Emission Ceilings Directive, using methodologies compatible with the emissions inventory.	Reduction of fertilizer/manure use on cropland (Agriculture)	N_2O	Regulatory	Common Agricultural Policy (CAP) Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013, and their transitory measures for 2014 (Regulation 1310/2013, 2006/144/EC; Other EU:Regulation No 1306/2013;; Other EU:Regulation n.º 1307/2013	Implemented	Financing Institute for Agriculture and Fisheries (Government)	WEM	N.A.	N.A.
Conserving, restoring and improving agricultural and forest soils and preventing their erosion	Promote agricultural and forestry techniques that increase the carbon stock in the soil. Support the installation of improved permanent grassland. Support the conservation of traditional permanent crops. Support for investment in agricultural holdings, which may include operations to improve fertility and soil structure. Promote the use of crops / species appropriate to the soil characteristics, which are contrary to the processes of acidification and salinization. Ensure compliance with Good Agricultural and Environmental Conditions (BCAA) and Legal Requirements for Management (RLG) as a prerequisite for access to funding under the Common Agricultural Policy (CAP).	Other activities improving cropland management (Agriculture); Activities improving grazing land or grassland management (Agriculture); Conservation of carbon in existing forests (LULUCF); Enhanced forest management (LULUCF)	CO_2	Regulatory; Planning; Economic	Common Agricultural Policy (CAP) Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013, and their transitory measures for 2014 (Regulation 1310/2013, 2006/144/EC; Other EU:Regulation (EU) n.º 1305/2013, Annex II of the Regulation (EU) n.º 1306/2013 and Implementing Order n.º 6/2015 of 20th of February	Implemented	Rural Development Program Management Authority (2014-2020) (Government); Financing Institute for Agriculture and Fisheries (IFAP) (Government)	WEM	N.A.	N.A.

Table 4.2.5

Policies and measures for the Land use, land-use change and forestry sector

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Increase the resistance and resilience of the forest to the abiotic and biotic agents	Reducing the number of fires, the burnt area and the emissions from fires through implementation of fire prevention actions	Strengthening protection against natural disturbances (LULUCF); Enhanced forest management (LULUCF)	CO_2	Regulatory; Planning; Economic	LULUCF Decision No 529/2013/EU	Implemented	ICNF, GPP (Government)	WEM	N.A.	N.A.
Support for afforestation and improving of the environmental value of forests	Increase forest area by planting agricultural land, non-agricultural land and areas prone to desertification. It also aims at improving the conservation and condition of forest habitats, riparian corridors and other NATURA 2000 areas and to improve the management standards of existing forests	Afforestation and reforestation (LULUCF); Enhanced forest management (LULUCF); Enhancing production in existing forests (LULUCF); Conservation of carbon in existing forests (LULUCF); Substitution of GHG-intensive feedstocks and materials with harvested wood products (LULUCF); Restoration of degraded lands (LULUCF)	CO_2	Regulatory; Planning; Economic	LULUCF Decision No 529/2013/EU	Implemented	ICNF, GPP (Government)	WEM	N.A.	N.A.
Promotion of the use of forest products as substitutes for fossil raw materials	Promote the use of biomass for energy through the establishment of short rotation biomass production and to promote the substitution of fossil based raw materials with forest products.	Increase in renewable energy (Energy supply); Substitution of GHG-intensive feedstocks and materials with harvested wood products (LULUCF)	CO_2	Regulatory; Planning	CAP Reform 2013 regulations: Rural Development (1305/2013), 'Horizontal' issues (1306/2013), Direct payments (1307/2013) and Market measures (1308/2013)	Implemented	ICNF, GPP (Government)	WEM	N.A.	N.A.

Waste

For the waste and wastewater sector, PNGR, PERSU and PENSAAR are highlighted as the strategic plans that contribute most to GHG reduction and therefore to the PNAC objectives.

PNGR 2014-2020 establishes the strategic guidelines at national level for policy on waste prevention and management, and the guiding rules which ensure consistency of the specific instruments for waste management, towards achieving the principles set out in the General Waste Management Scheme. This way, the PNGR seeks to promote waste prevention and management as part of the life-cycle of products, focused on an increasingly circular economy and ensuring greater efficiency in the use of natural resources, with the following strategic objectives: Promoting efficient use of natural resources in the economy; Preventing or reducing the negative impacts of waste generation and management.

This Plan establishes an action framework with specific measures in terms of GHG emission reduction, prevention of waste production and recovery and re-use of products/materials, by promoting the closing of materials cycles, the use of energy cascading and the consolidation and optimisation of the waste management network. To that effect, coordination with the PNAC has been ensured, as the PNGR establishes a target for GHG emissions in the waste sector, which should not exceed 4 Mt CO2e in 2020, and this value is set at 6,9 Mt CO2e when including wastewater.

PERSU 2020, adopted by Ordinance No 187-A/2014, of 17 September, is the new reference tool for municipal waste policy in mainland Portugal, and the PNAC incorporates all the measures set out in this Plan. This Plan lays down the vision, objectives, global targets and specific targets by Municipal Waste Management System, the measures to be implemented in the context of municipal waste in the period 2014-2020, as well as the strategy supporting their implementation, thus contributing to the achievement of national and EU targets in this area.

The implementation of PERSU 2020 seeks to attain ambitious levels of waste recycling and preparation for reuse in mainland Portugal, including the following overall targets by 2020:

a. Biodegradable municipal waste going to landfills must be reduced to 35 % of the total amount, by weight, of biodegradable municipal waste produced in 1995;

b. An overall increase to at least 50 %, by weight, in the the preparation of municipal waste for reuse and recycling, including paper, cardboard, plastic, glass, metal, wood and biodegradable municipal waste;

c. Achieving a reduction of waste generation per inhabitant of at least 10 %, by weight, compared to values recorded for 2012;

d. Ensuring, at national level, the recycling of at least 70 %, by weight, of packaging waste.

The general principles established for the PERSU 2020 are realised in eight objectives, which underpin the setting of targets and measures for municipal waste between 2014 and 2020. It should be stressed that for objective "8 – Increasing the contribution of the sector to other national strategies and plans" the following measures are laid down: "Contribution to the achievement of GHG emission reduction targets" and "Contribution to energy production from renewable sources".

In the wastewater sector, PENSAAR 2020 also identifies a number of measures that contribute to the reduction of GHG emissions associated with the wastewater sector, which are taken into consideration in the PNAC.

PENSAAR 2020 – A New Strategy for the Water Supply and Sewage Treatment Sector is based on a strategy which is less focused on increasing the coverage of infrastructure, and more focused on asset management, its operation and the quality of services provided with widespread sustainability. To this end, strategic objectives have been set – also referred to as Axes – which bear the vision for the sector and are at the core of a sectoral strategy to be implemented in the period 2014-2020. For the PNAC, measures selected were the ones included in the operational objectives which were more in lign with the PNAC objectives.

Table 4.2.6

Policies and measures for the Waste management sector

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Prevention of waste production	Voluntary agreements and prevention measures with industry aiming clean production and sustainable manufactoring of products.	Demand management/ reduction (Waste); Reduced landfilling (Waste)	CH_4; N_2O	Planning; Regulatory; Voluntary/ negotiated agreements	Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Councils (Local); Waste management systems (Companies)	WAM	N.A.	N.A.
Increased of the preparation for recycling re-use and quality of recyclables	Increasing the quantity and quality of materials taken up and recovered through the implementation of technical specifications and selectively collected biodegradable municipal waste.	Demand management/ reduction (Waste); Reduced landfilling (Waste); Enhanced recycling (Waste)	CH_4; N_2O	Planning; Regulatory	Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Specific flow management entities (Companies); Waste management systems (Companies)	WAM	N.A.	N.A.
Reduction of landfill	Diversion of recyclables and biodegradable municipal waste from landfill. Landfill diversion of refuse and waste from urban waste treatment.	Reduced landfilling (Waste)	CH_4	Planning; Regulatory	Waste Directive 2006/12/EC; Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Waste management systems (Companies); Councils (Local)	WAM	N.A.	N.A.
Economic recovery and disposal of recyclables and by-products	Streamline the market for recyclable materials and enhance classification as a by-product and end of waste status. Promote the use of biogas for energy production and the incorporation of waste into biofuels.	Increase in renewable energy (Energy supply); Low carbon fuels/electric cars (Transport); Enhanced CH_4 collection and use (Waste)	CH_4; CO_2	Planning; Regulatory	Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Industry (Companies); Waste management systems (Companies)	WAM	N.A.	N.A.
Consolidate and optimize the waste management network	Encourage the proximity of the collection network to the user and the selective separation and enhance the synergies of waste collection and treatment in a complementarity logic. Improving treatment efficiencies in the urban waste sector.	Improved landfill management (Waste); Enhanced recycling (Waste)	CH_4; N_2O	Planning; Regulatory	Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Water and Waste Services Regulatory Body (ERSAR) (Government)	WAM	N.A.	N.A.
Promotion the transition to a circular economy	Strengthening the specific flow management systems, with a view to creating synergies and evaluating the application of Producer Extended Responsibility (RAP) to emerging flows. Promote the establishment of new industrial areas developed in an industrial symbiosis perspective, with plans for rationalization of materials and energy and the rehabilitation of existing industrial areas.	Demand management/ reduction (Waste); Improved landfill management (Waste); Installation of abatement technologies (Industrial processes)	CO_2; CH_4; N_2O	Planning	Waste Management Framework Directive 2008/98/EC	Implemented	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Industry (Companies); Waste management systems (Companies)	WAM	N.A.	N.A.
Improvement of wastewater management	Main Purposes: Improvements in the treatment of the solid phase of the WWTP in order to optimize the process from the environmental, economic and technical point of view and the recovery of sludge; Promoting the use of energy production capacity in wastewater treatment systems, including through the use of biogas; Reduction and control of infiltrations and rainwater in public wastewater drainage systems; Development of innovation projects in the area of the conversion of WWTP to factories of valorization of resources with zero emissions of CO_2.	Improved wastewater management systems (Waste)	CO_2; CH_4	Economic	PaM not related to Union policies	Planned	Portuguese Environment Agency (APA) (Government)	WAM	N.A.	N.A.

Table 4.2.7

Cross-cutting policies and measures

Name of PAM	Short description	Objective and/or activity affected	GHG affected	Type of instrument	Union policy which resulted in the implementation of the PaM	Status	Implementing entity or entities	Projections scenario in which the PaM is included	Estimate of mitigation impact, by gas (for a particular year, not cumulative in CO^2eq)	
									2015	2020
Regenerate and revitalize urban centers and contain urban expansion	Promotion of the functional densification of urban fabrics, including the diversification and strengthening of the supply of services and proximity trade, promoting a sustainable mobility standards; Promotion of urban rehabilitation associated with the introduction of solutions for renewable energy use in buildings; Promotion of the extension, qualification and integration of urban green areas by enhancing their role as carbon sinks and urban microclimate regulators.	Territorial Cohesion and Urban Policy (Other cross-cutting)	CO_2	Regulatory; Planning	PaM not related to Union policies	Implemented	Directorate-General for Territory (DGT) (Government)	NIP	N.A.	N.A.
Carbon Tax	Carbon tax on non-ETS sectors linked to ETS allowances average price in the previous year.	Demand management/ reduction (Energy consumption); Demand management/reduction (Transport); Multi-sectoral policy (Cross-cutting)	CO_2	Fiscal	PaM not related to Union policies	Implemented	Ministry of Environment (Government); Ministry of Finance (Government)	NIP	N.A.	N.A.
Tax Incentives for Efficiency and Low Carbon Options	Tax incentives for: 1) Plug-in hybrid and LPG/NGV vehicles; 2) Renewables in urban buildings; 3) Car-sharing/ Bike-sharing systems; 4) Velocipede fleets.	Switch to less carbon-intensive fuels (Energy supply); Efficiency improvements of vehicles (Transport); Low carbon fuels/electric cars (Transport); Multi-sectoral policy (Cross-cutting); Increase in renewable energy (Energy supply); Modal shift to public transport or non-motorized transport (Transport)	CO_2	Fiscal	Energy Efficiency Directive 2012/27/EU	Implemented	Ministry of Finance (Government)	NIP	N.A.	N.A.
Emissions Trading Scheme	Implementation of the EU ETS - Industrial installations and aviation.	Switch to less carbon-intensive fuels (Energy supply); Efficiency improvement in the energy and transformation sector (Energy supply); Installation of abatement technologies (Industrial processes); Increase in renewable energy (Energy supply); Efficiency improvement in industrial end-use sectors (Energy consumption); Demand management/ reduction (Energy consumption); Demand management/ reduction (Transport)	CO_2; N_2O	Economic; Regulatory	EU ETS directive 2003/87/EC as amended by Directive 2008/101/EC and Directive 2009/29/EC and implementing legislation, in particular 2010/2/EU, 2011/278/EU, 2011/638/EU, 176/2014/EU, and Decision (EU) 2015/1814	Implemented	Portuguese Environment Agency (APA) (Government); National Authority for Civil Aviation (ANAC) (Government)	WEM	N.A.	N.A.

5. Projections and the Total Effect of Policies and Measures

In the context of preparing the National Programme for Climate Change 2020/2030 (PNAC 2020/2030), projections were carried out, which began in 2013 and were completed in 2014, and were reported under the previous biennial report (2015). Therefore, for the period 2015-2030 the projection data presented were obtained in the context of those proceedings. These projections are thus an update of the data reported in the 6th National Communication.

The base year used for the projections is the last inventory reporting year available when the projections were carried out (2013 inventory for the year 2011). For emissions from agriculture and land use, land-use change and forestry (LULUCF), previous projections were used, which had been carried out in 2011 when preparing the National Low Carbon Roadmap 2050 (RNBC 2050). For this reason, the base year for data relating to these sectors is 2009.

In the context of preparing the PNAC, a projection exercise was carried out regarding the activity paths and respective GHG emissions for the relevant sectors of activity, i.e. energy system (including sectors of energy production, transmission and consumption), industry (including fluorinated gases) and waste (including wastewater). As already mentioned, for the sectors of agriculture and LULUCF, RNBC data were used. In this context, there are two socio-economic scenarios – High Case (HC) and Low Case (LC) – and three policy scenarios with slightly differentiating assumptions.

The results of this exercise allow for an assessment of the national emission reduction potential. Analysing the behaviour of the different sectors under the conditions laid down for the different policy HC and LC scenarios helps to identify critical factors, trends and behaviours within those sectors for the timeframe under consideration.

Therefore, the underlying exercise for the projections undertaken allows for an assessment of the reduction potential, rather than for emission projections in the narrower sense of assessing where Portugal could be in 2020/2030 on the basis of current policies. These results are, however, considered to be representative of the national emission path in the timeframe under analysis.

For the purpose of reporting, the results of High Case scenarios are considered, since they reflect the most ambitious scenario in socio-economic terms and the most significant development of emissions. Values should be read as the maximum emissions possible under the projection assumptions.

In addition, work is ongoing on a new modelling exercise with a 2050 horizon, aiming at identifying and analysing the implications of cost-effective paths in order to achieve the national target of net-zero GHG emissions by 2050, as well as identifying the primary means of decarbonisation associated. This work, which is being developed under the Roadmap to Carbon Neutrality 2050, started in October 2017 and will go on until the first quarter of 2019.

5.1. Methodology used for the presented GHG emissions projections

Methodologies used for GHG emission estimates, taking the activity variables as a starting point, are used throughout the National Inventory Report (NIR) drawn up by the Portuguese Environment Agency (APA).

For each sector of activity, a specific methodology was adopted for the projection of the respective variables, although they are based on the same socio-economic reference framework, in order to ensure consistency of projections.

Socio-economic scenarios by 2030 underpinning the projection exercises, in particular demand for energy services, agriculture, livestock and waste, take two separate periods into account:

(i) Period until 2020: economic progress is closely modelled on the IMF projections, which are restricted by the current situation and by the short-term outlook of the Portuguese economy, and thus represents an update of the scenarios used in the RNBC;

(ii) Period between 2020 and 2030: economic progress follows the one adopted in the RNBC, ensuring concordance with this long-term exercise. In line with the approach already adopted in the RNBC, creating prospective scenarios for the national economy outlines paths which (by establishing maximum and minimum values) roughly demarcate the range within which the country will follow its course in the future with reasonable probability. Besides, elements of political, social or economic disruption, which could determine a structural change in the Portuguese economy, are not considered.

Two national socio-economic scenarios are taken into account: High Case scenario (HC) and Low Case scenario (LC), which assume two contrasting development models at economic level (GDP growth of 3 %/year and 1 %/year, respectively) and at social level (positive and negative population growth rates, respectively). These scenarios must be understood as the upper bound and the lower bound in the probability range of the results obtained.

It should be noted that although the projections presented here include in the very short term available information resulting from the current national financial and economic situation, they do not include nor anticipate short-term future events, focusing rather on the presentation of long-term trends. Therefore, there is a differentiated degree of uncertainty over the projection time horizon, which is lower for the period 2010-2020 and higher for the period 2020-2030.

The projection of demand for energy services in the different sectors (services, households, industry and transport) and materials (for some industries), is based on specific variables, such as sectoral GVA. The current exercise follows a continuation of the GVA structure recorded in 2011 for the time horizon until 2030.

The TIMES_PT is a technological model of linear optimization which results from the implementation of a generation of economy – energy – environment optimized models, with a TIMES44 technology base, in Portugal.

The generic structure of TIMES can be adapted by each user to simulate a specific energy system, at local system national or multi-regional.

TIMES_PT was initially developed under the European Project NEEDS, integrating a Pan European TIMES model used to estimate total European costs (including externalities) of energy production and consumption. The ultimate goal of any TIMES is to satisfy the demand for energy services at the minor cost. In order to do that, investment options and the operation of some technologies, as well as the primary energy sources and energy exportations and importations, according to the following equation:

$$NPV = \sum_{r=1}^{R} \sum_{y \in YEARS} (1 + d_{r,y})^{REFYR-y} \bullet ANNCOST(r, y)$$

NPV: actualizes net value of total costs
ANNCOST: annual total cost
d: actualization rate
r: region
y: years
REFYR: reference year for the actualization
YEARS: years in which costs exist (all costs for the modeling period + past years when costs where defined for past investments + the number of years after technology life time, in case there are decommissioning costs)

For each year, the TIMES models calculate the current sum of the total costs, expect the income. In the case of TIMES_PT model, the costs taken into account are the investment, operation and maintenance costs (fixed and variable) of the various production technologies and energy consumption. The Income usually considered in TIMES models include subsidies and materials recovery, which are not considered in the TIMES_PT model. More information about TIMES development and their equations can be obtained in [7] .

[44] TIMES is an acronym for *The Integrated Markal-EFOM System.* Both Markal - *Market Allocation* and EFOM - *Energy Flow Optimization Model* are based technology energy models developed by the IEA in the 80s and 70s, respectively. This model was developed by ETSAP (*Energy Technology Systems Analysis Program*) of the International Energy Agency.

The TIMES_PT model represents the Portuguese energy system from 2000 to 2050, including the following sectors:

1. Primary energy supply (refining and synthetic fuels production, import and local resources);
2. Electricity production;
3. Industry (cement, glass, ceramics, steel, chemical, paper and pulp, lime and other industrials);
4. Residential;
5. Commercial and Services;
6. Agriculture , forestry and fisheries (only the energy consumption), and
7. Transport.

In each sector the monetary, energy and materials fluxes are modeled according to the various production technologies and energy consumption, including mass balances for some industry sectors.

The simplified structure of the TIMES_PT model is shown in the figure below, as well as its main inputs and outputs.

The implementation of TIMES_PT requires a set of exogenous inputs, namely:

1. Demand for energy services;
2. Technologies' technical and economic characteristics for the base year and the future (e.g. efficiency, input/output ratio, availability, investment, operation and maintenance costs and actualization rate);
3. Availability of primary energy sources in the present and in the future, especially the potential for the use of endogenous energy resources, and
4. Policy restrictions (e.g. energy production targets or reduction of emissions).

Based on these elements, it is possible to obtain from the TIMES_PT model a series of outputs, such as:

1. Inherent costs to the energy system;
2. Energy flows inherent to each sector;
3. Technological options, including the installed capacity in the electricity production sector;
4. Energy imports and exports;
5. Use of indigenous resources, and
6. Emissions by sector.

Presently emissions considered by the model include the GHG emissions generated by combustion and industrial processes, and do not include fugitive emissions associated with the production, storage and distribution of fossil fuels and emissions of F-gases.

Note that the TIMES, being a partial equilibrium model, does not consider the economic interactions outside the energy sector, as for instance the implications in the activity of other economy sectors (e.g. impact of wind energy in the metal sector) or the implications in the activity of national sectors dictated by changes in international demand for their goods or services.

Furthermore, the TIMES model does not take into account irrational aspects that influence investment in new and more efficient technologies, e.g. motivated by aesthetic preferences or social status which mainly occurs in the acquisition of end-use technologies. Thus, the model assumes that agents have perfect knowledge of the market, present and future. Finally it should be emphasized that the based technology models such as the TIMES_PT do not accommodate market decisions based on price, instead they make choices based whether technologies or energy resources costs. For this reason, the solutions found show the best options in terms of cost - effectiveness and hence competitiveness, lato sensu.

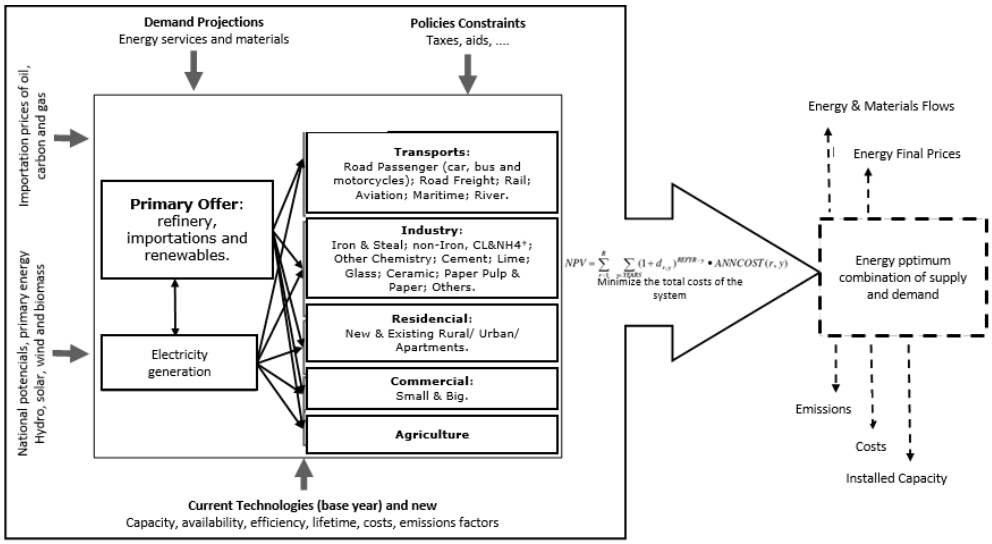


Figure 5.1.1
TIMES_PT model dimplified Sctructur

Economic policy instruments, such as VAT and the ISP (tax on petroleum products and energy products), have not been considered, since the aim is to identify cost-effective technological solutions, and therefore the whole exercise is based on technology costs.

Electricity exchange with Spain is not included in the modelling exercise, since it is mainly based on market decisions, and the TIMES_PT model is not an appropriate tool to account for it. According to the expectations of REN (concession holder of the national transport network), a zero balance with Spain is assumed as from 2025.

The availability of hydroelectric plants throughout the whole modelling period is considered, equivalent to an average hidraulicity (average year, e.g. 2006, HPI = 0,8). A ceiling of 85 % for the use of natural gas is considered in the household and tertiary sectors, due to limited access to the distribution infrastructure.

This projection process is underpinned by the set of variables and assumptions presented in Tables 5.1.1 and 5.1.2.

Table 5.1.1
Summary of the general economic parameters

General economic parameters	Units	Historic values					Projection values				Notes
		1990	1995	2000	2005	2010	2015	2020	2025	2030	
1a. Gross Domestic Product	constant EUR million (2010)	115 329,39	125 220,57	154 140,27	160 626,88	165 103,40	154 783,86	171 600,47	198 931,98	230 616,69	INE
1b. Gross domestic product growth rate	%		1,9%	4,2%	0,8%	0,6%	1,5%	3,0%	3,0%	3,0%	
2a. Population	thousand people	9970	10043	10257	10570	10573	10552	10566	10579	10677	INE
2b. Population growth rate and base year value	% of value from 1990		1%	3%	6%	6%	7%	7%	7%	8%	
3. International coal prices	€2000/GJ for the historic values and EUR(2010)/boe for the projections	1,3	1,2	1,1	2,1	2,5	19,1	23,0	22,6	24,0	IEA, ETP2012 - Energy Technology Perspectives 2012 for the historic values and Prometheus for the projections
4. International oil prices	€2000/GJ for the historic values and EUR(2010)/boe for the projections	2,9	2,4	5,3	8,5	8,3	73,9	89,0	85,2	93,0	IEA, ETP2012 - Energy Technology Perspectives 2012 for the historic values and Prometheus for the projections
5. International gas prices	€2000/GJ for the historic values and EUR(2010)/boe for the projections			5,5	6,5	4,3	50,6	62,0	55,7	65,0	IEA, ETP2012 - Energy Technology Perspectives 2012 for the historic values and Prometheus for the projections

Table 5.1.2

Summary of the sectorial parameters in the projections analysis

Parameters	Unit	Base/ Reference year	Projections			
		2010	2015	2020	2025	2030
Energy parameters						
Gross inland consumption: solid fuels	PJ	69,37	66,94	72,52	46,05	0,61
Gross inland consumption: total petroleum products	PJ	518,00	441,06	348,32	318,79	325,83
Gross inland consumption: gas	PJ	188,69	186,07	171,71	204,27	246,06
Gross inland consumption: Renewables	PJ	233,62	223,25	210,31	207,62	209,46
Gross inland consumption: Total	PJ	1 009,68	917,31	802,86	776,73	781,96
Gross electricity production: Coal	TWh	7,10	14,29	7,44	4,70	0,00
Gross electricity production: Oil	TWh	3,05	0,00	0,00	0,00	0,06
Gross electricity production: Natural gas	TWh	14,90	4,08	7,95	11,55	18,63
Gross electricity production: Renewables	TWh	28,53	24,29	27,26	28,56	30,89
Gross electricity production: Total	TWh	53,58	42,66	42,66	44,81	49,58
Final energy consumption: Industry	PJ	172,41	130,21	134,92	143,01	152,27
Final energy consumption: Transport	PJ	271,66	224,74	217,85	209,39	214,83
Final energy consumption: Residential	PJ	129,03	110,00	112,65	115,39	120,95
Final energy consumption: Agriculture/Forestry	PJ	19,36	18,33	19,18	20,67	22,26
Final energy consumption: Services	PJ	84,00	81,31	81,97	86,97	93,30
Final energy consumption: Total	PJ	676,46	564,59	566,58	575,43	603,62
Transport parameters						
Number of passenger-kilometres (all modes)	million pkm	96 425,06	87 708,76	99 297,69	109 390,39	121 813,49
Freight transport tonnes-kilometres (all modes)	million pkm	27 242,76	26 597,29	30 038,96	31 778,06	34 201,47
Final energy demand for road transport	PJ	271,66	224,74	217,85	209,39	214,83
Agriculture parameters						
Livestock:-Dairy cattle	1000 heads	278,00	274,60	272,03	269,96	268,11
Livestock:-Non-dairy cattle	1000 heads	1 152,00	1 118,57	1 089,48	1 089,42	1 070,51
Livestock:-Sheep	1000 heads	1 900,41	1 832,90	1 771,91	1 783,39	1 744,78
Livestock:-Pig	1000 heads	1 913,00	1 796,04	1 723,21	1 670,43	1 566,38
Livestock:-Poultry	1000 heads	35 352,00	35 352,00	35 352,00	35 352,00	35 352,00
Nitrogen input from application of synthetic fertilizers	kt nitrogen	194,53	178,13	165,56	155,74	141,59
Nitrogen input from application of manure	kt nitrogen	103,83	102,00	100,72	100,23	98,93
Nitrogen fixed by N-fixing crops	kt nitrogen	4,91	4,77	4,64	4,68	4,60
Nitrogen in crop residues returned to soils	kt nitrogen	52,41	53,34	53,67	54,53	56,60
Waste parameters						
Municipal solid waste (MSW) generation	tonne MSW	5 467 000,00	4 787 375,00	4 803 000,00	4 562 700,00	4 322 400,00
Municipal solid waste (MSW) going to landfills	tonne MSW	3 333 223,00	2 075 476,98	993 000,00	813 861,99	648 360,00

Assessment of aggregate effects of policies and measures

Global BAU

"Global BAU" is based on the specific carbon intensity of sectors 1 (Energy), 2 (Industrial Processes); 4 (Agriculture); and 5 (Waste) in 2000. Real emissions (up to 2010) and GDP data come from the Portuguese NIR (APA, 2017) and INE.

The estimation of "Global BAU" up to 2030 is based on GDP estimates (1.5% growth per year for 2015 and 3% growth per year for 2020, 2025 and 2030). Given its dependency of GDP projections, this methodology is considered to be sufficiently robust up to 2020.

The following table and graph illustrate the results of the methodology used and compare BAU emissions with actual and projected with measures emissions.

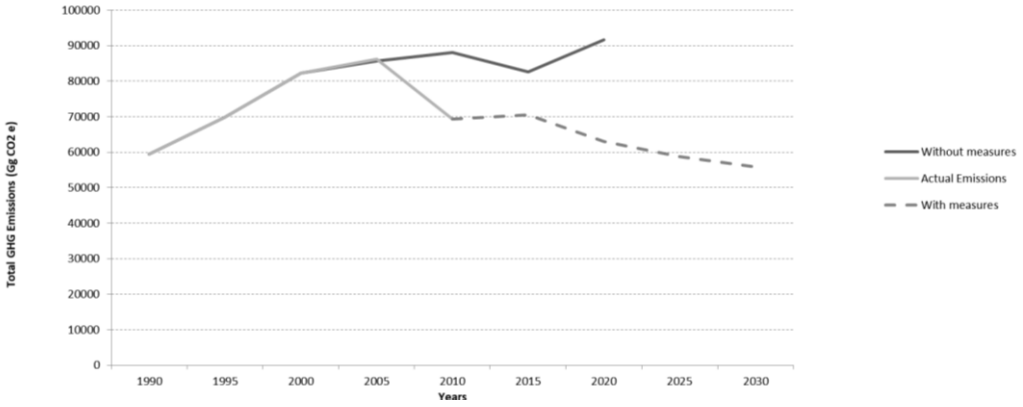


Figure 5.1.2

Table 5.1.3

Global BAU and GHG emissions avoided (compared to BAU), assessment of aggregate effect of PaM

	GHGs Source Categories	1990	1995	2000	2005	2010	2015	2020	2025	2030
		Total GHG (Gg CO2e)								
Without Measures (base 2000)	1,2 - Energy, Industrial Processes	47 061	56 398	67 733	70 583	72 550	68 015	75 405		
	4 - Agriculture	6 981	6 903	7 344	7 653	7 866	7 374	8 175		
	5 - Waste	5 361	6 535	7 215	7 518	7 728	7 245	8 032		
		59 403	69 836	82 291	85 754	88 144	82 634	91 612		
Actual Emissions	1,2 - Energy, Industrial Processes	47 061	56 398	67 733	71 847	55 898				
	4 - Agriculture	6 981	6 903	7 344	6 613	6 472				
	5 - Waste	5 361	6 535	7 215	7 674	6 921				
		59 403	69 836	82 291	86 134	69 292				
			0%	0%	0%	-21%				
REF (with measures)	1,2 - Energy, Industrial Processes					55 898	52 805	46 640	43 252	41 618
	4 - Agriculture					6 472	8 488	8 142	7 920	7 241
	5 - Waste					6 921	9 221	8 267	7 578	6 987
						69 292	70 514	63 049	58 749	55 847
GHG emissions avoided							12 120	28 564		

5.2. Projections

In the following tables , projections of anthropogenic greenhouse gases emissions by sources and removals by sinks are presented on a sectorial basis, as weel as, on a gas-by-gas basis for the following GHGs: CO_2, N_2O, CH_4, HFCs and SF6.

Note that Portugal does not have processes leading to PFC and NF3 emissions, thus no projections are presented for these GHGs.

Additionally, projections are provided in an aggregated format for sectors covered in the European Union Emissions Trading Scheme (EU ETS) and not covered in the ESD (ESD – EU effort sharing decision), as well as the national GHG total.

These projetions are also reported by type of scenario ('with measures' and 'with additional measures').

Table 5.2.1
CO_2 emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO2 (kt)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	40 104,05	48 990,24	59 155,05	62 540,09	47 521,48	45 583,66	38 740,30	36 219,47	34 224,99	45 583,66	38 740,30	34 118,26	31 693,67
A. Fuel combustion (sectoral approach)	39 984,83	48 436,25	58 694,04	61 932,79	46 897,47	44 466,20	37 719,30	35 494,69	33 456,47	44 466,20	37 719,30	33 396,50	30 932,72
1. Energy industries	16 328,35	19 883,90	21 510,42	25 331,13	14 365,66	18 034,80	12 260,11	10 092,92	8 248,16	18 034,80	12 260,11	9 492,97	6 587,92
2. Manufacturing industries and construction	9 605,58	10 705,82	12 286,55	10 354,30	8 974,66	6 901,19	6 825,43	6 831,30	6 700,90	6 901,19	6 825,43	5 976,74	5 989,64
3. Transport	9 883,38	13 035,19	18 846,96	19 318,05	18 530,29	15 294,55	14 519,68	14 337,66	14 162,28	15 294,55	14 519,68	13 795,14	14 162,95
4. Other sectors	4 063,02	4 729,21	5 954,42	6 856,02	4 940,49	4 235,65	4 114,07	4 232,81	4 345,13	4 235,65	4 114,07	4 131,65	4 192,21
5. Other	104,51	82,12	95,69	73,29	86,38	0	0	0	0	0	0	0	0
B. Fugitive emissions from fuels	119,22	553,99	461,01	607,29	624,01	1 117,46	1 021,01	724,79	768,52	1 117,46	1 021,01	721,75	760,95
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas	119,22	553,99	461,01	607,29	624,01	1 117,46	1 021,01	724,79	768,52	1 117,46	1 021,01	721,75	760,95
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes and product use	5 226,53	5 511,48	6 477,56	6 562,49	5 043,61	3 362,82	3 488,89	3 778,31	4 093,68	3 362,82	3 488,89	3 778,31	4 093,68
A. Mineral industry	3 668,75	4 128,60	4 682,97	4 922,97	4 112,08	3 196,69	3 321,33	3 602,83	3 909,79	3 196,69	3 321,33	3 602,83	3 909,79
B. Chemical industry	1 201,26	1 027,12	1 398,17	1 332,28	684,59	100,45	100,42	103,59	106,92	100,45	100,42	103,59	106,92
C. Metal industry	108,55	127,39	142,83	77,42	45,63	65,45	66,91	71,64	76,71	65,45	66,91	71,64	76,71
D. Non-energy products from fuels and solvent use	247,97	228,36	253,58	229,82	201,30	0,23	0,23	0,25	0,26	0,23	0,23	0,25	0,26
E. Electronic Industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	33,87	23,84	45,31	29,81	34,57	NE	NE	NE	NE	NE	NE	NE	NE
A. Enteric fermentation													
B. Manure management													
C. Rice cultivation													
D. Agricultural soils													
E. Prescribed burning of savannas													
F. Field burning of agricultural residues													
G. Liming	12,59	12,59	12,59	10,92	12,49	NE	NE	NE	NE	NE	NE	NE	NE
H. Urea application	21,28	11,25	32,72	18,89	22,09	NE	NE	NE	NE	NE	NE	NE	NE
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	888,23	-4 791,61	-5 998,63	115,11	-11 609,39	-10 144,81	-7 712,00	-8 086,73	-8 461,44	-10 144,81	-7 712,00	-8 086,73	-8 461,44
A. Forest land	-5 690,84	-8 260,08	-8 768,34	-2 092,45	-13 111,47	-11 321,42	-8 888,00	-8 856,16	-8 824,32	-11 321,42	-8 888,00	-8 856,16	-8 824,32
B. Cropland	4 068,84	2 701,67	1 793,61	1 263,33	607,79	248,01	-123,21	-74,85	-26,49	248,01	-123,21	-74,85	-26,49
C. Grassland	3 228,00	2 534,91	2 294,92	1 586,82	613,42	-38,34	-704,89	-554,75	-404,6	-38,34	-704,89	-554,75	-404,6
D. Wetlands	NO,IE	117,50	258,32	399,14	387,20	966,94	2 004,10	1 399,03	793,97	966,94	2 004,10	1 399,03	793,97
E. Settlements	30,49	553,49	1 193,07	1 833,88	2 186,16								
F. Other land	925,27	-1 494,38	-1 795,54	-2 096,13	-2 049,09								
G. Harvested wood products	-1 673,53	-944,71	-974,67	-779,49	-243,39	NE	NE	NE	NE	NE	NE	NE	NE

H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	6,86	7,12	4,99	9,58	15,99	13,68	13,68	13,68	13,69	13,68	13,68	13,68	13,69
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Biological treatment of solid waste													
C. Incineration and open burning of waste	6,86	7,12	4,99	9,58	15,99	13,68	13,68	13,68	13,69	13,68	13,68	13,68	13,69
D. Waste water treatment and discharge													
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO2 emissions (kt) without LULUCF	45 371,32	54 532,67	65 682,92	69 141,97	52 615,65	48 960,16	42 242,87	40 011,46	38 332,36	48 960,16	42 242,87	37 910,25	35 801,04

Use of notation keys: IE (included elsewhere), NO (not occurring), NA (not applicable), NE (not estimated); WEM – with existing measures scenario, WAM – with additional measures scenario

Table 5.2.2
N_2O emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	N2O (kt)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	1,50	2,42	2,03	2,26	1,96	2,32	2,76	2,75	3,02	2,32	2,76	2,69	2,83
A. Fuel combustion (sectoral approach)	1,49	2,41	2,02	2,25	1,95	2,32	2,76	2,75	3,02	2,32	2,76	2,69	2,83
1. Energy industries	0,16	0,22	0,38	0,54	0,46	0,57	0,53	0,39	0,51	0,57	0,53	0,33	0,35
2. Manufacturing industries and construction	0,34	0,38	0,41	0,43	0,44	0,19	0,21	0,26	0,27	0,19	0,21	0,26	0,25
3. Transport	0,30	1,10	0,74	0,73	0,60	1,16	1,61	1,67	1,79	1,16	1,61	1,67	1,79
4. Other sectors	0,69	0,70	0,49	0,55	0,45	0,40	0,42	0,43	0,45	0,40	0,42	0,43	0,44
5. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Fugitive emissions from fuels	0,01	0,01	0,01	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas	0,01	0,01	0,01	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
C. CO_2 transport and storage													
2. Industrial processes and product use	1,95	1,73	2,04	2,00	1,12	0,19	0,21	0,24	0,27	0,19	0,21	0,24	0,27
A. Mineral industry													
B. Chemical industry	1,67	1,50	1,82	1,81	0,96	0,19	0,21	0,24	0,27	0,19	0,21	0,24	0,27
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Electronic Industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	0,28	0,24	0,22	0,20	0,16	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	8,66	8,35	9,16	7,47	7,30	10,83	10,43	10,17	9,93	10,83	10,43	10,17	9,93
A. Enteric fermentation													
B. Manure management	0,85	0,84	0,89	0,76	0,72	1,37	1,36	1,35	1,35	1,37	1,36	1,35	1,35
C. Rice cultivation													
D. Agricultural soils	7,74	7,44	8,21	6,66	6,52	9,42	9,04	8,80	8,56	9,42	9,04	8,80	8,56
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0,07	0,07	0,06	0,06	0,05	0,04	0,03	0,02	0,02	0,04	0,03	0,02	0,02
G. Liming													
H. Urea application													
I. Other carbon-containing fertilizers													

J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1,98	1,79	1,70	1,89	1,35	0,27	0,27	0,27	0,27	0,27	0,27	0,27	0,27
A. Forest land	0,18	0,22	0,21	0,42	0,16	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
B. Cropland	1,08	0,68	0,43	0,29	0,17	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24
C. Grassland	0,54	0,63	0,56	0,37	0,19	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
D. Wetlands	NO,IE	0,01	0,05	0,09	0,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Settlements	0,01	0,05	0,23	0,41	0,53	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Other land	0,09	0,12	0,15	0,21	0,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
G. Harvested wood products													
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0,74	0,80	0,88	0,89	0,96	2,06	2,08	2,20	2,34	2,06	2,08	2,20	2,34
A. Solid waste disposal													
B. Biological treatment of solid waste	0,01	0,03	0,03	0,03	0,05	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12
C. Incineration and open burning of waste	0,00	0,00	0,00	0,01	0,00	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
D. Waste water treatment and discharge	0,73	0,77	0,84	0,85	0,91	1,91	1,93	2,05	2,19	1,91	1,93	2,05	2,19
E. Other	NO	NO	NO	0,00	0,00	NO	NO	NO	NO	NO	NO	NO	NO
Total N2O emissions (kt) without LULUCF	12,85	13,31	14,11	12,63	11,33	15,40	15,48	15,36	15,57	15,41	15,48	15,30	15,38

Table 5.2.3
CH_4 emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH4 (kt)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	26,84	23,12	22,07	19,75	17,05	18,4	19,5	19,62	20,92	18,4	19,5	18,6	18,82
A. Fuel combustion (sectoral approach)	22,23	21,13	19,54	16,35	13,35	12,66	12,91	12,34	12,37	12,67	12,91	12	11,17
1. Energy industries	0,24	0,31	0,56	0,64	0,57	0,44	0,38	0,28	0,33	0,44	0,38	0,22	0,24
2. Manufacturing industries and construction	1,29	1,53	1,80	1,91	1,99	1,7	1,55	1,62	1,45	1,7	1,55	1,71	1,52
3. Transport	4,14	4,44	3,85	2,54	1,63	2,1	1,86	1,97	2,08	2,1	1,86	1,66	1,68
4. Other sectors	16,55	14,85	13,33	11,26	9,15	8,42	9,12	8,47	8,51	8,43	9,12	8,41	7,74
5. Other	0,00	0,00	0,00	0,00	0,00	0	0	0	0	0	0	0	0
B. Fugitive emissions from fuels	4,61	1,99	2,54	3,41	3,70	5,73	6,6	7,28	8,55	5,73	6,6	6,6	7,65
1. Solid fuels	3,54	0,67	0,52	0,43	0,38	0	0	0	0	0	0	0	0
2. Oil and natural gas	1,07	1,32	2,02	2,97	3,32	5,73	6,6	7,28	8,55	5,73	6,6	6,6	7,65
C. CO_2 transport and storage													
2. Industrial processes and product use	1,28	1,19	1,48	1,68	1,54	1,81	1,89	1,98	2,09	1,81	1,89	1,98	2,09
A. Mineral industry						0,8	0,87	0,91	0,97	0,8	0,87	0,91	0,97
B. Chemical industry	1,02	0,85	1,00	1,07	0,98	0,44	0,44	0,45	0,46	0,44	0,44	0,45	0,46
C. Metal industry	0,22	0,27	0,40	0,50	0,50	0,57	0,58	0,62	0,66	0,57	0,58	0,62	0,66
D. Non-energy products from fuels and solvent use	0,04	0,07	0,08	0,11	0,06	0	0	0	0	0	0	0	0
E. Electronic Industry													
F. Product uses as ODS substitutes													
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	174,62	175,66	182,76	174,33	170,53	210,43	201,37	195,57	171,29	210,43	201,37	195,57	171,29
A. Enteric fermentation	140,83	142,79	150,12	144,05	140,53	134,06	130,52	129,36	123,83	134,06	130,52	129,36	123,83

B. Manure management	26,95	27,35	26,66	23,13	23,32	55,07	48,99	44,14	25,5	55,07	48,99	44,14	25,5
C. Rice cultivation	5,36	4,16	4,70	6,08	5,53	20,72	21,43	21,71	21,96	20,72	21,43	21,71	21,96
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1,49	1,36	1,28	1,07	1,14	0,58	0,43	0,36	0	0,58	0,43	0,36	0
G. Liming													
H. Urea application													
I. Other carbon-containing fertilizers													
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	14,56	18,11	16,20	33,65	11,81	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58
A. Forest land	7,16	8,88	6,07	20,92	5,24	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02
B. Cropland	0,36	0,45	0,36	0,48	0,13	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33
C. Grassland	0,18	0,22	0,27	0,18	0,17	0,23	0,23	0,23	0,23	0,23	0,23	0,23	0,23
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	6,86	8,56	9,50	12,06	6,27	0	0	0	0	0	0	0	0
G. Harvested wood products													
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	205,31	251,52	277,89	295,95	264,74	343,79	305,34	276,33	251	343,78	305,34	269,91	244,63
A. Solid waste disposal	109,14	139,35	179,99	190,86	175,34	219,49	186,04	151,28	113,86	219,49	186,04	144,73	107,39
B. Biological treatment of solid waste	0,20	0,44	0,55	0,52	0,89	1,83	2,12	2,16	2,18	1,83	2,12	2,29	2,28
C. Incineration and open burning of waste	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
D. Waste water treatment and discharge	95,96	111,72	97,35	104,56	88,50	122,46	117,16	122,87	134,94	122,46	117,16	122,87	134,94
E. Other	NO	NO	NO	0,00	0,00	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions (kt) without LULUCF	408,05	451,50	484,20	491,72	453,86	574,42	528,1	493,51	445,3	574,43	528,1	486,07	436,84

Table 5.2.4
HFC emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HFC (kt CO2e)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
2. Industrial processes and product use	NO,NA	35,42	281,22	907,13	1 910,10	2 538,29	2 875,82	1 652,26	1 514,98	2 538,29	2 837,43	1 224,04	631,12
F. Product uses as ODS substitutes	NO,NA	35,42	281,22	907,13	1 910,10	2 538,29	2 875,82	1 652,26	1 514,98	2 538,29	2 837,43	1 224,04	631,12
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total HFC emissions (kt CO2e) without LULUCF	NO,NA	35,42	281,22	907,13	1 910,10	2 538,29	2 875,82	1 652,26	1 514,98	2 538,29	2 837,43	1 224,04	631,12

Table 5.2.5
SF6 emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	SF6 (kt CO2e)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
2. Industrial processes and product use	NO,NA	13,93	16,61	26,63	34,69	65,28	114,05	170,45	227,26	65,28	114,05	170,45	227,26
F. Product uses as ODS substitutes	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other product manufacture and use	NO,NA	13,93	16,61	26,63	34,69	65,28	114,05	170,45	227,26	65,28	114,05	170,45	227,26
Total SF6 emissions (kt CO2e) without LULUCF	NO,NA	13,93	16,61	26,63	34,69	65,28	114,05	170,45	227,26	65,28	114,05	170,45	227,26

Table 5.2.6
Total GHGs emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Total GHGs (kt CO2e)												
	Historic					WEM Scenario				WAM Scenario			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	41 221,95	50 290,84	60 311,31	63 708,45	48 530,40	46 735,42	40 051,23	37 529,96	35 648,65	46 735,58	40 051,16	35 385,38	33 008,42
A. Fuel combustion (sectoral approach)	40 985,10	49 684,23	59 784,28	63 013,06	47 811,20	45 474,60	38 865,35	36 623,07	34 666,48	45 474,77	38 865,27	34 498,56	32 056,13
1. Energy industries	16 382,91	19 957,73	21 638,30	25 509,43	14 516,05	18 215,33	12 426,29	10 217,42	8 408,21	18 215,33	12 426,29	9 596,65	6 697,51
2. Manufacturing industries and construction	9 738,92	10 857,73	12 453,35	10 530,13	9 154,70	7 001,60	6 927,68	6 948,46	6 819,04	7 001,60	6 927,68	6 098,09	6 103,44
3. Transport	10 075,31	13 475,47	19 163,35	19 598,21	18 749,46	15 692,95	15 044,49	14 884,36	14 746,65	15 692,95	15 044,49	14 333,86	14 736,93
4. Other sectors	4 682,57	5 310,47	6 432,76	7 301,37	5 303,87	4 564,71	4 466,88	4 572,83	4 692,58	4 564,89	4 466,81	4 469,96	4 518,26
5. Other	105,38	82,82	96,50	73,92	87,11	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Fugitive emissions from fuels	236,85	606,61	527,03	695,39	719,20	1 260,81	1 185,89	906,89	982,17	1 260,81	1 185,89	886,82	952,29
1. Solid fuels	88,53	16,66	12,90	10,87	9,57	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2. Oil and natural gas	148,32	589,95	514,13	684,52	709,63	1 260,81	1 185,89	906,89	982,17	1 260,81	1 185,89	886,82	952,29
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes and product use	5 839,26	6 107,10	7 421,29	8 138,95	7 367,93	6 069,17	6 588,42	5 721,88	5 969,82	6 069,17	6 550,03	5 293,66	5 085,96
A. Mineral industry	3 668,75	4 128,60	4 682,97	4 922,97	4 112,08	3 216,69	3 343,08	3 625,58	3 934,04	3 216,69	3 343,08	3 625,58	3 934,04
B. Chemical industry	1 724,63	1 494,38	1 964,24	1 897,99	994,03	169,08	173,87	186,21	199,98	169,08	173,87	186,21	199,98
C. Metal industry	114,10	134,27	152,82	89,95	58,09	79,60	81,38	87,13	93,29	79,60	81,38	87,13	93,29
D. Non-energy products from fuels and solvent use	248,88	230,03	255,47	232,46	202,87	0,23	0,23	0,25	0,26	0,23	0,23	0,25	0,26
E. Electronic Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes	NO,NA	35,42	282,36	910,43	1 918,03	2 603,57	2 989,86	1 822,71	1 742,24	2 603,57	2 951,48	1 394,49	858,39
G. Other product manufacture and use	82,90	84,42	83,43	85,15	82,82	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	6 981,16	6 903,12	7 343,64	6 613,00	6 472,12	8 488,09	8 142,39	7 919,91	7 241,39	8 488,09	8 142,39	7 919,91	7 241,39
A. Enteric fermentation	3 520,64	3 569,87	3 753,09	3 601,16	3 513,32	3 351,50	3 263,00	3 234,00	3 095,75	3 351,50	3 263,00	3 234,00	3 095,75
B. Manure management	927,87	933,09	930,32	803,48	798,78	1 785,01	1 630,03	1 505,80	1 039,80	1 785,01	1 630,03	1 505,80	1 039,80
C. Rice cultivation	133,92	104,00	117,49	151,94	138,36	518,00	535,75	542,75	549,00	518,00	535,75	542,75	549,00
D. Agricultural soils	2 306,27	2 218,54	2 446,90	1 983,23	1 942,17	2 807,16	2 693,92	2 622,40	2 550,88	2 807,16	2 693,92	2 622,40	2 550,88
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	58,58	53,77	50,53	43,38	44,93	26,42	19,69	14,96	5,96	26,42	19,69	14,96	5,96
G. Liming	12,59	12,59	12,59	10,92	12,49	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Urea application	21,28	11,25	32,72	18,89	22,09	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1 841,56	-3 805,51	-5 086,77	1 519,85	-10 910,43	-9 999,85	-7 567,04	-7 941,77	-8 316,48	-9 999,85	-7 567,04	-7 941,77	-8 316,48
A. Forest land	-5 458,25	-7 971,81	-8 554,75	-1 444,26	-12 932,04	-11 261,98	-8 828,56	-8 796,72	-8 764,88	-11 261,98	-8 828,56	-8 796,72	-8 764,88
B. Cropland	4 398,89	2 916,00	1 930,39	1 360,76	662,74	327,78	-43,44	4,92	53,28	327,78	-43,44	4,92	53,28
C. Grassland	3 394,31	2 728,39	2 470,03	1 700,95	673,30	-32,59	-699,14	-549,00	-398,85	-32,59	-699,14	-549,00	-398,85
D. Wetlands	NO,IE	119,87	272,53	425,20	418,08	966,94	2 004,10	1 399,03	793,97	966,94	2 004,10	1 399,03	793,97
E. Settlements	32,80	567,28	1 260,44	1 954,95	2 345,37								
F. Other land	1 124,96	-1 244,15	-1 512,49	-1 733,16	-1 851,06								
G. Harvested wood products	-1 673,53	-944,71	-974,67	-779,49	-243,39	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	5 360,77	6 534,68	7 214,61	7 674,08	6 921,27	9 221,39	8 266,53	7 577,65	6 987,25	9 222,44	8 267,47	7 416,49	6 827,43
A. Solid waste disposal	2 728,45	3 483,76	4 499,72	4 771,53	4 383,53	5 487,13	4 650,99	3 782,06	2 846,49	5 487,13	4 650,99	3 618,37	2 684,81
B. Biological treatment of solid waste	8,62	18,93	23,57	22,42	37,86	80,38	87,77	90,37	90,87	81,43	88,71	92,90	92,73
C. Incineration and open burning of waste	8,02	8,37	6,30	11,80	16,78	23,62	23,62	23,62	23,64	23,62	23,62	23,62	23,64
D. Waste water treatment and discharge	2 615,68	3 023,61	2 685,02	2 868,31	2 483,09	3 630,26	3 504,15	3 681,60	4 026,25	3 630,26	3 504,15	3 681,60	4 026,25
E. Other	NO,NA	NO,NA	NO,NA	0,01	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total GHGs emissions (kt CO2e) without LULUCF	59 403,14	69 835,74	82 290,85	86 134,48	69 291,72	70 514,07	63 048,57	58 749,41	55 847,11	70 515,29	63 011,05	56 015,43	52 163,20

Table 5.2.7
Total ETS GHGs emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Total ETS GHGs (kt CO2e)							
	WEM Scenario				WAM Scenario			
	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	23 942,80	18 597,68	16 183,89	14 445,39	23 942,80	18 597,68	14 555,54	11 975,44
A. Fuel combustion (sectoral approach)	22 824,18	17 576,67	15 459,10	13 676,87	22 824,18	17 576,67	13 833,79	11 214,49
1. Energy industries	17 497,68	12 006,94	10 092,92	8 248,16	17 497,68	12 006,94	9 492,97	6 587,92
2. Manufacturing industries and construction	5 326,41	5 569,63	5 366,06	5 428,58	5 326,41	5 569,63	4 340,70	4 626,44
3. Transport	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4. Other sectors	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Fugitive emissions from fuels	1 118,62	1 021,01	724,79	768,52	1 118,62	1 021,01	721,75	760,95
1. Solid fuels	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2. Oil and natural gas	1 118,62	1 021,01	724,79	768,52	1 118,62	1 021,01	721,75	760,95
C. CO_2 transport and storage	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2. Industrial processes and product use	3 301,85	3 423,40	3 705,04	4 011,69	3 301,85	3 423,40	3 705,04	4 011,69
A. Mineral industry	3 135,95	3 256,07	3 529,81	3 828,06	3 135,95	3 256,07	3 529,81	3 828,06
B. Chemical industry	100,45	100,42	103,59	106,92	100,45	100,42	103,59	106,92
C. Metal industry	65,45	66,91	71,64	76,71	65,45	66,91	71,64	76,71
D. Non-energy products from fuels and solvent use	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Electronic Industry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Product uses as ODS substitutes	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
G. Other product manufacture and use	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
3. Agriculture	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
A. Enteric fermentation	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Manure management	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
C. Rice cultivation	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
D. Agricultural soils	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Prescribed burning of savannas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Field burning of agricultural residues	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
G. Liming	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Urea application	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
I. Other carbon-containing fertilizers	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
J. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4. Land use, land-use change and forestry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
A. Forest land	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Cropland	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
C. Grassland	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
D. Wetlands	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Settlements	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Other land	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
G. Harvested wood products	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5. Waste	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
A. Solid waste disposal	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Biological treatment of solid waste	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
C. Incineration and open burning of waste	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
D. Waste water treatment and discharge	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total ETS GHGs emissions (kt CO2e) without LULUCF	27 244,65	22 021,08	19 888,93	18 457,08	27 244,65	22 021,08	18 260,58	15 987,13

Table 5.2.8
Total ESD GHGs emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Total ESD GHGs (kt CO2e)							
	WEM Scenario				WAM Scenario			
	2015	2020	2025	2030	2015	2020	2025	2030
1. Energy	22 362,70	20 945,40	20 779,86	20 574,76	22 362,86	20 945,32	20 263,62	20 404,48
A. Fuel combustion (sectoral approach)	22 220,50	20 780,52	20 597,76	20 361,11	22 220,67	20 780,45	20 098,55	20 213,15
1. Energy industries	717,65	419,35	124,50	160,05	717,65	419,35	103,68	109,59
2. Manufacturing industries and construction	1 675,19	1 358,05	1 582,40	1 390,46	1 675,19	1 358,05	1 757,39	1 477,00
3. Transport	15 263,03	14 536,34	14 318,14	14 118,14	15 263,03	14 536,34	13 767,64	14 108,43
4. Other sectors	4 564,71	4 466,88	4 572,83	4 692,58	4 564,89	4 466,81	4 469,96	4 518,26
5. Other	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Fugitive emissions from fuels	142,19	164,88	182,10	213,65	142,19	164,88	165,07	191,34
1. Solid fuels	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2. Oil and natural gas	142,19	164,88	182,10	213,65	142,19	164,88	165,07	191,34
C. CO_2 transport and storage	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2. Industrial processes and product use	2 767,32	3 165,02	2 016,84	1 958,13	2 767,32	3 126,64	1 588,61	1 074,27
A. Mineral industry	80,74	87,01	95,77	105,98	80,74	87,01	95,77	105,98
B. Chemical industry	68,63	73,45	82,62	93,06	68,63	73,45	82,62	93,06
C. Metal industry	14,15	14,47	15,49	16,59	14,15	14,47	15,49	16,59
D. Non-energy products from fuels and solvent use	0,23	0,23	0,25	0,26	0,23	0,23	0,25	0,26
E. Electronic Industry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Product uses as ODS substitutes	2 603,57	2 989,86	1 822,71	1 742,24	2 603,57	2 951,48	1 394,49	858,39
G. Other product manufacture and use	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
3. Agriculture	8 488,09	8 142,39	7 919,91	7 241,39	8 488,09	8 142,39	7 919,91	7 241,39
A. Enteric fermentation	3 351,50	3 263,00	3 234,00	3 095,75	3 351,50	3 263,00	3 234,00	3 095,75
B. Manure management	1 785,01	1 630,03	1 505,80	1 039,80	1 785,01	1 630,03	1 505,80	1 039,80
C. Rice cultivation	518,00	535,75	542,75	549,00	518,00	535,75	542,75	549,00
D. Agricultural soils	2 807,16	2 693,92	2 622,40	2 550,88	2 807,16	2 693,92	2 622,40	2 550,88
E. Prescribed burning of savannas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
F. Field burning of agricultural residues	26,42	19,69	14,96	5,96	26,42	19,69	14,96	5,96
G. Liming	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Urea application	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
I. Other carbon-containing fertilizers	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
J. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4. Land use, land-use change and forestry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
A. Forest land	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Cropland	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
C. Grassland	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
D. Wetlands	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E. Settlements								
F. Other land								
G. Harvested wood products	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
H. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5. Waste	9 221,39	8 266,53	7 577,65	6 987,25	9 222,44	8 267,47	7 416,49	6 827,43
A. Solid waste disposal	5 487,13	4 650,99	3 782,06	2 846,49	5 487,13	4 650,99	3 618,37	2 684,81
B. Biological treatment of solid waste	80,38	87,77	90,37	90,87	81,43	88,71	92,90	92,73
C. Incineration and open burning of waste	23,62	23,62	23,62	23,64	23,62	23,62	23,62	23,64
D. Waste water treatment and discharge	3 630,26	3 504,15	3 681,60	4 026,25	3 630,26	3 504,15	3 681,60	4 026,25
E. Other	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total ESD GHGs emissions (kt CO2e) without LULUCF	42 839,50	40 519,34	38 294,26	36 761,53	42 840,71	40 481,82	37 188,63	35 547,58

Results of Sensitivity Analysis

In terms of sensitivity analysis, the following scenarios can be considered:

i) High case socio-economic scenario (GDP growth of 3 % per annum between 2020 and 2030) and low case socio-economic scenario (GDP growth of 1 % per annum between 2020 and 2030);

ii) Technological development of electric vehicles with estimated optimism for 2030 regarding the technological features of battery electric vehicles (ensuring that mobility is equivalent to a conventional vehicle);

iii) Production potential from renewable indigenous sources aimed at exporting, leveraged by increased interconnection, considering the maximisation of solar pv in Portugal compared to its indigenous potential.

The first exercise of sensitivity analysis allows the delimitation of emissions for the time horizons 2020/2030, assuming that national emissions will be somewhere between the emission levels identified. The table below shows the overall results obtained.

Table 5.2.9
Summary of the results of national emissions and projections (Mt CO_{2e})

Mt CO_{2e}		1990	2000	2005	2010	2012	2020	2030
Total (without LULUCF)	High	61	84	88	71	69	59|60	51|54
	Low							44|47
EU ETS	High	-	-	36	24	25	20|22	16|19
	Low							1#|15
Non-ETS	High	-	-	51	47	44	38	35|36
	Low							31|32

Source: National Programme for Climate Change 2020/2030 (Resolution of the Council of Ministers No 56/2015 of 30 July)

Regarding electric vehicles:

i) The choice for electric mobility as a cost-effective technology is limited, not only by its cost, but also by the features of battery electric vehicles (BEV), in particular in terms of meeting demand for long distance.

ii) Assuming the current expectation on electric mobility in Portugal, the aim is to assess in what extent that limitation constitutes a barrier to the penetration of BEV, taking into account the expected cost of vehicles.

iii) The sensitivity analysis performed concluded that, once autonomy limitations are overcome, allowing for an offer of long-distance mobility, electric vehicles become competitive, which results in significant changes in the final transport consumption profile, with increased efficiency associated with this sector, as well a significant increase in the provision of mobility services through electric vehicles.

Regarding the export of renewable energy scenario:

i) Once limitations are removed, there is a very significant increase in the production of electricity through solar photovoltaic, while the need persists for marginal production from natural gas;

ii) In terms of installed capacity, the total solar photovoltaic capacity allowed is used in 2030, accompanied by a reduction of installed natural gas capacity;

iii) The maximum capacity of onshore wind power is not entirely explored, and the capacity already installed remains in 2025;

iv) In conclusion, it seems that an increase in electricity demand for export could be secured through a new production capacity with solar photovoltaic, since this technology appears as more cost-effective, considering the cost and efficiency curve by 2030 currently available and used in the modelling. This sensitivity analysis only considers domestic demand for electricity. Results seem to confirm the potential for renewable energy export.

6. Vulnerability Assessment, Climate Change Impacts and Adaptation Measures

The first major milestone addressing climate change adaptation in Portugal goes back into 2001 and 2006 when it was published the SIAM projects reports[45] where multissectoral and integrated assessments of climate change impacts were realized. These reports remain a reference for adaptation initiatives including the first National Adaptation Strategy (ENAAC) published in 2010[46]. The developments undertaken by the various sectors and coordination within the ENAAC were then summarized in the Progress Report in 2013[47], which included the identification of the main vulnerabilities and proposals of adaptation measures. With the experience acquired along the process it was carried out a revision of the NAS leading to the adoption of a Strategic Framework for Climate Policy which includes the National Strategy for Adaptation to Climate Change 2020 (ENAAC 2020)[48]. Furthermore the Autonomous Regions of Azores and Madeira have their own respective strategy[49] and Azores is developing a Regional Climate Change (Adaptation and Mitigation) Action (expected to be finalized in 2017).

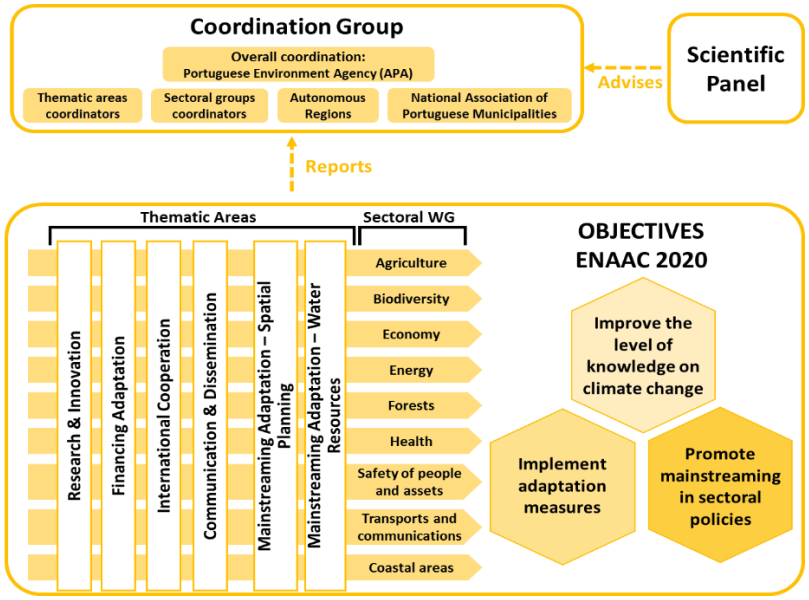


Figure 6.1
Governance model of Adaptation in Portugal (ENAAC 2020)

The Strategic Framework sets out the vision and objectives of national climate policy, reinforcing the commitment to develop a competitive, resilient and low-carbon economy, contributing to a new development paradigm for Portugal. It includes the National Programme for Climate Change 2020/2030 (2020/2030 PNAC), addressing mitigation goals and action, and the follow-up of the National Adaptation Strategy (ENAAC 2020).

[45] Santos, F.D., Forbes, K. & Moita, R. (eds.), 2002. *Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures - SIAM Project*. Gradiva, Lisbon.

Santos, F.D., & Miranda, P. (eds.), 2006. *Alterações Climáticas em Portugal Cenários, Impactos e Medidas de Adaptação – Projecto SIAM II [Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures – SIAM II Project]*. Gradiva, Lisbon.

[46] Estratégia Nacional de Adaptação às Alterações Climáticas *[National Strategy for Adaptation to Climate Change]*, approved by the Resolution of the Council of Ministers no. 24/2010.

[47] Agência Portuguesa do Ambiente, 2013. *Relatório de Progresso da Estratégia Nacional de Adaptação às Alterações Climáticas [Progress Report of the National Adaptation Strategy]*. APA, Amadora.

[48] Quadro Estratégico para a Política Climática *[Strategic Framework for Climate Policy]* (QEPiC) & Estratégia Nacional de Adaptação às Alterações Climáticas 2020 *[National Strategy for Adaptation to Climate Change 2020]*, approved by the Resolution of the Council of Ministers no. 56/2015.

[49] Azores Climate Change Strategy. Government Council Resolution No. 123/2011 of 19 October. Available at: http://servicos-sraa.azores.gov.pt/grastore/SRAM/Resolu%C3%A7ao%20-%20estrat%C3%A9gia%20para%20as%20altera%C3%A7%C3%B5es%20clim%C3%A1ticas.pdf

Madeira Adaptation Strategy. Resolution No 1062/2015 of the Presidency of the Regional Government of Madeira. Available at: http://www.gov-madeira.pt/joram/1serie/Ano de 2015/ISerie-188-2015-12-02.pdf

On this revision of ENAAC there is a focus on better articulation between the domains (particularly the cross-cutting ones) and on the implementation of adaptation measures, along with mainstreaming in sectoral policies. Three main goals guide ENAAC 2020:

1. **Improve the level of knowledge about climate change.**

   Basis for the development of the strategy, focusing on the need for research, collect information, consolidate, and communicate accordingly to the target audience.

2. **Implement adaptation measures.**

   Integrates the prioritization of measures, in harmony with the concerns of the spheres of science, policies and civil society, through benchmarking and participatory mechanisms. Additionally, the identification of funding mechanisms is addressed to support the implementation of adaptation measures.

3. **Promote mainstreaming of adaptation into sectoral policies.**

   The development of adaptation is guided towards its mainstreaming into sectoral policies setting a more effective framework. This approach also must rely on proper monitoring mechanisms in order to centralize the progress on adaptation policies.

Box 6.1 Adaptation governance

The implementation of ENAAC 2020 is supported by a coordination group presided by the Portuguese Environment Agency – APA, and composed of the coordinators of the thematic areas and of the sectoral working groups, as well as the representatives of the Autonomous Regions of Azores and Madeira and of the National Association of Portuguese Municipalities. This way, the coordination group brings together the central administration bodies which in turn engage their specific stakeholders.

Six cross-cutting thematic areas have been identified: i) research; ii) financing; iii) international cooperation; iv) communication/ dissemination; v) spatial planning; and vi) water resources. The work to be developed under these thematic areas is essentially undertaken by the nine priority sectors that constitute the basic units of work of ENAAC 2020, under the coordination of APA and other relevant bodies of each thematic area.

This framework is backed up by two other structures: the scientific panel and the Interministerial Commission on Air and Climate Change (CIAAC). The scientific panel guarantees the engagement of the scientific community and can provide knowledge-based support to the coordination group. The political support is essentially guaranteed by the CIAAC, a structure created for the monitoring of climate policy and sectoral policies with an impact on national goals in the field of air and climate change, taking into account the synergies between these two themes.

It is important to note the relevance of the ongoing project LIFESHARA (LIFE15 GIC/ES/000033 - Sharing Awareness and Governance of Adaptation to Climate Change in Spain) that will give an important contribute on the thematic area "international cooperation". One of the outcomes of this project, which has APA as a partner, is precisely the establishing of a framework for cooperation between the units of adaptation to climate change in Spain and Portugal in order to identify risks, vulnerabilities, priorities and common actions.

At regional level, besides their representation in the coordination group of ENAAC 2020, both Azores and Madeira autonomous regions have developed regional strategies for adaptation to climate change. Azores strategy was adopted on 19th October 2011, through the Resolution of the Council of the Government No.123/2011 which will be operationalized through a Regional Plan for Climate Change (conclusion in 2016/2017), which will integrate the measures and actions considered relevant to each sector, in particular those which are already underway. The Strategy of Adaptation to Climate Change of the Autonomous Region of Madeira was published in September 2015 (http://clima-madeira.pt/) where, among other aspects, has compiled the extensive sectoral assessment of impacts and vulnerabilities.

Please check Box 6.3 for information on adaptation action at local level.

6.1. Expected Impacts of climate change

The impacts of climate change are continuing globally and in Europe, as stressed out on EEA Report No 1/2017[50]. Besides the direct impacts of climate change in Europe, this report also assesses Europe's vulnerability to cross-border impacts like trade (including agricultural commodities) (e.g. price volatilities), infrastructure and transport (e.g. disruption of transports networks), geopolitics and security risks, human

[50] EEA, 2017. *Climate change, impacts and vulnerability in Europe 2016 – An indicator-based report*. EEA Report No 1/2017. Publications Office of the European Union: Luxembourg. Available at: https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016

mobility related to migration and finance. It is particularly highlighted the Mediterranean area vulnerability to shocks in the flow of agricultural commodities.

Adding to this, in the past few years some climatic variables have reached new record levels, affecting all regions of Europe. However the type and magnitude of these impacts vary greatly with the geographical location. The south of Europe is considered to be the region more vulnerable with significant impacts on different sectors. Project PESETA II[51] demonstrates the vulnerability of southern Europe by estimating losses of GDP between 1,8% and 3% for the scenarios of average global temperature rise of 2ºC and 3.5ºC respectively. The Iberian Peninsula is also highlighted on the EEA Report No 1/2017 as a hotspot for ecosystems and their services.

Being Portugal a southern European, coastal, and Mediterranean influenced country, it is located in these regions potentially more affected by climate change. Therefore, it faces a variety of impacts from heat waves, droughts, floods, wildfires and storm surges. The understanding of the changing patterns of temperature and precipitation is then crucial to assess climate risks. With this purpose it was developed a website with climate scenarios (http://www.portaldoclima.pt/en/) which stands as the reference source of information for Portugal's future climate. This website provides an easy access platform for the general public making available, namely: time series, CORDEX climate change projections and sectoral climatic indicators for the geographical coverage of mainland Portugal.

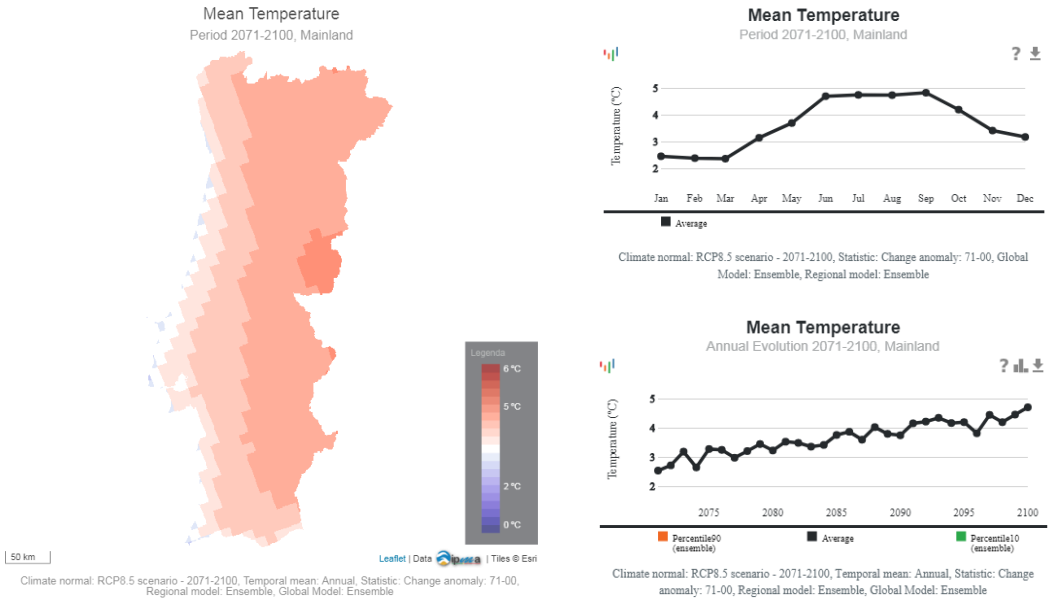


Figure 6.1.1

Mean temperature anomalies (reference 1971-2000) for the period 2071-2100 under RCP8.5 and for the ensembles of the regional and global models. Source: http://portaldoclima.pt/.

The climate scenarios on Portal do Clima reinforce the rise of temperature which can reach +5ºC for 2100 (applicable for minimum, mean and maximum temperature), particularly during summer and countryside of Portugal (see figure 6.1.1). The rising temperatures will bring a substantial increase of very hot days (Tmax ≥35ºC), especially in the southern countryside, more tropical nights (Tmin ≥20ºC), and longer heat waves, especially in the northeastern countryside (see table 6.1.1). This warming will also worsen the risk of forest fires as demonstrated in table 6.1.1).

Table 6.1.1

Mean values for mainland Portugal for the ensembles of the regional and global models. Source: http://portaldoclima.pt/.

Indicator	Modeled historical (1971-2000)	Anomalies under the scenarios

[51] Ciscar JC, Feyen L, Soria A, Lavalle C, Raes F, Perry M, Nemry F, Demirel H, Rozsai M, Dosio A, Donatelli M, Srivastava A, Fumagalli D, Niemeyer S, Shrestha S, Ciaian P, Himics M, Van Doorslaer B, Barrios S, Ibáñez N, Forzieri G, Rojas R, Bianchi A, Dowling P, Camia A, Libertà G, San Miguel J, de Rigo D, Caudullo G, Barredo JI, Paci D, Pycroft J, Saveyn B, Van Regemorter D, Revesz T, Vandyck T, Vrontisi Z, Baranzelli C, Vandecasteele I, Batista e Silva F, Ibarreta D, 2014. *Climate Impacts in Europe. The JRC PESETA II Project*. JRC Scientific and Policy Reports, EUR 26586EN. Available at:

http://publications.jrc.ec.europa.eu/repository/handle/JRC87011

(*average for mainland Portugal*)		RCP4.5		RCP8.5	
		2041-2070	2071-2100	2041-2070	2071-2100
Very hot days (Tmax ≥35ºC)	4 days	+8 days	+11 days	+11 days	+28 days
Tropical nights (Tmin ≥20ºC)	6 days	+9 days	+11 days	+15 days	+33 days
Heat Wave Duration Index	5 days	+6 days	+6 days	+7 days	+13 days
Fire Risk Index – Extreme risk – High risk	 7 days 60 days	 +7 days +10 days	 +8 days +10 days	 +9 days +15 days	 +23 days +18 days
Days without precipitation (PP <1mm)	229 days	+9 days	+13 days	+12 days	+25 days
Maximum period without precipitation	38 days	+3 days	+6 days	+6 days	+13 days

The precipitation patterns will also face changes, with significant decrease of the annual figures throughout the territory (see figure 6.1.2) despite the increase of precipitation in December/January (particularly for the period 2041-2070). In this way it is expected the extension of the dry season from summer to spring and autumn. Still this reduction of precipitation does not offset the positive deviations of the interannual variability, so despite this trend there will be years with more precipitation than the normal climate of 1971-2000. In this way the territory will remain vulnerable to floods, especially considering the trend of increased contribution of days with intensive rain to the annual precipitation. On the other hand, the reduction of precipitation will reduce river flow and will intensify the drought events and processes of desertification.

Both variables, temperature and precipitation, define a solid trend for Portugal's climate, where it is expected the expansion to the north of the hot-summer-Mediterranean-climate (Csa Köppen climate classification) and contraction of the warm-summer Mediterranean climate (Csb Köppen climate classification) (see figure 6.1.4). For the end of the century it is also expected the appearance of hot semi-arid climate (BSh Köppen climate classification) in the southeast of Portugal.

These changes will also have an array of consequences. It affects the geographical distribution of crops, reduce yields and increase water demand for agriculture. It provides favorable conditions for pests and diseases with negative impacts on agriculture, forests, biodiversity and human health. The heat waves also increase mortality while water stress is an important driver for biodiversity loss and species migration. Complementarily there is a trend for more storm surges and coastal erosion processes.

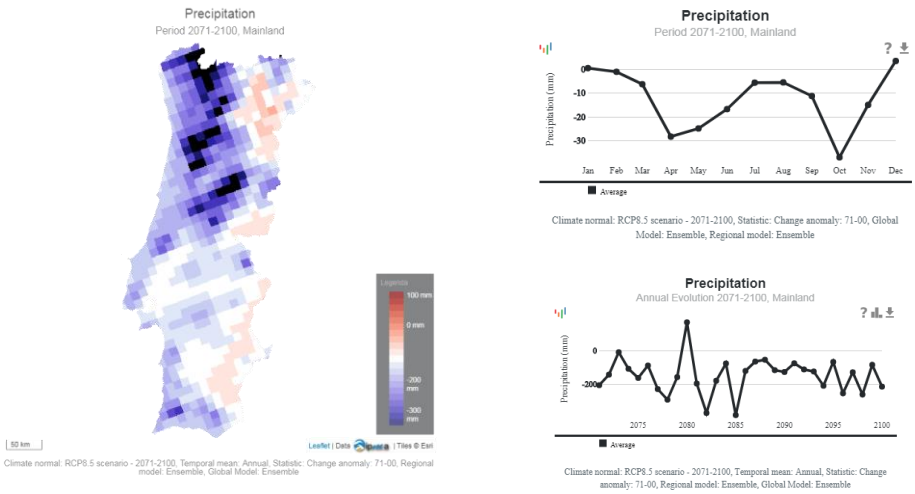


Figure 6.1.2

Precipitation anomalies (reference 1971-2000) for the period 2071-2100 under RCP8.5 and for the ensembles of the regional and global models.
Source: http://portaldoclima.pt/.

Modeled historical (1971-2000) **RCP4.5 (2071-2100)** **RCP8.5 (2071-2100)**

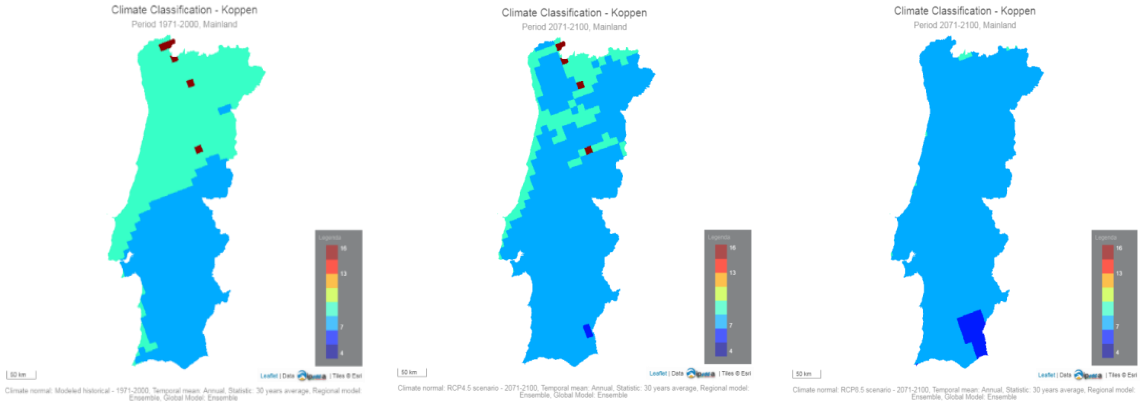


Figure 6.1.3

Köppen climate map for Portugal for the periods 1971-2000 (modeled historical) and 2071-2100, for the scenarios RCP4.5 and 8.5 and for the ensembles of the regional and global models. Key: light blue – Csa hot-summer-Mediterranean-climate; light green – Csb warm-summer Mediterranean climate; dark blue – BSh hot semi-arid climate; dark red – temperate without dry season with temperate summer.
Source: http://portaldoclima.pt/.

Box 6.2 National databases for extreme weather-related events

Within the scope of national observation programmes, the following initiatives that manage national databases for extreme weather-related events can be highlighted:

- The National Authority of Civil Protection (ANPC) has a national database on disaster response and losses since 2006 and publishes that information on the yearbooks of civil protection events;
- The Portuguese Environmental Agency (APA) keeps the records of the historical marks of floods and of its network of meteorological and hydrological monitoring stations, this data is available on SNIAmb (National System of Environmental Information – http://sniamb.apambiente.pt).
- The Portuguese Sea and Atmosphere Institute (IPMA) is the body responsible for carrying out the observations for meteorological and climatological purposes. IPMA has the responsibility for deployment, exploration and maintenance of the country network of meteorological stations; it is also responsible for archive and quality control of weather observations. Also promotes a project "MeteoGlobal" (http://meteoglobal.ipma.pt/) that allows any citizen to report in almost real-time the occurrence of severe weather events.

6.2. Vulnerability Assessment

The reflective process during the first stage of ENAAC (2010-2015) has involved specific stakeholders and experts for each of the sectors which resulted, in many cases, in an exhaustive collection of key action areas and adaptation measures published in sectorial reports which also included sectoral vulnerability assessments. However some sectoral groups observed limited due to the availability of resources and skills which reduced the depth of the assessments conditioning the quality of the final products. A resume of these vulnerability assessments developed by the sectoral working groups is documented in ENAAC's progress report (APA, 2013, available at:

https://www.apambiente.pt/_zdata/Politicas/AlteracoesClimaticas/Adaptacao/ENAAC/RelatProgresso/Relat_Progresso.pdf).

This report resulted from the involvement with sectoral stakeholders and compiles the impacts and vulnerabilities of the sectors, the barriers for adaptation, and the adaptation measures. It is important to highlight that the main references of this report are the SIAM projects.

The SIAM projects (2002[52] and 2006[53]) were the most comprehensive and integrated assessments on impacts and vulnerability associated with climate on mainland Portugal, Azores and Madeira. The studies were based on future climate scenarios and associated effects on a number of socio-economic sectors and biophysical systems including hydrological resources, coastal areas, energy, forests and biodiversity, fishing, agriculture and health. A sociological analysis of climate change in Portugal was also performed.

[52] Santos, F.D., Forbes, K. & Moita, R., 2002 (eds.). Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures - SIAM Project. Gradiva, Lisbon.

[53] Santos, F.D., & Miranda, P., 2006 (eds.). Alterações Climáticas em Portugal Cenários, Impactos e Medidas de Adaptação – Projecto SIAM II [Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures – SIAM II Project]. Gradiva, Lisbon.

At subnational level it is important to highlight the Adaptation Strategy of the Autonomous Region of Madeira (http://clima-madeira.pt/) and the significant trend of development of Local Adaptation Strategies. This trend was greatly promoted by the project ClimAdaPT.Local (see box 6.3) where local officers were subject of training on vulnerability assessment, among other adaptation issues. The project also led to local adaptation strategies that integrate detailed assessments of the climate change impacts and vulnerabilities on the respective territories. The capacity building achieved with ClimAdaPT.Local is presently being replicated on other subnational regions through EU funding by using the guiding manuals produced.

The impacts of extreme events such as heat waves, droughts, floods and forest fires demonstrate the significant vulnerability and exposure to climate variability of some ecosystems and many human systems. Portugal is among the European countries with the greatest potential vulnerability to climate change impacts as it can be seen in the following summary of sectoral vulnerabilities:

Agriculture

For the agriculture sector it is expected a significant reduction of crop yields due to lack of water availability and drought events. The crops most affected are pastures, rainfed crops (mostly cereals). Other vulnerabilities for agricultures are the damages caused by heavy precipitation and winds to crops and infrastructures. Despite being very localized events the impact magnitude is high affecting particularly horticulture, fruit growing and agricultural facilities. Climate change will also bring more pests and diseases but can also have positive impacts with the reduction of the number of frost days and with the temperature rising conjugated with assured water availability for irrigation.

Forest

Climate change compromise the performance of ecological and economic functions of Portuguese forests. The most relevant vulnerabilities on the forest sector are the ones caused by fires and the propagation of harmful biotic agents such as pests, diseases and invasive species. This affects the main species and population productivity such as eucalypt and pine productivity in the centre and south of the Portuguese territory. Furthermore the climate scenarios provide an overview of the geographical distribution potential for the species, which can lead to improvements of productivity, such as for cork oak, especially when there is water availability. As a consequence of the degradation of the tree cover and forest fires there is an intensification of the desertification and soil erosion processes.

Biodiversity

The vulnerability of the different species and ecosystems varies with their sensitivity to the impacts of climate change and with their adaptive capacity to environmental changes. In general amphibians[54] are the most vulnerable due to their narrow climatic niches and low dispersion capacity. As for ecosystems, the most vulnerable are coastal ecosystems, inland wetlands and associated species, and species and habitats that are sensitive to extreme events.

Energy and industry

There is a great variety of vulnerabilities for the sector energy and industry whose infrastructures can be sensitive (variable depending of the facility) for localized and specific extreme weather events and water level rise[55]. Accessibilities are also affected, especially considering that it's based mainly on the road option which is less resilient than the rail option. Also the supply of natural gas and specific raw materials (e.g. availability of cotton for the textile industry) can be compromised. On the energy side, the rising temperatures lead to electric losses in power transport, lead to reduction of energy demand for space heating and for hot water against the rising demand for space cooling inducing in this way to the displacement of the peak demand from winter to summer.

Water resources

[54] The most vulnerable amphibian species are: *Pelodytes punctatus*, *Triturus helveticus*, *Triturus marmoratus*, *Chioglossa lusitanica*, *Alytes obstetricans*, *Alytes cisternasii*, *Discoglossus galganoi*, *Rana iberica*, *Bufo calamita*, *Triturus pygmaeus*, *Pelodytes ibericus* and *Pelobates cultripes*.

The most vulnerable reptile species are: *Iberolacerta monticola*, *Vipera latastei*, *Vipera seoanei*, *Coronella austriaca*, *Anguis fragilis*, *Podarcis carbonelli*, *Lacerta schreiberi*, *Emys orbicularis*, *Mauremys leprosa* and *Natrix natrix*.

[55] The industrial and chemical poles are located in the coast or next to large estuaries becoming necessary to have parameters of containment / diversion of water courses.

The vulnerabilities of water resources can be distinguished in four types: availability of water, water demand, water quality and flood risk. On the one hand it is expected a reduction of the annual outflow and annual recharge of aquifers, especially in the south, an increase in flow variability and regional asymmetry of water availability and an increase of the risk of droughts. On the demand side it is expected an increase of water demand for agriculture and for production of energy (in order to reduce dependence on fossil fuels). The water quality is also affected due to the following trends: reduction of runoff, increase of water temperature, increase in soil erosion and diffuse contamination, salinization of the coastal aquifers (due to sea level rise and the reduction of aquifers recharge), and degradation of ecosystem health. Furthermore climate change increases the risk of floods, especially in the north of Portugal and in coastal areas.

Human health

Climate change also affects human health at different extents. Extreme weather events such as heatwaves, floods and forest fires can cause deaths, other injuries and mental disorders. This, along with the appearance of new diseases or the resurgence of others (whether they are transmitted by food, by water or by vectors), affects the response capacity of the health services. Additionally it is expected an increase of respiratory disorders and deaths associated with poor air quality due to forest fires and episodes of high-level tropospheric ozone. Almost all of the environmental and socio-economic impacts of climate change can lead to adverse effects on human health by modifying existing health risk factors and introducing new risk factors into regions that would otherwise not be affected by them.

Security of people and assets

The diverse climate risks are also addressed for purposes of security of people and assets. More frequent and intense extreme weather events forces stronger responses of Disaster Risk Reduction. The most relevant vulnerabilities are associated to forest fires and flood events.

Tourism

Being tourism an important sector for Portuguese economy it is important to assess its vulnerability to climate change. The sectoral vulnerabilities described in this chapter can be properly projected into the touristic attraction areas according to the geographical characteristics. As a consequence it is expected a shift of tourism from the most affected regions. Regarding touristic facilities, the rising temperatures increase the demand for water and energy (space cooling) and make it difficult to maintain green areas (e.g. golf courses).

Coastal areas

According to the Coastal National Working Group Report (2014)[56], Climate change, by increasing the average global sea level (AGSL), is causing more frequent extreme sea level values. These trends cause more coastal erosion, allow waves to burst closer to shore, transferring more energy to the coast. The other factor that also tends to increase erosion is the rotation of the average wave direction on the west coast. Finally there is the possibility of changes in the thunderstorms regime, although in this case there is still much uncertainty about the future evolution. In the medium and long term (time horizons up to 2050 and 2100, respectively), the increase in AGSL will become a very important factor of aggravation of storm surges, flooding and coastal erosion. Although there is uncertainty as to what the AGSL will increase by the end of the 21st century, it is most likely to exceed 0.5m and can reach values around 1m. Such AGSL variations will have very significant and serious effects on the coast of Portugal. There is still a considerable lack of knowledge about these impacts and the associated cost estimates.

6.3. Adaptation Measures

Financing

The implementation of adaptation measures is highly dependent from practitioners' capacity to address adaptation issues and also depends from the availability of external funding sources. In order to foster adaptation action it was developed an adaptation funding programme under the EEA Grants 2009-2014 with a total budget of 3,529,412.00 € (3,000,000.00 € EEA + 529,412.00 € from the ex-Portuguese Carbon Fund – FPC). Programme AdaPT (http://apambiente.wixsite.com/adapt) was built from the needs identified

[56] Available at: http://sniamb.apambiente.pt/infos/geoportaldocs/docs/Relatorio_Final_GTL2015.pdf

previously on the ENAAC's progress report (APA, 2013) and was structured around four lines of action covering a website for climate scenarios, development of local adaptation strategies and training of local officers, integration of climate change in schools activities, and development of small scale sectoral projects. The first two lines of action led to the projects Portal do Clima (http://www.portaldoclima.pt/en/) and ClimAdaPT.Local (see box 6.3). Both of these projects are presently a reference for adaptation actions, one by providing all the information on climate scenarios and other by providing guidance for assessing vulnerability and for adaptation planning. Despite the focus of ClimAdaPT.Local on municipalities its outputs can be widely used by other types of adaptation practitioners. The other two lines of actions led to the project Clima@EduMedia[57] (http://www.climaedumedia.com/) which aimed for the increased awareness of and education on climate change and to five small scale sectoral demonstrative projects[58]. One of these projects consisted in a collaborative platform for the adoption of measures for adaptation to climate change in industry and services. This platform (http://www.adaptis.uc.pt/) is now a reference platform that collects adaptation measures, tools and case studies. Programme AdaPT marks, in this way, the start-up of adaptation action. Even at education level further efforts are being held by a task force established between Ministry of Education and Ministry of Environment to assess environmental integration in schools curricula, including Climate Change.

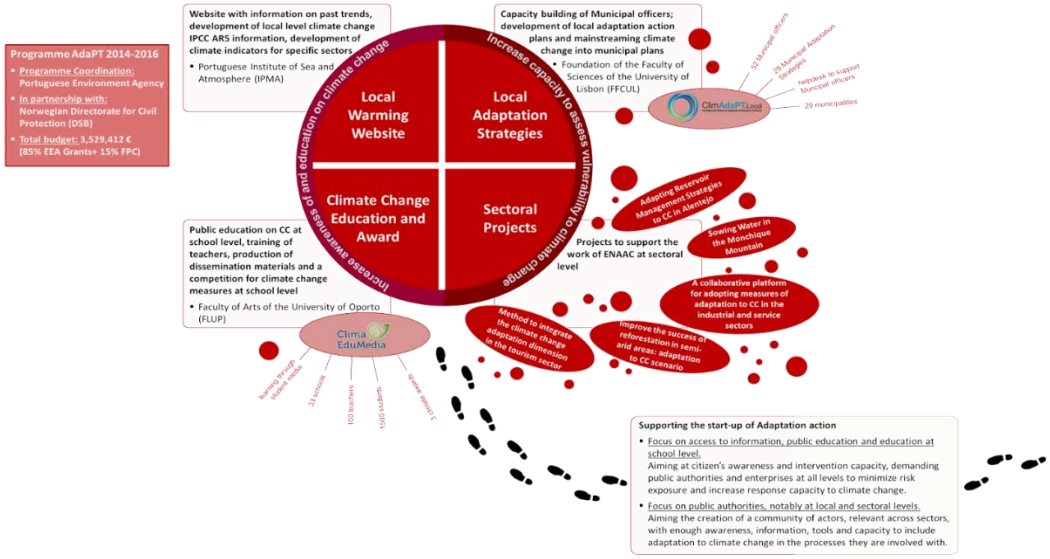


Figure 6.3.1
EEA Grants' Programme AdaPT Scheme.

Besides Programme AdaPT, the adaptation funding mechanisms to climate change are specially guaranteed by the EU Common Strategic Framework Structural Funds2014 – 2020 as well as programmes such as Horizon 2020, the Interreg IV-C and LIFE.

Under capacity building and governance it is worth mentioning the INTERREG IVC project F:acts! – Forms for Adapting to Climate Change through Territorial Strategies, directed to exchange good practices, and transfer knowledge about climate change adaptation (Directorate General of Spatial Planning-DGT participation). Two publications have resulted: a) a handbook (which provides a framework to define and implement territorial integrated strategies in the context of climate change adaptation in risk areas); and b) a study directed to a specify area, which previously defined as a pilot areas – Landscape Multifunctionality of

[57] The project on education and climate change award Clima@EduMedia seeked innovative approaches for teaching and learning content related to climate change in the areas of mitigation and adaptation. The project included several activities such as training on the use of media to communicate science, educational materials with tutorials for teachers on how to introduce media contents for climate change awareness, workshops and labs for collaborative content production, online platform for experience sharing and a final contest for schools to present and implement their best ideas for mitigation and adaptation of climate change.

[58] AC:T - Method to integrate the climate change adaptation dimension in the tourism sector (http://adapt-act.lnec.pt/); AdaptForChange – Improve the success of reforestation in semi-arid areas: adaptation to climate change scenario (http://echanges.fc.ul.pt/projetos/adaptforchange/); adaptIS – A collaborative platform for adopting measures of adaptation to climate change in the industrial and service sectors (http://www.adaptis.uc.pt/); GestAqua.AdaPT – Adapting Reservoir Management Strategies to Climate Change in Alentejo (http://www.gestaqua.adapt.pt/); SOWAMO - Sowing Water in the Monchique Mountain (http://188.93.230.40/~sowamoeu/).

Baixo Vouga Lagunar: a contribution for climate change adaptation - which offers a set of measures and recommendations to promote an implementation of a local governance model and a definition strategy for territorial management and landscape. During the implementation of the project several events, about climate adaptation through territorial strategies have taken place in Portugal, including study visits, workshops to promote local stakeholders involvement, and coaching visits from foreign partners to increase adaptation capacity, for which it were also invited local stakeholders.

In order to maximize Programme LIFE for national projects, including adaptation to climate change, it is being implemented since 2016 a PT capacity building project (LIFE14 CAP/PT/000004). This project aims to increase the number and quality of projects that are yearly presented to the Calls for Proposals in LIFE through: a) increasing the capacity of public administrations involved with LIFE; b) creating and improving networking and best practice dissemination mechanisms; c) facilitating access to other co-financing sources; d) promoting and establishing a better interaction between project proposers and the national administrations dealing with LIFE along the whole project cycle; e) transversally to the former, increasing the dissemination/recognition of the LIFE program and projects supported by LIFE.

The Common Strategic Framework is implemented at national level by several national Programmes (Portugal 2020) with the Operational Programme on Sustainability and Resource Use Efficiency (PO SEUR) and the Transnational Operational Programme for Madeira-Azores-Canary Islands (MAC 2014-2020) standing out as the most significant in matters related to adaptation action.

Also at national level there are the Foundation's grants for Science and Technology (FCT) and the financing mechanism provided by the Environmental Fund (Decree-law No.42-A/2016) that aims to support environmental policies such as on adaptation to climate change, with special focus on actions on coastal areas and on water resources.

Furthermore the development of funding mechanisms and of selection criteria for applications are some of the issues to be addressed under the thematic area "Funding and implementing adaptation" of ENAAC 2020.

As demonstrated in box 6.3, vertical coordination between all levels of governance is an important aspect of ENAAC 2020. This contributes also to one of ENAAC's main objectives-"*mainstreaming adaptation*", an area that registers relevant progresses. Within this scope it is important to highlight the ongoing process of revision of the National Territorial Planning Policy (PNPOT) where adaptation to climate change will be properly integrated. This is a very important issue as PNPOT is a territorial development instrument of a strategic nature that establishes the great options with relevance to the organization of the national territory, consubstantiates the frame of reference to be considered in the elaboration of other territorial management instruments and constitutes an instrument of cooperation with the other Member States for the organization of the territory of the European Union.

Additionally, the following sections provide an overview of the adaptation work already developed and planned for each of the sectoral groups and cross-cutting areas of ENAAC 2020.

Box 6.3. Local level governance

The project on local adaptation strategies ClimAdaPT.Local intended to effectively promote adaptation at local level in Portugal. The main objectives were: embedding the climate change adaptation dimension on local and municipal level in Portugal; creating a community of municipal actors aware of climate change issues and trained for the use of decision support tools on adaptation; promotion and provision of local adaptation knowledge particularly in the definition of strategies, planning and implementation of measures and results communication; the reduction of barriers and constraints on the local actors involvement on adaptation process; and integrating adaptation into municipal and sectoral agents decision and planning processes. The project team included the 3 municipalities with previous experience on adaptation planning and action and resulted on the development of Local Adaptation Strategies for 27 municipalities. Additionally a significant know-how and involvement of local and regional communities has been realized under the project which is now being translated into the development of other local adaptation plans funded by the Common Strategic Framework.

In this way, from 2013 until now there was a significant development of the local authorities' capacity to assess vulnerability to climate change and to deal with adaptation issues. This can also be seen on the number of signatories with adaptation commitments under Convenant of Mayors, which counts presently with 23 signatories. Additionally there are 14 Portuguese municipalities involved in the Campaign Making Cities Resilient where they are active in public education to enhanced awareness of risk and protective measures.

Agriculture

In the first stage of ENAAC this sector was aggregated along with forests and fisheries and developed a National Adaptation Strategy for Agriculture and Forests (2013) that covered climate trends, sectoral characterization, assessment of climate change impacts and adaptive capacity, and definition of adaptation measures. This strategy addresses aspects such as desertification and soil conservation, main systems of agriculture production, water use, extreme situations, and plant health. The following adaptation actions stand-out:

- There are already some aspects from the Common Agriculture Policy that contribute directly and indirectly to the implementation of adaptation measures, namely: support to soil conservation, efficient use of water in agriculture, maintenance of local breeds at risk, risk prevention and restoration of productive potential.
- The ex-Portuguese Carbon Fund[59] supported agricultural and forestry projects (biodiverse grasslands and shrubland management) contributing both to mitigation (by increasing carbon sequestration in soil) and adaptation (by improving the content of soil organic matter, fighting erosion and desertification, increasing the resilience of grassland and forest areas) to new climatic conditions.
- The National Action Programme to Combat Desertification - PANCD (2014) also includes guidelines that interact with ENAAC.

By 2017, the agriculture working group plans to: 1) produce a report with the developments undertaken in ENAAC I including the implementation of adaptation measures, 2) define the Programme AGRI_ADAPT 2020 covering a) the identification of gaps in the impacts, measures and policy instruments, b) identification of best practices to address these gaps, c) definition of actions to be developed until 2020.

Biodiversity

The Biodiversity working group published a report (2013) covering climate trends and its impacts on biodiversity assessing the vulnerability of ecosystem services, different habitats, and species. The report provides an extensive list of adaptation measures with indicators and targets, and actions categorized by priority. These considerations have been mainstreamed into biodiversity and nature conservation policies and into other instruments such as financing. For this sector it is highlighted the following aspects:

- The National Strategy for Nature Conservation and Biodiversity - ENCNB (2001, on revision process60) considers particularly important, studies on the impact of climate change to the stability of ecosystems and biodiversity.

[59] Became part of the Environmental Fund since 2017 by application of the Decree-Law No. 42-A/2016.

[60] Considering the new legal and programmatic framework and international commitments undertaken by Portugal, including on adaptation to climate change.

- The sector has adopted a framework for the climate validation of plans and programs, which allows diagnosing the extent to which programs integrate biodiversity adaptation to climate change, improving the outcomes of the mechanism for strategic environmental assessment of plans and programs (Decree-Law No. 232/2007).
- Implementation of actions of forest fires prevention such as the conservation and reforestation of forests of native vegetation as a fire management measure.
- Development of management plans for the areas classified under the RAMSAR convention in order to include adaptation to climate change.
- The development of conservation projects that somehow address climate risks, examples: a) conservation of Anaecypris hispanica (Life Saramugo - LIFE13/NAT/PT/786); b) Aquila adalberti conservation in Portugal (Life Imperial - LIFE13/NAT/PT/1300); c) conservation of temporary ponds in the southwest coast of Portugal (Life Charcos - LIFE12 NAT/PT/000997); d) Falco & Otis Project: Protect Falco naumanni and Otis tarda.

The plans defined by the Biodiversity Group for 2017 include the preparation of the Programme Biodiv_ADAPT2020 and the support and promotion of its implementation in the following areas: a) vulnerabilities, impacts, options and measures, b) mainstreaming of adaptation into sectoral policies, c) knowledge gaps, and d) sectoral studies. For this matter it was initiated the mapping of the projects and actions that contribute for biodiversity adaptation to climate change, which were or will be implemented in the periods 2013-2015 and 2016-2020.

Economy

The Economy is a new working group on ENAAC 2020 which integrates the industry and tourism sectors previously covered on ENAAC I. Other subgroup now considered is the services sector. In the tourism subsector the following aspects stand-out:

- Publication of the annual reports about the Best Environmental Practices on Touristic Resorts based on surveys to all Touristic Resorts in Portugal. These surveys were conducted since 2008, and are specially focused on the improvement of the efficiency on resources management (energy, water and waste).
- The National Strategic Plan for Tourism (2013, currently being revised) aims, among other things, to promote sustainability and rational use of natural resources, and to protect natural and cultural landscapes focusing on the relation with the tourist. Both these aspects have synergies with adaptation action.
- The Programme of Touristic Destinations also stresses the importance to develop sustainable destinations, contributing with activities of impact assessment and identification of corrective measures, given the long-term geophysical nature concerns that interfere with the development of tourism or that are conditioned by it (bathing areas, dynamic coastlines, hydrological regime, availability of drinking water, etc.).
- In the 2020 Tourism Action Plan climate change is also integrated, stressing the concerns on sustainable practices and on efficient resource use, accompanied with the rising on environmental certification and on environmental regulation. On its strategic objectives it is highlighted the requalification of consolidated tourist areas and the adaptation to climate change in coastal areas.

The activities planned for the sector Economy under the framework of ENAAC 2020 include: a) identification of impacts, vulnerability and adaptation measures; b) mainstreaming of adaptation into sectoral policies; c) identification of needs and knowledge gaps; d) promotion of sectoral studies about the characterization of the problems and necessary measures, sources of funding and monitoring mechanisms; and e) dissemination of compiled information among sectoral stakeholders.

Energy

In 2012, the energy sector prepared a progress report in the framework of ENAAC I, which identified actions on adaptation, mitigation and prevention for vulnerabilities of the sector. The report concluded that larger companies had already undertaken a number of measures, some with large investments, in order to reduce the impact of climate change. Actions were also identified to be undertaken by business and society in general. The report also contained proposals for "win-win" and "no regrets" measures, concerning horizontal

measures (sector-wide) and specific measures (linear and fixed infrastructure). For example, horizontal measures for the short/medium term can incorporate best practices in building design, vulnerability analysis, and stress testing for vulnerable infrastructure. As far as the long term is concerned firms may think of technological diversification and geographical distribution of its assets and strengthening its distribution network and transportation. The evolution of the energy supply sector, although triggered mainly by concerns about security of supply and mitigation of climate change, is convergent and consistent with the adaptation objectives. In this way the implementation of adaptation measures is being assured by various energy policies and instruments. It is essential then to develop climate proofing procedures in order to provide an overview of the adaptation performance of the energy sector. Another important issue is the need for re-examination of the vulnerabilities and climate risks identified for the energy sector. Furthermore the energy working group intends to explore in more depth in the prospect of energy demand as well as in the energy-water nexus.

Forests

As mentioned above, the Forests sector was aggregated with agriculture in ENAAC I and developed the National Adaptation Strategy for Agriculture and Forests (2013). Additionally it was published the report "Forests Adaptation to Climate Change" (2013) that addressed the impacts and adaptive capacity and measures on issues such as distribution and productivity for the main forestry species, forest fires, biotic agents (pests, diseases and non-native invasive species), environmental services, fishing and inland aquaculture resources, cinegetic species, socioeconomic factors. Similarly, two other instruments at strategic level but with a stronger operational component, the National Strategy for Forests - NSF (2015) and the National Strategy for Nature Conservation and Biodiversity - ENCNB (2001, on revision process) include specific objectives and corresponding measures, covering also adaptation to climate change. These objectives and measures are supported within the scope of rural development, the structural funds, the permanent forest fund and regular budget. In particular, some measures identified in the NSF are:

- Implementation of the National Plan of Integrated Management of Fire, encompassing the implementation of primary and secondary fuel management networks, increasing the area of intervention and the number of the fire prevention teams' better operationalizing their action.
- Emergency restoration after large fires, regeneration of affected stands and restoring forestry production potential in stands affected by biotic agents.
- Installation of well-adapted forest stands and conversion of stands in inadequate ecological conditions.
- Promotion of resilience of the stands, adjusting the density of maritime pine stands and the improvement of the stands' condition for the cork oak and holm oak.
- Expansion of the area under management plans improving the economic value of the goods and services they provide.

Under the framework of ENAAC 2020 the next steps for this sectoral working group are: a) the adequacy assessment of the adaptation measures identified on the report "Forests Adaptation to Climate Change" (2013) according to the current situation of the Portuguese forest; and b) monitoring of the implementation of measures based on a system of established indicators. The adequacy assessment will grasp the identification and adjustment of dysfunctional measures, identification of new measures to address gaps, revision of the measures' indicators.

Health

The health sector was also represented in ENAAC I where it produced a state of the art report on the effect of climate change in the sector. Additionally it is highlighted the following aspects:

- Implementation of plans for improved efficiency on water and energy use, and on waste management for all the buildings of the health sector.
- Since 2004 there is a Contingency Plan for heat waves, with warning system and responses to emergencies.
- Since 2007 there is a Surveillance System on Vector Born Diseases.

Safety of people and assets

On ENAAC I, the sector "safety of peoples and assets" has published an exploratory report on the implications of climate change on the disaster risk reduction activities, and has developed several initiatives such as:

- Publication in April 2014 of the Report on National Risks Assessment, including the ones related to climate change (http://www.prociv.pt/bk/RISCOSPREV/AVALIACAONACIONALRISCO/Documents/2016_Avaliacao_Nacional_Riscos.pdf).
- Acts to support disaster reduction policy at the sectorial level, namely in forest fires, floods; climate change adaptation and critical infrastructure protection.
- Other good practices in place including the warning systems: under adverse weather conditions, monitoring of water resources (droughts and floods), heat waves, warning in affected areas within the risk of dam break.
- Development of a national wide educational programme to children (reached more than 300 schools) addressing subjects related to Disaster Risk Reduction in the curricula of several education levels. Universities also include these issues not only in the area of civil protection but also in other areas, like land use planning, engineering and geography.
- Establishment of the Portuguese National Platform for Disaster Risk Reduction, in May 2010, a key measure towards better coordination of prevention, preparedness and response activities. The Platform is chaired by the Minister for Internal Affairs and composed of Delegates from Ministries and other national entities. A consultative Sub-Committee was also created within this Platform to promote Disaster Risk Reduction (DRR) activities. This sub-committee includes representatives from ministries and from private sector, academic institutions, resilient cities and professional associations (engineers; architects). In 2014 the Sub-Committee constituted also the Working Group on Safety of Public and Assets from ENAAC 2020.
- Integration and streamlining DRR into national development strategies and legislation, recognizing its importance for the promotion of sustainable economic growth and progress, and as a result from the subscription of Portugal to the Hyogo Framework for Action in 2005.
- Under the framework of European Commission, Portugal is involved in regional hazard monitoring, namely in the area of forest fire risk (EFFIS-European Forest Fire Information System: http://forest.jrc.ec.europa.eu/effis/) and meteorological events (Meteoalarm-alerting Europe for extreme weather: http://www.meteoalarm.eu/).

Besides the common responses of disaster risk reduction, the working group safety of people and assets has contributed to ENAAC 2020 with the publication of two manuals, one dedicated to best practices on flood risk management and other dedicated to best practices in risk prevention and management – resilient cities in Portugal 2016. Another manual is being prepared about best practices of resilience within the private sector.

Transports and communications

Transports and communications is a new sector in the national adaptation strategy. The first steps still need to be taken in order to promote sectoral stakeholders involvement, vulnerability and impact assessment and adaptation measures, and integration of adaptation into sectoral activities. Therefore, in ENAAC 2020 it will be developed the following activities:

- Establishment of a stakeholder network under the theme of adaptation to climate change in transports.
- Development of a survey focusing on the assessment of the transport infrastructures vulnerabilities to Climate Change.
- Identification of I&D lines under climate change adaptation.
- Identification of financing lines and potential projects for application for funding.

Coastal areas and sea

In ENAAC I, this sectoral group was partially addressed in the sectoral adaptation strategy for water resources. Coastal protection is one of the main areas of investment given our particular vulnerability. There

were several types of implementing actions under the National Action Plan on Coastal Protection 2012-2015, in priority sites:

- Insertion of buffer strips in spatial planning rules.
- Monitoring of coastal systems.
- Conclusion of risk and vulnerability assessment for most of the Portuguese coast.

In the past reactive measures were prioritised, such as sand deposition and construction of coastal protection hard infrastructure, but now it is intended to prioritise a shift towards prevention, according to knowledge and experience accumulated, with cost-benefit evaluation. This can include measures such as replacements of people and infrastructures.

In response to the winter of 2013/2014 where Portuguese coastal areas were greatly affected by storm surges a Coastal Working Group was created, with contributions from academia and governmental organizations for a deeper reflection on the coastal areas for the definition of a set of measures. These aim to reduce the exposure to risk in the medium term, including a reflection on sustainable development within climate change scenarios.

ENAAC 2020 adds to the former sectoral group the sea dimension with the intention to develop adaptation in this important area. It is expected to register significant progresses in this sectoral group knowing that a significant component of PO SEUR, is particularly destined to fund the Coastal Areas protection taking into account adaptation (200 M€). Under the framework of ENAAC 2020 the following activities are planned:

- Knowledge improvement on the coastal and marine systems behaviour including monitoring, data collection and its organization into a repository of geographical information making it available for the public.
- Research for better understanding of climate change impacts on the population in order to define proper adaptation measures, including the options: a) protecting the area; b) adapting the area; and c) withdrawing the population.
- Implementation of adaptation measures, including structural defence interventions and local adaptation, such as shots of artificial feeding and projects for increasing resiliency, development of warning and protection systems.
- Enhancing the effectiveness and enforcement of the legal instruments that determine the uses and activities in risk areas.
- Promoting training and innovation, dissemination and participation on adaptation policy.

Furthermore it must be highlighted the latest progress within this sector, which includes:

- The approval of project COSMO: Program for Monitoring the coastal strip of Continental.
- The approval of project QUIMERA, which involves studies and actions of artificial feeding of sediments.
- The application for project SIARL for implementation of the Collaborative Platform to become an Information and Data repository essential to promote the Integrated Management of Coastal Areas.
- The integration of the issues highlighted in the Coastal Working Group Report on the Coastal Shore Programmes.
- The development of the Action Plan for the Coastline - Coastline XXI and Annual Action Plan.
- The development of the action plan within the scope of the National Strategy for the Sea 2013-2020.

Water resources

The main focus of this sector is at the planning level, particularly by integrating climate change issues into Hydrographic Region Management Plans, Flood Risk Management Plans and the Water National Plan. On these plans it is defined adaptation measures. These plans define adaptation measures to be implemented during the period of validity of the plans, between 2016 and 2021. Additionally, under the framework of ENAAC 2020 it is planned the following activities:

- Development of water resources indicators for the climate scenarios developed under the Climate Portal Project, for the geographical scale of the river basin districts.
- Integration of climate change into the third management cycle of Hydrographic Region Management Plans (under the EU Water Framework Directive – Directive 2000/60/EC) by considering climate scenarios in the demand and supply-side parameters that support the characterization and assessment of each hydrographic region.
- Integration of climate change into the second Preliminary Flood Risk Assessment (under the EU Floods Directive – Directive 2007/60/EC) benefiting from the experience of the project CIRAC (Maps of Floods and Risk in Climate Change Scenarios) and its methodology for quantifying the risk of flooding, addressing the processes that allow to define the probabilities and consequences inherent to risk assessment
- Collaboration in the development of an Adaptation Plan for the Water Supply sector in partnership with Águas de Portugal Group.
- Preparation of an Adaptation Plan to other economic sectors (agriculture, livestock, industry, including agro-industries, tourism and energy) in partnership with the respective stakeholders.
- Development of a methodology to estimate the incremental costs of investments related to climate change.
- Identification of Water Resources projects funded with POSEUR contribution to adaptation.

7. Financial Resources and Transfer of Technology

In light of (national and international) best practices on transparency, accountability and reporting, as well as recommendations from DAC to Portugal and various commitments made by Portugal in this context, Camões – Instituto da Cooperação e da Língua I.P. (Institute for Cooperation and Language), as the coordinating entity for development cooperation, currently provides the Integrated Information System on Portuguese Cooperation.

This involves providing on-line information about Official Development Assistance (ODA), both in aggregate terms (global data) and per project, in Portuguese and English, both in EUR and in USD, relating to a fixed period of time. For a more detailed and in-depth analysis of the Portuguese ODA, please refer to http://www.instituto-camoes.pt/activity/o-que-fazemos/cooperacao/atuacao/reportamos/reportamos-2.

7.1. Provision of "new and additional" resources

Measures regarding public debt control and fiscal consolidation have made it difficult to meet the target of 0.7 % ODA/GNI (Official Development Assistance/Gross National Income). However, despite this adverse and changing environment, Portugal remains engaged in the commitments made at international level as much as the economic situation allows. As a EU Member State, Portugal made the commitment to mobilise 0.15 % to 0.20 % of its GNI as ODA allocated to Least Developed Countries (LDCs) by 2030. It also endorsed the commitment derived from the 2014 ministerial-level meeting of the Development Assistance Committee (OECD/DAC) to focus the support from member countries on countries most in need (which includes Fragile States, Least Developed Countries and Small Island Developing States).

In the absence of an international definition accepted by all Parties of 'new and additional' financing, Portugal has decided to consider the framework set out below.

The Portuguese Carbon Fund (FPC) was established in 2006 with the aim of "*supporting the shift towards a low-carbon competitive economy through funding or co-funding of measures which contribute to meeting the commitments of the Portuguese State under the Kyoto Protocol and other international and Community commitments in the field of climate change*".

In 2010, it was decided that the FPC (currently the Environmental Fund), as an additional source of funding complementary to the conventional ODA, would also support development cooperation projects in the field of climate change. This decision was a response to the need to implement commitments undertaken by Portugal at international level, including with the EU and the United Nations Framework Convention for Climate Change, in the context of so-called 'fast start' initiative and given the fact that the budget traditionally allocated to development cooperation was not able to accommodate yet another financing burden. Thus, since 2011, FPC has funded development cooperation projects whose main objective is climate change (both mitigation and adaptation, including institutional capacity-building and technology transfer). Development financing through the FPC is considered ODA, however these resources are independent and derive entirely from stand-alone income of the Fund.

Table 7.1.1

New and additional financial resources in USD.

Year	Source of flows	Climate Change					
		mitigation *		adaptation *		Climate Change *	
		Committed amount	%	Committed amount	%	Committed amount	%
2012	Total disbursed flows	18.529.060,00	100	77.136,00	100	0	0
	Of which disbursed by the **Portuguese Carbon Fund**	**1.426.434,00**	7,7	**0**	0	**0**	0
2013	Total disbursed flows	20.718.706,00	100	491.810,00	100	0	0
	Of which disbursed by the **Portuguese Carbon Fund**	**3.458.271,00**	16,7	**491.810,00**	100	**0**	0
2014	Total disbursed flows	11.091.032,00	100	1.134.410,00	100	0	0
	Of which disbursed by the **Portuguese Carbon Fund**	**3.101.223,00**	28	**907.224,00**	80	**0**	0
2015	Total disbursed flows	6.557.804,00	100	346.481,00	100	0	0
	Of which disbursed by the **Portuguese Carbon Fund**	**3.825.456,00**[a]	58,3	**158.303,00**	45,7	**0**	0
2016	Total disbursed flows	2.106.496,00	100	466.726,00	100	0	0
	Of which disbursed by the **Portuguese Carbon Fund**	**1.850.561,00**	87,9	**314.942,00**	67,5	**0**	0

* Considered as principal objective only.

[a] Including contributions to the Green Climate Fund. Although the Biennial Report of 2016 (2015 data) reported the Portuguese contribution to the Green Climate Fund (USD 2,218,524.68) as "Climate specific" in the table of multilateral contributions, according to the OECD/DAC rules on reporting, since this is a contribution to a specific sector, albeit through a Multilateral Organisation, it should be considered bilateral and with the type of support "B03 – Contributions to specific-purpose programmes and funds managed by international organisations (multilateral, INGO)".

Amounts in USD (OECD/DAC exchange rate for each year).

Committed amounts in compliance with the MMR guidelines.

Source: Camões, I.P./DPC

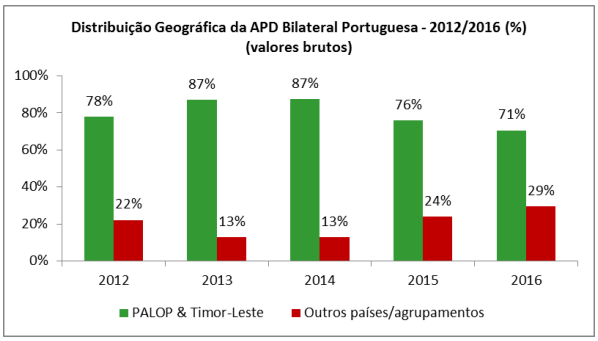
The finance flows fluctuations presented in Table 7.1.1 are linked mainly to the cycle of approval, implementation and completion of 'fast start' projects. This is also due to the fact that, since 2014, there has been less use of the concessional credit line granted to Cape Verde for imports of goods and services within the scope of projects in the areas of renewable energy, environment and water.

However, it is worth emphasising the importance of the two above-mentioned financial instruments in taking climate change in particular to a higher level of priority in the context of the Strategic Concept of Portuguese Cooperation for 2014-2020.

7.2. Assistance to developing country Parties that are particularly vulnerable to Climate Change

The Portuguese ODA features a regular and strong geographical concentration in the PALOP countries (Portuguese-speaking African countries) and in Timor-Leste, in line with the principle of geographical concentration set out in the Strategic Concept of Portuguese Cooperation for 2014-2020, which can be found at http://www.instituto-camoes.pt/images/cooperacao/rcm_17_2014.pdf. This trend, which was very strong in 2010 and 2011, with the PALOP and Timor-Leste together having received respectively 80 % and 90 % of bilateral ODA, fell in 2012 to 78 % and increased again in 2013 and 2014 (87 %). As of 2015 the weight of the PALOP countries and Timor-Leste followed once again a decreasing trend.

Figure 7.2.1



Source: Camões, I.P./DPC

In 2016, the main beneficiaries of bilateral ODA were, in descending order, Mozambique, Cape Verde, São Tome and Príncipe, Timor-Leste, Guinea-Bissau and Angola.

Until 2016 the geographical priorities of the Portuguese cooperation in the field of climate change were focussed on the PALOP countries and Timor-Leste, all of whom belong to the group of the most vulnerable countries (Least Developed Countries, Small Island Developing States and/or in Africa). This priority is also in line with the strong focus of the Portuguese ODA on the Least Developed Countries and Fragile States.

Portugal, as a member country of the OECD/DAC, reports ODA finance flows in compliance with the rules of the Creditor Reporting System (CRS).

Since 1998, the OECD/DAC has monitored the finance flows for development aid which take into account the objectives of the Rio Conventions, particularly the United Nations Framework Convention for Climate Change (UNFCCC), through its Creditor Reporting System (CRS) and the implementation of the so-called 'Rio markers'. The Rio markers were originally designed precisely to help DAC members prepare the National Communications or National Reports for the Rio Conventions, by identifying activities which integrate the objectives of the Conventions in development cooperation.

Initially, the Rio markers included only climate change mitigation. In 2009, an additional marker was created for adaptation, which started to be monitored for support flows reported in 2010.

Applying the Rio markers, which include climate change mitigation and adaptation, means the use of a scoring system of three values, according to which the ODA amount reported within the DAC/CRS is screened and marked as:

i. Targeting the Convention as a 'principal' objective (score "2"): when the objective (climate change mitigation or adaptation) is explicitly stated as fundamental in the design of, or the motivation for, the activity, and promoting the objectives of the Convention is thus stated in the activity documentation as one of the principal reasons for undertaking it. In other words, the activity would not have been undertaken that particular way, had it not been for that specific objective.

ii. As a 'significant' objective (score "1"): when the objective (climate change mitigation or adaptation) is explicitly stated but it is not the fundamental driver or motivation for designing or undertaking the activity. The activity has other prime objectives but it has been formulated or adjusted to help meet the relevant climate concerns, particularly in the field of climate change mitigation and adaptation.

iii. Not targeting the objectives of the Convention (score "0"): it means that the activity was examined but found not to target the objective (climate change mitigation or adaptation) in any significant way.

It is therefore on the basis of the procedures described above that the amounts provided in the tables below are calculated and reported, i.e. the finance flows of ODA which contribute to the objectives of the UNFCCC, in particular for the period reported in the context of this national communication (from 2012 to 2016).

Climate related ODA is not significant when compared to the total amounts due to the strategic priorities established, which focus primarily on areas such as education, health, security and justice, with a view to sustainable development and fight against poverty. However, following the OECD/DAC recommendations,

Portugal has sought to develop wherever possible the integration of environmental and climate change issues in activities targeted at other sectors.

Table 7.2.1
ODA related to Climate Change – Mitigation

Year	Unit	*Significant objective*	*Principal objective*	TOTAL bilateral ODA
2012	USD	903.118,00	18.529.060,00	19.432.178,00
	%	4,6	95,4	100
2013	USD	914.518,00 €	20.718.706,00	21.633.224,00 €
	%	4.2	95.8	100
2014	USD	589.897,00	11.091.032,00	11.680.929,00
	%	5,0	95,0	100
2015	USD	13.611.788,00	6.557.804,00[a]	20.169.592,00
	%	67.5	32.5	100
2016	USD	305.858,00	2.106.496,00	2.412.353,00
	%	12,7	87,3	100

Amounts in USD (OECD/DAC exchange rate for each year).
[a] Including contributions to the Green Climate Fund. Although the Biennial Report of 2016 (2015 data) reported the Portuguese contribution to the Green Climate Fund (USD 2,218,524.68) as "Climate specific" in the table of multilateral contributions, according to the OECD/DAC rules on reporting, since this is a contribution to a specific sector, albeit through a Multilateral Organisation, it should be considered bilateral and with the type of support "B03 – Contributions to specific-purpose programmes and funds managed by international organisations (multilateral, INGO)".
Committed amounts in compliance with the MMR guidelines.
Source: Camões, I.P./DPC

Table 7.2.2
ODA related to Climate Change – Adaptation

Year	Unit	*Significant objective*	*Principal objective*	TOTAL bilateral ODA
2012	USD	760.165,00	114.520,00	874.685,00
	%	90,8	9,2	100
2013	USD	1.054.981,00	491.810,00	1.546.791,00
	%	68,2	31,8	100
2014	USD	2.294.843,00	1.134.410,00	3.429.253,00
	%	66,9	33,1	100
2015	USD	1.661.584,00	346.481,00	2.008.065,00
	%	82,8	17,2	100
2016	USD	937.650,00	466.726,00	1.404.376,00
	%	66,77	33,23	100

Amounts in USD (OECD/DAC exchange rate for each year).
Committed amounts in compliance with the MMR guidelines.
Source: Camões, I.P./DPC

Tables 7.2.1 and 7.2.2 show the evolution of the Portuguese ODA related to climate between 2012 and 2016 for mitigation and adaptation. Information provided refers to the funding of projects whose primary objective was climate change as well as projects which belonged to other areas but included activities that contribute to reducing the negative impacts of climate change and increasing resilience of the economies where they were carried out.

In its efforts to strengthen its work on fighting climate change and reinforcing resilience, Portugal is involved, together with other EU Member States, in the implementation of projects in the form of delegated cooperation (on behalf of the EU). In this respect, Portugal has been implementing in Timor-Leste since 2013, together with GIZ and the Ministry of Agriculture and Fisheries (MAF), the EU support programme for Climate Change, which aims at contributing to the sustainable well-being of rural communities in Timor-Leste and

strengthening the capacity of people living in selected sub-districts and vulnerable to climate change to address the effects of climate change through the sustainable management of natural resources and the improvement of their life choices by using local development mechanisms. The beneficiaries are MAF–Timor-Leste and small primary producers (including agricultural livestock husbandry). For more detailed information on this programme, please refer to the EU National Communication or http://www.qccatl.eu/. Information concerning the amounts of this financial support is available in the EU National Communication, the total amount being EUR 4 million.

7.3. Provision of financial resources

Regarding climate change in particular, the amounts of financing considered, especially those that have been assigned score 2, are still heavily influenced by the 'fast start' initiative, so it can be inferred that the decrease of finance flows of approximately 82.50 % in 2016, compared to 2012 and 2013 (Table 7.3.1), results from the progressive completion of the cooperation projects funded in this context. These projects were carried out primarily in the PALOP countries and Timor-Leste. This significant decrease is also influenced by the fact that there has been less use of concessional credit lines, in particular the one granted to Cape Verde for imports of goods and services within the scope of projects in the areas of renewable energy, environment and water.

Table 7.3.1
Bilateral cooperation, committed amount per year and per country (principal objective only)

Country	Year				
	2012	2013	2014	2015	2016
Cape Verde	16.939.057,00	17.224.843,00	8.327.869,00	3.171.584,00	1.119.652,00
Cuba	0.00	0.00	0.00	0.00	128.997,00
El Salvador	15.878,00	0.00	0.00	0.00	0.00
Guinea-Bissau	144.488,00	193.757,00	312.736,00	21.631,00	123.640,00
Mozambique	1.509.789,00	3.584.279,00	3.029.159,00	364.727,00	802.570,00
São Tomé and Principe	20.933,00	207.635,00	474.388,00	461.638,00	392.222,00
Timor-Leste	0.00	0.00	81.291,00	111.550,00	0.00
DC Not specified	13.436,00	0.00	0.00	2.773.156,00	6.141,00
Total	18.643.580,00	21.210.514,00	12.225.442,00	6.904.285,00	2.573.221,00

Amounts in USD (OECD/DAC exchange rate for each year).
Committed amounts in compliance with the MMR guidelines.
Source: Camões, I.P./DPC

Table 7.3.2
Multilateral cooperation, disbursed amount per year

Year	Multilateral financial institutions, including regional development banks	Specialised United Nations bodies	Total
2012	15.872.793,00	667.992,00	**16.540.785,00**
2013	9.524.973,00	98.595,00	**9.623.569,00**
2014	4.494.344,00	109.508,00	**4.603.852,00**
2015	4.297.455,00	214.956,00	**4.512.411,00**
2016	14.168.286,00	125.298,00	**14.293.584,00**

Amounts in USD (OECD/DAC exchange rate for each year).
Disbursed amounts in compliance with the MMR rules.
Source: Camões, I.P./DPC

As agreed in the context of the OECD/DAC, it is up to the multilateral financial institutions themselves to apply the system of Rio markers to the amounts of multilateral ODA and to inform OECD/DAC by reporting the activities undertaken (CRS). On the basis of that report and the core multilateral contributions, the OECD/DAC allocates annually to each donor country the part corresponding to activities related to climate.

7.4. Financial resources, including under Article 11 of the Kyoto Protocol

Table 7.4.1
Summarised information on financial resources and technology transfer

	2012	2013	2014	2015	2016

Total Official Development Assistance (ODA)[61]	580,78	488,32	430,23	308,03	343,63
Total bilateral ODA[62]	397,28	302,80	246,44	146,00	127,29
Bilateral ODA related to Climate[63]	18.643.580,00	21.210.514,00	12.225.442,00	6.904.285,00	2.573.221,00
Support to programmes related to Climate	0,00	0,00	0,00	0,00	0,00
Contributions to the GEF[64]	995.630,00	608.072,00	379.528,00	175.263,00	73.427,00
Contribution to the replenishment of the GEF	0,00	0,00	0,00	0,00	0,00
Activities of Joint Implementation (JI)	0,00	0,00	0,00	0,00	0,00
JI and CDM under the Kyoto Protocol	0,00	0,00	0,00	0,00	0,00
Other (Bilateral/Multilateral)	–	–	–	–	–

Amounts in USD

Source: Camões, I.P./DPC

As regards contributions to the Global Environment Facility (GEF), Portugal has not formalised any commitment aimed at its potential participation in the replenishment of this facility since 2010.

Table 7: Financial contributions to Institutions and Multilateral Programmes, see Appendix I.

Table 8: Bilateral and regional financial contributions related to the implementation of the Convention for the period 2012-2016, see Appendix II.

Regarding the data provided in Table 8, it should be noted that Portugal supported institutional capacity-building projects within the scope of mitigation, as can be seen in the supplementary table included in point 7.6 below.

7.5. Activities related to transfer of technology

In what concerns technology transfer, and considering the definition set out in the text of the Convention, particularly Article 4, paragraph 1(c) and paragraph 5, it can be said that the majority of programmes, projects and actions (PPA) developed by the Portuguese cooperation within ODA involve the transfer of technology, practices and procedures appropriate to each PPA area, as well as the knowledge necessary for the application of those technologies.

OECD/DAC guidelines on statistical reporting do not currently provide for a marker concerning technology transfer that would allow classifying the PPA in this way or specifically and systematically identify the technology or technologies transferred in each case. This gap in the statistical reporting benchmark does not mean that the process of analysis and approval does not take into account the technologies identified and that its assessment is not part of the criteria considered.

Therefore, in terms of technology transfer, the following projects are highlighted:

[61] Million USD

[62] Million USD

[63] Considered as principal objective only. Committed amounts in compliance with the MMR guidelines.

[64] Disbursement – use of promissory notes (type of flow 311)

Table 7.5.1

Description of projects or programmes promoting practical steps to facilitate and/or finance access to technology transfer.

Programme/project title: Installation of photovoltaic systems in 50 towns			
Objective: To promote access to renewable energy			
Beneficiary	**Sector**	**Total funding**	**Duration**
Mozambique	Energy	5,16 M USD[65]	2011-2016
Description: Equipping 50 remote towns across all provinces with solar photovoltaic systems in schools, health centres and associated homes, allowing for basic access to electricity, not only for lighting systems, but also for vaccine refrigerators and water pumping systems, enabling access to health and education for people without these resources.			
Facts leading to the success of the project: Promotion of access to quality education and healthcare through the electrification of schools and health centres in rural areas.			
Transferred technology: Solar photovoltaic systems			
Impact of GHG emissions: The system does not include an emissions monitoring system			

Programme/project title: Bioenergy in São Tomé and Príncipe: Harnessing the energy of Biogas			
Objective: To promote access to renewable energy			
Beneficiary	**Sector**	**Total funding**	**Duration**
São Tomé and Príncipe	Energy	772.141 USD[66]	2014-2016
Description: Promoting sustainable access to energy using renewable energy sources in rural communities of STP through the use of waste produced in agriculture. Implementation of anaerobic digestion through the construction and installation of small-scale anaerobic digesters.			
Facts leading to the success of the project: Is has allowed to equip populations of rural communities in remote areas and the technical staff of the National Directorate for the Environment (DNA) the capacity to build and operate small-scale anaerobic digesters			
Transferred technology: Anaerobic digestion			
Impact of GHG emissions: The system does not include an emissions monitoring system			

In general, the PPAs supported by the Portuguese cooperation have a strong component of technical assistance targeted at national capacity-building. It is endeavoured to give special attention to the implementation of the aid effectiveness principles enshrined in the Paris Declarations and developed in Accra and Busan, mainly: leadership and control by beneficiaries so that they can strategically allocate their resources; to enhance existing capacities as a starting point, avoiding the creation of parallel structures and using national systems in a systematic manner to implement aid; technical cooperation driven by partner demand.

It was in this specific context of capacity-building that Portugal supported a project from CPLP (Community of Portuguese-speaking Countries) with EUR 500,000 through the Portuguese Carbon Fund in 2015.

In the area of development cooperation, particularly with the PALOP countries and Timor-Leste, both in the bilateral context and in the CPLP, Portugal has given particular attention to capacity-building at institutional level. This applies to the PPAs exclusively dedicated to this subject as well as to the inclusion of a capacity-building component in the different PPAs as an effort to adapt them to a demand for change, to the beneficiary institutions and to the potentialities and weaknesses of existing national systems in beneficiary countries, so as to build capacities of independent problem-solving.

In particular with regard to cooperation projects in the field of climate change, Portugal intends for partners to lead and control, and often uses national systems for the implementation of aid.

As already mentioned, projects supported by the Portuguese cooperation have a strong component of institutional capacity-building and those in the field of climate change are no exception to this, with some projects being even exclusively dedicated to institutional capacity-building, which are shown in the table below.

[65] Amount in USD (OECD/DAC average exchange rate over 2011-2016).

[66] Amount in USD (OECD/DAC average exchange rate over 2014-2016).

Table 7.6.1

Project title	Partner country	Area	Description
Atlas of Renewable Energy	Mozambique	Mitigation	Mapping and evaluation of renewable resources in Mozambique: wind, solar, water, geothermal, biomass and wave energy. http://www.atlasrenovaveis.co.mz/
Capacity-building for the Development of Resilient Low Carbon Strategies	Cape Verde, Mozambique and São Tomé and Príncipe	Mitigation	To equip the countries involved with the necessary expertise to develop, implement, measure, report and verify a development strategy with low GHG emissions, adapted to the impacts of climate change.
Integration of Climate Change Adaptation into Development	Cape Verde, Mozambique and São Tomé and Príncipe	Adaptation	To contribute to the reduction of vulnerability to the impacts of climate change in CV, MOZ and STP. To build capacity in order to integrate a response to vulnerability to climate change through the creation of expertise in the design of policies and projects which are resilient to the impacts of climate change.
Roadmap to Waste Management in Cape Verde	Cape Verde	Mitigation	Mapping technologies, sites, collection methods as well as defining capacity-building and establishing the necessary legislative framework for the waste sector in Cape Verde, for future implementation of projects aimed at reducing GHG emissions.
National Plan Supporting Urban Sanitation for Emissions Reduction and Climate Change Adaptation	Mozambique	Adaptation	To contribute to the development of policies and strategies for further development of urban sanitation, with concerns for mitigation of GHG emissions, adaptation of infrastructure to climate change and capacity-building of institutions. Development and transfer of know-how to the relevant institutions of this sector in Mozambique, in the area of sustainable development of urban sanitation with adaptation to climate change impacts.

8. Research and Systematic Observation

8.1. General Policy on and funding of research and systematic observation

The Foundation for Science and Technology (FCT) is the national agency responsible for public funding of science, technology and innovation, as a partially shared task with the National Innovation Agency (ANI).

Therefore FCT aims to achieve the following structural targets:

i. To promote the progress of scientific and technological knowledge in Portugal;

ii. To explore opportunities (in the different scientific and technological areas) towards achieving the highest international standards of knowledge creation;

iii. To encourage the dissemination of the knowledge created so that it contributes to improve education, health and environment;

iv. To improve the quality of life standards and the well-being of the general public;

v. To boost competitiveness and employment.

The provision of funding is the main channel for FCT to achieve the goals as set out above, which from a procedural point of view requires conducting open competitions and implementing a pre-established assessment protocol (according to the merit of the proposals and research teams). In addition to this, FCT establishes cooperation agreements and other forms of support in partnership with universities and other public and private institutions, both in Portugal and abroad.

FCT's activities will ultimately result in increased contributions from the individuals, research groups and institutions covered by its funding portfolio.

IPMA (Portuguese Institute for Sea and Atmosphere) is another institution which, besides being responsible for coordinating the implementation of national plans related to climate systematic observation, also contributes to the national effort through the observation of the atmospheric and ocean components, in coordination with other national bodies such as the Hydrographic Institute (ocean observation component) and the Portuguese Environment Agency (atmospheric and terrestrial observation component).

8.2. Research

Funding of Research Projects:

a. National funds

In the period between 2010 and 2016, FCT funded 107 scientific research projects exclusively in the field of Climate Change (CC), with a budget line of over EUR 20 million (data for 2016 not yet available).

Additionally, in the same period, 225 research grants were funded (doctoral and post-doctoral level, among others), with a total value in excess of EUR 19 million.

Between 2012 and 2016 FCT financially supported 32 contracts within the scope of Scientific Employment for PhD graduates, the value of which amounted to EUR 4 million (table 8.2.1).

The result indicators (publications, theses, patents and prototypes) of the projects listed in Table 7.1, and completed in the meantime, can be seen in Table 2. Full details of the result indicators for the 107 projects funded by FCT between 2010 and 2016 can be found in Appendices X.

Table 8.2.1
Research projects, grants and scientific employment in the field of climate change funded by FCT in 2010-2016

Year	Number of projects	Funding provided	Number of grants	Funding provided	Number of contracts	Funding provided
2010	14	3.120.584 €	40	2.445.297 €	N/A[67]	N/A
2011	2	2.292.341 €	41	2.721.815 €	N/A·	N/A
2012	35	3.601.350 €	43	2.929.223 €	7	N/
2013	15	4.279.842 €	23	2.963.271 €	9	163.220 €
2014	39	4.533.801 €	31	2.758.401 €	16	708.596 €
2015	2	2.956.576 €	47	2.707.909 €	N/A	1.557.339 €
2016	N/A	N/A	N/A	2.835.053 €	N/A	1.615.271 €
Total	**107**	**20.784.493 €**	**225**	**19.360.967 €**	**32**	**4.044.426 €**

The result indicators summarised in Table 8.2.2 cannot be divided by scientific subfield (paleoclimatology, modelling, impacts of Climate Change, socio-economic analyses, adaptation and mitigation technologies) due to the absence of pre-established 'keywords' geared towards those subjects, leaving it up to the relevant researchers to introduce keywords they consider as most appropriate to identify each project.

In view of this shortcoming, FCT is already preparing a protocol to determine the subfields that can be withdrawn from the abstracts of the projects.

Table 8.2.2

Result indicators relating to the research projects already completed and funded by national funds (FCT), for which funding was allocated between 2010 and 2013[68] ()

Year of allocation	Publications in the national press	Publications in the international press	Presentations	Reports	Models	Prototypes	Patents
2010	67	337	91	62	11	4	1
2011	0	40	3	2	1 143	0	0
2012	39	682	157	85	29	1	0
2013	7	86	32	26	1	0	0
Total	**113**	**1 145**	**283**	**175**	**1 184**	**5**	**1**

b. European funds:

Between 2010 and 2016 the European Union (EU) funded, through the Seventh Framework Programme for Research and Technological Development (FP7) and Horizon 2020 (H2020), 44 research projects within the field of CC in which national research teams are (or were) involved (see Table 8.2.3).

The total funding allocated in this period to participating national institutions came close to EUR 11 million (Table 8.2.3). It should be clarified that the amounts mentioned for each year do not refer to the total amounts granted to national participants in competitions during that year, but rather to the expected expenditure for each year (for example, 33 % of the total cost of the project per year in the case of a three-year project).

[67] N/A: Data not available.

[68] N.B.: Projects with funding allocated between 2014 and 2016 have not yet been completed.

Table 8.2.3
Research projects in the field of climate change funded by the EU[69] in 2010-2016[70]

Year	Number of projects	Funding granted to national institutions
2010	5	933.656 €
2011	6	1.318.581 €
2012	6	1.613.893 €
2013	5	1.467.914 €
2014	4	1.188.032 €
2015	7	1.700.427 €
2016	11	2.654.848 €
Total	**44**	**10.877.352 €**

Out of the 44 projects examined, only 21 were reported as finished at the time of this report, and the remaining 23 will be completed after 2017. All of them are composed of teams from different countries, which makes it impossible to assess the results generated by the national participants. Moreover, it should be noted that it is the responsibility of the European Commission (EC), as the funding and managing authority of the projects under FP7 and H2020, to inform and publish all results achieved by each of these projects.

8.3. Systematic observation

National plans related to climate systematic observation fall under the remits of the Portuguese Institute for Sea and Atmosphere (IPMA) regarding the components of atmospheric and ocean observation, the Hydrographic Institute (IH) for the component of ocean observation and the Portuguese Environment Agency (APA) concerning the components of atmospheric and terrestrial observation.

The different networks and systems for observation and data processing which are installed in Portugal and which contribute to the Global Climate Observing System (GCOS), as part of the observation networks defined in the programmes of the World Meteorological Organisation (WMO), are described below.

Meteorological and atmospheric observation

As a member of the WMO, Portugal develops and operates several weather and climate observation networks in the framework of its global programmes, in particular the World Weather Watch (WWW) through the Global Observing System (GOS), but also the Global Atmosphere Watch (GAW) and the World Hydrological Cycle Observing System (WHYCOS), and it follows the recommendations of the Instruments and Methods of Observation Programme (IMOP) and of the World Climate Programme (WCP) of the WMO.

IPMA is the Portuguese body responsible for carrying out observations for meteorological and climatological purposes and it has therefore pursued and developed relevant scientific and technical activities which began in Portugal in the mid-nineteenth century, focusing on the availability and quality of longer series of climatological data, which are key to conducting studies on CC, especially in terms of trends and climate extremes.

IPMA has done its utmost to ensure the operability of the network of climatological stations, providing for its maintenance and for quality control and subsequent recording of observations. In March 2017 there were 146 climatological stations operating in Portugal, of which 125 are automated and 21 are conventional. All stations measure air temperature, wind speed and direction, air humidity and precipitation, among other climate elements, almost all of them also measure global solar radiation, and some measure atmospheric pressure.

In mainland Portugal there are 106 stations with a density of 1,2/1000 km², in Madeira there are 20 stations with a density of 25/1000 km² and in the Azores there are 18 stations with a density of 8/1000 km².

[69] 7th Framework Programme and Horizon 2020.

[70] N.B.: The 6th Communication considered the total funding granted to projects where national institutions were involved, without clarifying that the amounts presented were the total funding of the projects.

Of these, 9 stations prepare and disseminate on a monthly basis reports containing monthly climatological input data, under the code CLIMAT through the Global Telecommunication System of the WMO.

Portugal maintains its participation in the GSN with three weather surface-based stations: one on the mainland (Lisbon – belonging to the Geophysical Institute of the University of Lisbon), one in Madeira (Funchal – IPMA) and one in the Azores (Ponta Delgada/Nordela – IPMA).

The Azores archipelago has 13 weather stations under the responsibility of IPMA. Only 7 of those stations send SYNOP reports to the GTS regularly. Only 3 of those stations have 24-hour visual observations made by a meteorological observer. Regarding the GSN, only the Ponta Delgada station (08512) submits CLIMAT reports.

There are 10 stations for solar radiation in the Azores, which fall within the remits of IPMA, but only one station makes measurements of the radiation balance and other types of radiation measurements under the Atmospheric Radiation Measurement (ARM) programme (Graciosa: 08517). The Ponta Delgada station is part of the CTBTO programme.

Table 8.3.1

National contributions to surface-based atmospheric essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2020	Number of stations or Platforms providing data to the international data centres	Number of stations or platforms with complete Historical record available in international data centres
GCOS Surface Network (GSN)	Air temperature	2	2	2	2	1
	Precipitation	2	2	2	2	1
Full World Weather Watch/Global Observing System (WWW/GOS) surface network	Air temperature, air pressure, wind speed and direction, water vapour	11	10	11	7	1
	Precipitation	11	10	11	7	1
Baseline Surface Radiation Network (BSRN)	Surface radiation	-	-	-	-	-
Solar radiation and radiation balance data	Surface radiation	10	10	10	10	10
Ocean drifting buoys	Air temperature, air pressure.	-	-	-	-	-
Moored buoys	Air temperature, air pressure.	-	-	-	-	-
Voluntary Observing Ship climate Project (VOSClim)	Air temperature, air pressure, wind speed and direction, water vapour	-	-	-	-	-
Ocean Reference Mooring Network and sites on small isolated islands	Air temperature, wind speed and direction, air pressure	-	-	-	-	-
	Precipitation	-	-	-	-	-

With respect to aerologic observations, IPMA continued the programme of one daily observation at the national radiosonde stations on mainland Portugal (Lisbon), in Madeira (Funchal) and in the Azores (Lajes – 08508 and Graciosa – ENA/ARM: 08517), which includes high-resolution measurements of pressure, temperature, humidity and wind of up to more than 30 km above ground level. The Lajes station is part of the GUAN network and the ENA (Eastern North Atlantic) station, located on the island of Terceira and part of the ARM programme.

Table 8.3.2

National contributions to aerologic essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2020	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres

GCOS Upper Air Network (GUAN)	Upper-air-temperature, upper-air wind speed and direction, upper-air water vapour	1	1	1	1	1
Full WWW/GOS Upper Air Network	Upper-air-temperature, upper-air wind speed and direction, upper-air water vapour	2	1	2	1	1

There is a sampling station for greenhouse gas emissions near the Serreta lighthouse, within the scope of the cooperation network for air quality NOAA/ ESRL/ GMD CCGG.

There are also two stations measuring aerosol optical depth: one on the island of Terceira (08511) and one on the island of Graciosa (ENA/ARM: 08517). The latter is part of the ARM programme and performs other aerosol measurements (extinction coefficients, surface concentration, size distribution, vertical profiles, etc.).

Table 8.3.3
National contributions to atmospheric composition

Contributing networks specified in the GCOS implementation plan	*ECVs[a]*	*Number of stations or platforms currently operating*	*Number of stations or platforms operating in accordance with the GCMPs*	*Number of stations or platforms expected to be operating in 2020*	*Number of stations or platforms providing data to the international data centres*	*Number of stations or platforms with complete historical record available in international data centres*
World Meteorological Organization/ Global Atmosphere Watch (WMO/GAW) Global Atmospheric CO2 & CH4 Monitoring Network	Carbon dioxide	1	1	1	1	1
	Methane	1	1	1	1	1
	Other greenhouse gases	1	1	1	1	1
WMO/GAW ozone sonde network	Ozone	0	0	0	0	0
WMO/GAW column ozone network	Ozone	0	0	3	0	0
WMO/GAW Aerosol Network	Aerosol optical depth	2	2	2	0	0
	Other aerosol properties	1	1	1	0	0

Complementary to the networks for precipitation observation, and also for weather forecasting and nowcasting, IPMA has three meteorological radars operating on the mainland (North, Centre and South), which make up a national network covering mainland Portugal, integrated with the weather radar networks of the Iberian Peninsula and Europe, within the framework of the Eumetnet OPERA programme.

Oceanographic observation

At European level, the service for maritime meteorology at IPMA actively participates in the EUCOS – EUMETNET sub-programme Surface Marine Programme (E-SURFMAR). The surface maritime observation system meets the EUMETNET requirements under the operational management of the French meteorological service Metéo-France (the member responsible for E-SURFMAR).

The service for maritime meteorology hired a national merchant navy vessel from the ETE Group in order to participate at international level, integrating it in the voluntary programme for meteorological observation at sea (VOS) in maritime areas under Portuguese jurisdiction, thereby tackling the lack of systematic coverage of sea surface observation.

The focal point of IPMA's VOS programme, in cooperation with the service for maritime meteorology Meteo-France, implemented the first automated surface observation system (first automatic meteorological station BAREU S-AWS) on board a national merchant navy vessel with regular shipping routes between the Portuguese mainland and the autonomous regions of the Azores and Madeira. This programme allows not only to obtain daily meteorological and oceanographic parameters, but also to disseminate them through the Global Telecommunication System (GTS) for meteorology.

At global level, IPMA is responsible, as the national meteorological authority, for forwarding sea surface observation data via GTS to the International Centres. IPMA shares meteorological and (surface) oceanographic data through the GTS system under different codes (SHIP, BUOYS), including ocean buoys from the Portuguese Hydrographic Institute.

Observations of atmospheric pressure, wind speed and direction, air temperature and relative humidity during the reference period were systematically sent to the database of the E-SURFMAR VOS programme close to real-time, and were subject to quality control and validation.

The EUMETNET meteorological services use the information obtained from the observation when verifying numerical forecasting models which operate for the North Atlantic area.

Table 8.3.4

National contributions to oceanic essential climate variables – surface

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2020	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
Global surface drifting buoy array on 5x5 degree resolution	Sea surface temperature, sea level pressure, position-change-based current	-	-	-	-	-
GLOSS Core Sea-level Network	Sea level	-	-	-	-	-
Voluntary observing ships (VOS)	All feasible surface ECVs	1	0	6	1	0
Ship of Oportunity Programme	All feasible surface ECV's	-	-	-	-	-

Table 8.3.5

National contributions to the oceanic essential climate variables – water column

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2020	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
Global reference mooring network	All feasible surface and subsurface ECVs	-	-	-	-	-
Global tropical moored buoy network	All feasible surface and subsurface ECVs	-	-	-	-	-
Argo network	Temperature, salinity, current	-	-	-	-	-
Carbon inventory survey lines	Temperature, salinity, ocean tracers, biogeochemistry variables	-	-	-	-	-

Table 8.3.6

Global products requiring satellite observations - oceans

ECVs/ Global products requiring satellite observations	***Fundamental climate data records required for product generation (from past, current and future missions)***
Sea Icenacionais *Sea ice concentration*	*Microwave and visible imagery*
Sea Level *Sea level and variability of its global mean*	*Altimetry*
Sea Surface Temperature *Sea surface temperature*	*Single and multi-view IR and microwave imagery*
Ocean Colour *Ocean colour and oceanic chlorophyll-a concentration derived from ocean colour*	*Multi-spectral VIS imagery*
Sea State *Wave height and other measures of sea state (wave direction, wavelength, time period)*	*Altimetry*
Ocean Salinity *Research towards the measurement of changes in sea surface salinity*	*Microwave radiances*
Ocean Reanalyses *Altimeter and ocean surface satellite measurements*	*Key FCDRs and products identified in this report, and other data of value to the analyses.*

Terrestrial observation

Table 8.3.7
National contributions to the terrestrial domain essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2020	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
GCOS baseline river discharge network (GTN-R)	River discharge	-	-	-	-	-
GCOS baseline Lake Level/ Area/ Temperature Network (GTN-L)	Lake Level/ Area/ Temperature	-	-	-	-	-
WWW/GCOS synoptic network	Snow cover	-	-	-	-	-
GCOS glacier monitoring network (GTN-G)	Glacier mass balance and length, also ice sheet mass balance	-	-	-	-	-
GCOS permafrost monitoring network (GTN-P)	Permafrost borehole-temperatures and active-layer thickness	-	-	-	-	-

8.4. Research Infrastructures

a) Programmes based on spatial observation

Through IPMA, Portugal has been involved in several projects regarding the use of remote sensing data for the systematic monitoring of continental surfaces, which are therefore relevant for climate monitoring and impact assessment of CC.

EUMETSAT – Satellite Applications Facility on Land Surface Analysis (LSA SAF) is a project led by IPMA which has as its main goal the development of algorithms to obtain variables related to continental surfaces, such as albedo, temperature and emissivity, radioactive flows, parameters characterising the state of vegetation, evapotranspiration, identification, characterisation and risk assessment of forest fires. LSA SAF, being mainly funded by EUMETSAT, aims primarily at exploring the capacities of European meteorological satellites (Meteosat Second Generation and EUMETSAT Polar System).

The methodologies developed in the context of LSA SAF are used for the production, recording and dissemination of satellite products related to the variables mentioned above. LSA SAF aims to keep a medium-long term service: data production began in 2005 and the current stage of LSA SAF ensures the processing until 2022. In order to continue generating surface products based on the next generation of EUMETSAT satellites (Meteosat Third Generation and EPS-Second Generation) after 2022, the processing chains are currently in the design and development stage. It should also be highlighted that LSA SAF processes regularly data regarding albedo, temperature, evapotranspiration, vegetation and emissions from forest fires in order to make these data available for climate studies.

Regarding the ocean, IPMA uses the following atmospheric ECVs: wind speed and direction; these observations come from scatterometers on board Metop satellites and are provided by OSISAF on a regular basis through EUMETCast. Wind observations are used regularly at the IPMA operational centres. These observations are also used for studies on processing.

The product Total Column Water Vapour, obtained from the GNSS observations, is currently under development. This product is derived from 144 stations located in the western region of the Iberian Peninsula, of which 59 are in mainland Portugal, and includes time series since 2013.

Table 8.4.1
Global products requiring satellite observations – oceans

ECVs/Global products requiring satellite observations	Fundamental climate data records required for product generation

Wind speed and direction – ocean	Data from scatterometers on board Metop satellites
Total Column Water Vapour	GNSS observation data

IPMA uses the following surface oceanic ECVs: sea surface temperature (SST); this observation comes from SEVERI radiometer on board Meteosat satellites and is provided by OSISAF on a regular basis through EUMETCast. SST observations are used regularly at the IPMA operational centres.

IPMA generates, records e disseminates a range of terrestrial ECVs in the framework of the EUMETSAT Satellite Application Facility on Land Surface Analysis (LSA SAF; Trigo et al., 2011) http://lsa-saf.eumetsat.int and the Copernicus Global Land Service http://land.copernicus.eu/global/.

Table 8.4.2
Global products requiring satellite observations – terrestrial

ECVs/Global products requiring satellite observations	Fundamental climate data records required for product generation (from past, current and future missions)
Albedo Black sky and white sky	VIS/NIR imagery of Eumetsat satellites (MSG and Metop). To be continued with the future series of MTG and EPS-SG satellites
Fraction of absorbed photosynthetically active radiation (fAPAR) Maps of fAPAR	VIS/NIR imagery of Eumetsat satellites (MSG and Metop). To be continued with the future series of MTG and EPS-SG satellites
Leaf Area Index (LAI) Maps of LAI	VIS/NIR imagery of Eumetsat satellites (MSG and Metop). To be continued with the future series of MTG and EPS-SG satellites
Fire **Active fire maps and fire radiated power**	VIS/NIR imagery of Eumetsat satellites (MSG and Metop). To be continued with the future series of MTG and EPS-SG satellites
LST * Maps of LST	TIR data from Eumetsat satellites (MSG and Metop). To be continued with the future series of MTG and EPS-SG satellites

** LST was added as an ECV in 2016.*

8.5. Support to Developing Countries

In order to support developing countries, FCT, as the organisation representing Portugal in these areas, has been promoting a wide range of programmes encouraging scientific cooperation within the field of CC, which are listed below:

a) Initiatives in the framework of ERA-NET (European Research Area Networks)

ARIMNET2[71] – "Coordination of Agricultural Research in the Mediterranean"

Agriculture and food systems in the Mediterranean basin face a number of common problems related to the management of natural resources (in particular soil, water and biodiversity), the propagation and emergence of animal and plant diseases and the impact of climate change on the productivity and sustainability of agricultural and food systems.

ARIMNet2 (Coordination of Agricultural Research in the Mediterranean, 2014-2017) is an ERA-NET Action financed by the European Union for research, technological development and demonstration, aimed at enhancing the coordination of agricultural research in the Mediterranean area and strengthening the cooperation among stakeholders from the food and agriculture sector (e.g. researchers, farmers and their organizations, agricultural extension services, agribusinesses, policy-makers, funders, etc.).

ARIMNet2 gathers 24 partners (funding agencies and research institutions) from 15 Mediterranean countries (Algeria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Malta, Morocco, Portugal, Slovenia, Spain, Tunisia and Turkey).

Portugal's participation in ARIMNet2 is coordinated by FCT – Fundação para a Ciência e a Tecnologia (Foundation for Science and Technology) and has a 249,800 € financial investment which was approved in 2016.

[7171] http://arimnet2.net

ERA4CS[72] – "ERA-NET Co-fund for Climate Services"

The ERA-NET Consortium "European Research Area for Climate Services", so-called ERA4CS (time frame 2016-2020), has been designed to boost the development of efficient Climate Services in Europe, by supporting research for developing better tools, methods and standards on how to produce, transfer, communicate and use reliable climate information - including climate adaptation, mitigation and disaster risk management - to cope with current and future climate variability.

ERA4CS aims to improve the scientific expertise on Climate Change risks and adaptation options, and to connect that knowledge with decision-making, e.g. by developing and accessing climate adaptation strategies and pathways at different scales (regions, cities, catchments, vulnerable sectors, etc.). It focuses on the development of a "climate information translation" layer, including climate information production for Climate Services (CS), as well as researching and advancing CS as such.

This ERA-NET is implemented in close articulation with the Joint Programming Initiative "Connecting Climate Knowledge for Europe" – JPI Climate (http://www.jpi-climate.eu/home). The ERA4CS consortium is formed by 45 Organizations (15 Public Research-Funding entities and 30 Research-Performing Organizations) from 18 European Countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Romania, Slovakia, Spain, Sweden and the United Kingdom.

Portugal is represented in ERA4CS by FCT - Fundação para a Ciência e a Tecnologia, the national Research-funding Agency has committed close to 250k€ (248,798€) for the 3 Research Projects approved in the 2016 Co-fund call of ERA4CS.

ERANET-LAC[73] – "Network of the European Union, Latin America and the Caribbean Countries on Joint Innovation and Research Activities"

The main activities of ERANet-LAC (2014-2017), which is sponsored by the 7th EU Framework Program for Research & Innovation (ending on the 31st of December 2017), are:

i) The promotion of mutual opening and coordination of existing programs, infrastructures and cooperation;

ii) The implementation of 2 Joint Calls (at the end of 2014 and the end of 2015);

iii) The coordination of a consultation process to inform funding agencies and research institutions from both regions about the joint actions;

iv) Building a platform for EU and CELAC funding agencies.

ERANet-LAC is supported by 16 European and CELAC Countries: Argentina, Barbados, Brazil, Chile, Finland, France, Germany, Mexico, Norway, Panama, Peru, Portugal, Romania, Spain, Turkey and Uruguay.

The 2014 call for R&I Projects from ERANET-LAC focused on the themes of Biodiversity, Climate Change and Energy, notably:

i) Biodiversity assessment and monitoring - Improving baseline distribution data and compatibility with climate datasets;

ii) Small-scale self-sustainable biorefineries for multi-feedstock processing of agro-industrial and urban wastes for advanced biofuels, biobased chemicals and biomaterials;

iii) Towards Zero Carbon Energy Systems for heating and cooling in industrial processes by means of solar technologies including the envelopes of the buildings.

In the 2014 call, the total national investment through FCT (Portuguese Foundation for Science and Technology) amounted to 767,159€. Portugal did not participate in the 2015 call for Projects.

[72] http://www.jpi-climate.eu/ERA4CS

[73] http://www.eranet-lac.eu

ERANETMED[74] – "Euro-Mediterranean Cooperation Through ERANET Joint Activities and Beyond"

The main aim of ERANETMED is to enhance Euro-Mediterranean co-ownership through innovation and competitive research in the societal challenges of the region.

The project aims at reducing fragmentation of programming in the Mediterranean region by increasing coordination among national research programs of European Member States, Associated Countries and Mediterranean Partner Countries. Its activities will span from 2013 to 2017, and involve 15 Partner Countries: Algeria, Cyprus, Egypt, France, Greece, Germany, Italy, Jordan, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey, together with the International Organization CIHEAM IAMB - Mediterranean Agronomic Institute of Bari.

The themes of its three calls for funding of R&I activities were:

i) Renewable Energies, Water Resources and their connections for the Mediterranean Region (2015);

ii) Environmental challenges and solutions for vulnerable communities (2016);

iii) Fostering sustainable water management for the economic growth and sustainability of the Mediterranean region (2017).

FCT represents Portugal in the ERANETMED and invested a total of 800,000€ in Research Projects (2015: 500.000€; 2017: 300.000€). Portugal did not participate in the 2016 call.

ERASUSAN[75] - "ERA-NET on Sustainable Animal Production"

Like other agricultural sectors, animal production faces many challenges from projected increases in global demand for food, climate change, competition for natural resources and economic volatility.

The European animal production landscape is very complex, consisting of different species farmed within a wide range of different extensive, semi-intensive and intensive production systems using multiple resources to produce a diverse range of animal products and other services.

Partners in ERASUSAN (of 37 partner organizations from 21 EU Member States and 2 EU Associated Countries) believe that these challenges can be effectively addressed through joint European research within a framework which supports the three pillars of sustainability - economy, environment and society - and targets opportunities for innovative research spanning all areas of animal production such as health and welfare, feeding and nutrition, reproduction, breeding and genetics, housing, nutrient management and economics.

The ERASUSAN consortium (2016-2020) consists of: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Turkey and the United Kingdom.

The Portuguese contribution, made by FCT – Foundation for Science and Technology, for projects approved in the 2016 call, will be 252,000€.

LEAP-AGRI[76] – "A Long term EU- Africa research and innovation Partnership on food and nutrition security and sustainable Agriculture"

LEAP-Agri is a partnership between 30 partners including 24 funding organizations from nine African countries (i.e. Algeria, Burkina Faso, Cameroun, Egypt, Ghana, Kenya, Senegal, South Africa and Uganda), nine European countries (i.e. Belgium, Finland, France, Germany, Nederland, Norway, Portugal, Spain and Turkey) and an international organization (i.e. CIHEAM-Bari based in Italy).

This partnership, which operates under the EU Framework Program for Research and Innovation Horizon 2020 and its EU-Africa High Level Policy Dialogue on science, technology and innovation, aims to support joint research and innovation projects in food and nutrition security and sustainable agriculture. Indicative areas

[74] www.eranetmed.eu/

[75] http://www.era-susan.eu/

[76] http://www.leap-agri.com/

of activities include 'climate smart' agriculture practices, sustainable approaches to optimise resource efficiency, more efficient use of biomass, methods to measure the global impact and performances of agriculture intensification pathways, among others.

The 2017 call for Projects from LEAP-AGI has an overall budget of 27 million €, comprising contributions from Member States (18.5M€) and the EC (8.5M€). Portugal has committed 250.000€ through FCT (National Science & Technology Foundation).

b) INCO-NETs (International Cooperation Networks with third countries).

INCO-Nets are networks funded by the EC, which aim at fostering cooperation in research and innovation between ministries and/or funding agencies, with the following objectives:

i) To encourage new partnerships with different types of players who, through research and innovation, tackle global challenges affecting Europe and the target region;

ii) To enable a better understanding among the public and private sectors at bi-regional level of the link between research and innovation, as well as to identify and share cooperation opportunities through networks and dissemination;

iii) To perform strategic analysis of bi-regional research and innovation programmes between the EU Member States and the target region, in terms of the identified societal challenges, resulting in the production of recommendations;

iv) To facilitate exchanges leading to learning experiences which help the formal political dialogue for cooperation in research and innovation more effectively.

Such initiatives do not entail a financial investment in research projects, other than those relating to the participation of national representatives in the activities.

Portugal currently participates through FCT (Foundation for Science and Technology) in the following partnerships within the framework of INCO-NET:

ALCUE NET[77] – "Research and Innovation Network between Latin America, the Caribbean and the European Union"

ALCUE NET is a network of 19 ministries or funding agencies from 17 countries in Latin America, the Caribbean and Europe (Argentina, Austria, Barbados, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Finland, France, Germany, Mexico, Norway, Panama, Portugal, Spain and Uruguay), funded under the 7th EU Framework Programme for Research and Technological Development (2013-2017) and coordinated by the Ministry of Science, Technology and Innovation of Argentina (MINCyT).

This network supports the process of political dialogue in Science, Technology and Innovation in order to consolidate the EU-CELAC cooperation, contributing to the implementation of the EU-LAC Joint Initiative for Research and Innovation (JIRI). It also contributes to the establishment and implementation of joint strategic agendas for research, development and innovation in the following priority areas: Biodiversity and Climate Change; Bioeconomy; Energy; and Information and Communication Technologies.

ALCUE NET goals are:

i) To progress in the joint improvement of the key aspects of societal challenges related to the areas addressed by the Working Group for the Senior Officials Meetings;

ii) To support political dialogue at all relevant levels; to strengthen the EU-CELAC cooperation.

CAAST-Net Plus[78] – "Promoting the cooperation between Sub-Saharan Africa and Europe on research and innovation in order to address global challenges"

[77] http://alcuenet.eu/

[78] https://caast-net-plus.org/

CAAST-Net Plus is a network of 26 ministries or funding agencies from Africa and Europe, originating from 23 countries: Austria, Cape Verde, Denmark, Egypt, Finland, France, Germany, Ghana, Greece, Kenya, Madagascar, Malawi, the Netherlands, Nigeria, Norway, Portugal, Ruanda, Senegal, South Africa, Spain, Switzerland, Uganda and the United Kingdom. This Partnership was funded between 2013 and 2016 under the 7th EU Framework Programme for Research and Innovation. It is coordinated by the Association of Commonwealth Universities (ACU) of the United Kingdom, and the Ministry of Higher Education, Science and Technology of Kenya.

The ultimate goal of CAAST-Net Plus is to strengthen cooperation in research and innovation between the two continents, through the following actions:

i) Analysing policies and bi-regional cooperation programmes in research and innovation in terms of societal challenges: Food Security, Climate Change and Health;

ii) Carrying out various activities between multiple players so as to strengthen cooperation;

iii) Formally and informally supporting processes and political dialogue by supporting the establishment of bi-regional research partnerships and networks to allow for more effective cooperation;

iv) Effectively disseminating results and providing a multimedia platform for communication and interaction between research and innovation communities in Africa and Europe.

MED-SPRING[79] - "Mediterranean Science, Policy, Research & Innovation Gateway"

The Mediterranean Science, Policy, Research & Innovation Gateway - MED-SPRING - is a coordination and support action funded by the 7th EU Framework Program for Research & Innovation. It builds on the previous experience of the INCO-NET MIRA (Mediterranean Innovation and Research coordination Action), but adapted to the new reality of the Euro-Mediterranean policy, and the general orientations defined in the Euro-Mediterranean Conference of Barcelona (2-3 April 2012).

MED-SPRING is focused on three societal challenges: Energy, High Quality Affordable Food, and Scarcity of resources, and aims at tackling policy objectives by creating a dialogue and coordination platform of governmental institutions, research organizations, associations and civil society. Other horizontal issues, such as socio-economic sustainability, climate variability, governance and research system capacity, gender, demographic growth and innovation development around societal challenges will also be dealt with.

c) CYTED

The Ibero-American Programme for Science and Technology for Development (CYTED) was established in 1984 through an Interinstitutional Agreement signed by Portugal, Spain and 19 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. In Portugal, CYTED is monitored and managed by FCT — Foundation for Science and Technology.

CYTED is responsible, among other things, for promoting and funding RTD activities through the organisation of annual competitions for Thematic Networks, Fora and Strategic Projects. CYTED's priority scientific areas are: Agri-food, Information and Communication Technologies, Promotion of Industrial Development, Sustainable Development, Global Change and Ecosystems, Health, Science and Society, and Energy.

Between 15 March and 31 May 2016, CYTED promoted the 1st Competition for Strategic Projects, and Portugal took part in the only project approved in the subject of "Climate change and socio-economic marine and coastal development".

This project, coordinated by the University of Granada (Spain), with the participation of the National Laboratory of Civil Engineering and the Autonomous University of Mexico, is entitled "Protección de Frentes Urbanos Costeros Frente al Calientamento Global" (acronym: PROTOCOL) FCT will give a financial contribution

[79] http://medspring.eu/

of EUR 29,589 to this project over the full 3-year project period. National investment in CYTED also includes the payment of a country annual fee of EUR 250,000.

We highlight the importance of the CYTED programme for the Ibero-American region, as well as the fact that it has been supported and enhanced in the Declarations resulting from Summits of Ibero-American Heads of State and Government and from meetings between Ibero-American Ministers and High Authorities for Science, Technology and Innovation.

d) IPBES

The IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), which is open to all members of the United Nations, was established in April 2012. Participating members, including Portugal, currently make up a total of 127 countries from all continents, who have undertaken to develop the IPBES Platform so that it becomes a leading tool in assessing the current state of biodiversity on Earth, its ecosystems and the key services they provide to society.

IPBES-Portugal primarily aims to bring together and engage all stakeholders in the field of biodiversity, ecosystems and their services, in Portugal, ranging from the scientific community to policy-makers and society at large, thus creating a national network of stakeholders who could contribute to the work programme established by the IPBES.

IPBES-International has been making progress in conducting a study to evaluate biodiversity and ecosystem services worldwide, and FCT was involved in this process by examining requests for the representation of Portuguese experts in international meetings of working groups. These experts were selected by IPBES-International on a competitive basis, and subsequently supported by FCT.

e) PRIMA

It is also worth noting that the European Commission and the European Parliament recently approved the Partnership for Research and Innovation in the Mediterranean Area – PRIMA, with Portugal being one of the founding countries, together with Italy and Spain.

This partnership focuses on the areas of agriculture and food and water resources, with a cross-cutting axis of Research and Innovation on the sustainability of those resources, taking into account global CC among other aspects.

The PRIMA programme will have a duration of at least 10 years (2018-2028), with an overall funding of around EUR 500 million, of which EUR 220 million are funded by the EC and the remaining amount by the 19 European and North African countries involved in this initiative. Portugal intends to provide an amount of around EUR 7.5 million and the first competitions are expected to be launched in the spring of 2018.

9. Education, Training and Public Awareness

9.1. Introduction and general policy toward education, training and public awareness

According to the Education System Act (LBSE)[80], the education system comprises pre-school education, school education and out-of-school education, and public education is free of charge.

School education comprises basic (primary), secondary, and higher (tertiary) education, including special arrangements and leisure time activities.

As a policy instrument, the LBSE sets up the education system so that it contributes effectively to the process of personal fulfilment of the learner, while striving to ensure the necessary balance of values required for an individual development process (personality and citizenship).

In this context, the Ministry of Education and the institutions under its political and administrative authority, in partnership with other bodies, public institutions and civil society itself, has published documentation serving as reference to approach the different dimensions of citizenship, such as the Framework of Environmental Education for Sustainability, which is now finished and about to be submitted to public consultation. Such reference documents, as well as other guiding documents, are not prescriptive guides or programmes but rather supporting instruments that each educational institution can use and adapt within the scope of their autonomy, depending on the options to be made in each context, in order to frame practices to be undertaken, both in a classroom setting and in project development.

9.2. Primary, secondary and higher education

Curricular autonomy and flexibility, learner's profile, key learnings and National Strategy for Citizenship Education

In the framework of the priorities set out in the programme of the 21st Constitutional Government for the area of education, the implementation of the project on autonomy and flexibility of curricula in basic and secondary education was approved, as a pedagogical experience, for the 2017/2018 school year (Order No 5908/2017 of 5 July). This project is active in 226 schools with a view to its generalised application in all schools in 2018/2019.

In the context curricular autonomy and flexibility, schools can manage up to 25 % of the weekly hours of basic curriculum matrices per school year or, in the case of education and training for young people and vocational courses, of the total hours per training cycle.

In order to support the implementation of the project on curricular autonomy and flexibility, three strategic documents were developed as the project framework: Learner's Profile when Finishing Compulsory Education, Key Learnings, and the National Strategy for Citizenship Education.

The document on the Learner's Profile when Finishing Compulsory Education, recently adopted (Order no. 6478/2017, of 26 July), serves as a reference for curriculum development and for the work to be carried out in each school, addressing social and economic challenges of today's world, in line with the development of 21st century skills. The Principles, Areas of Competence and Values established in the Learner's Profile when Finishing Compulsory Education are combined in order to educate individuals as participating citizens, paving the way towards lifelong citizenship.

The document on Key Learnings, currently being drafted, identifies the knowledge, skills and attitudes to be developed by all learners, leading to the development of competences included in the Learner's Profile, in the context of promoting curricular autonomy and flexibility.

The National Strategy for Citizenship Education (ENEC), adopted in January 2017, is a reference document to be implemented in the 2017/2018 school year, both in public and private schools which form part of the

[1] Law No 46/86, of 14 de October, as amended by Law No 115/97, of 19 de September, and Law No 49/2005, of 30 August.

project on curricular autonomy and flexibility, in line with the Learner's Profile when Finishing Compulsory Education and Key Learnings.

Citizenship education is compulsory in all education levels and cycles and subject to evaluation.

The different areas of Citizenship Education are organised in three groups with different implications: the first one is compulsory for all education levels and cycles (since these are cross-sectoral and longitudinal areas). This subject includes Environmental Education, with the Framework of Environmental Education for Sustainability as the reference document for its curriculum, in which climate change is one of the topics, including: Climate change causes, Climate change impacts, Climate change adaptation and Climate change mitigation.

The share of curriculum to be managed by each school (25 % of hours of the curriculum matrices) may also become a key tool for developing projects in the area of environment and, more specifically, dealing with climate change.

Primary, secondary and higher education

As already mentioned, the LBSE, in addition to establishing the general framework of the education system, sets up the school education structure, consisting of three levels: basic, secondary and higher education.

Pre-school education is intended for children between 3 years of age and the age of entry into compulsory schooling, it is optional although universal from the age of 5, and delivered in public (free of charge) or private child-care facilities.

Table. 9.2.1
Compulsory Education

Levels		School Years	Age
Basic Education	1st Cycle	1st - 4th	6-10 years
	2nd Cycle	5th - 6th	10-12 years
	3rd Cycle	7th - 9th	12-15 years
Secondary Education	Course type	School Years	Age
	Science and Humanities Artistic, Specialised and Vocational	10th, 11th, 12th	15-18 years

Basic Education

Basic education lasts for nine years, from 6 to 15 years of age, and is organised in three sequential cycles: the first one is four years, the second one two years and the third one three years.

The 1st cycle works within a system of one single teacher, resorting to specialised teachers for certain areas. This cycle aims at global education and the development of basic competences in Portuguese Language, Mathematics, Environmental Studies and Expressive Skills. In the area of Environmental Studies, within the theme "QUALITY OF ENVIRONMENT", on air quality, one of the objectives is to recognise the effects of air pollution, mentioning the increase of greenhouse effect.

The 3rd cycle is organised by subjects. The main objectives of this cycle are the development of skills and competencies which provide a common general preparation to all pupils, enabling them to pursue their studies, whether through courses geared mainly towards entering working life or towards attending higher education.

The 2nd and 3rd cycles involve multiple teachers specialised in the various subject areas. In the 3rd cycle, climate change is addressed in the context of Geography, Physicochemical Science and Natural Sciences.

BOX 9.1 - Framework of Environmental Education for Sustainability

The Framework of Environmental Education for Sustainability is not a programme, but rather a curricular document that falls within the set of reference documents prepared by the Directorate-General for Education, in partnership with various entities, within the field of Citizenship Education.

In order to promote Environmental Education for Sustainability in schools, this Framework has been prepared as a guiding document for teachers and a supporting document for educational actions aimed at raising society's awareness on the importance of sustainability.

This Framework, of a flexible nature, may be used in very different contexts, in full or in part, within the cross-cutting dimension of Citizenship Education, through the development of projects and initiatives that aim to contribute to learners' personal and social development.

The Framework proposes eight cross-cutting themes for all cycles and levels of education, consisting of subthemes and objectives and using descriptors appropriate to the education level involved, namely: Sustainability, Ethics and Citizenship; Sustainable Production and Consumption; Territory and Landscape; Climate Change; Biodiversity; Energy; Water; Land.

We hereby underline the subthemes of Climate Change, which include: Climate change causes, Climate change impacts, Climate change adaptation and Climate change mitigation.

Secundary Education

Secondary education is compulsory and covers a three-year cycle (10th, 11th and 12th school years) and pupils must have successfully completed the 3th cycle of Basic Education or have equivalent qualifications.

Secondary education is structured in differentiated forms (mainstream and vocational), with course curricula organised within a framework of three school years and essentially divided in the following way:

- Science and humanities courses: intended primarily for continuing studies at higher level;
- Artistic specialised courses: aim at providing specialised artistic training in the areas of visual arts, audiovisual media, dance and music;
- Vocational courses: meant to enable entry into the labour market, also allowing for the continuation of studies in post-secondary non-tertiary education or in tertiary education. They are organised by modules in different training areas.

The specific theme of climate change is addressed directly in the following subjects:

A. Geography (3rd cycle of Basic Education)

Theme 9: Environment and Society: Heating - Climate Change

B. Physical and Natural Science (3rd cycle of Basic Education)

Theme 4: Sustainability on Earth: Global change

Weather forecast and description; the influence of human activity on the Earth's atmosphere and climate. Activity suggestion: bearing in mind the need to extract, process and use natural resources and the pros and cons associated with these actions, pupils should look ahead and present proposals for rational management of resources, comparing them afterwards with existing documents on this subject, for example, the Kyoto Protocol, signed on 11 December 1997. Discuss the controversy around this Protocol.

C. Geology (Secondary Education, 12th year)

Theme: The Earth – Past, Present and Future

Mankind as an agent of environmental changes; Global Warming. Content related to climate change addressed under this topic involves the role of mankind as an agent of global warming as well as environmental concerns in the context of geological knowledge.

D. Biology (Secondary Education, 12th year)

Unit 5: Environment Conservation and Recovery (greenhouse effect)

E. Geography (Secondary Education, 12th year)

Subtheme: Greenhouse effect and global warming

It includes proposals for discussions on the resolutions from the global conferences. In the case of vocational training, it is included in the technical courses on Renewable Energy and Environmental Management.

Box 9.2 - Environmental education in curricular programmes and documents of Basic and Secondary Education

In the framework of formal education, environmental content and themes have been integrated in school programmes since the late 70's. From the 80's onwards, it has been made possible for schools to be formally involved in project methodologies with a focus on environmental issues from the perspective of study and intervention at local level.

In 2002, programmes for Geography, Natural Sciences and Physicochemical Science in basic education were replaced by curricular guidelines, reinforcing the relationship between Science, Technology, Society and Environment (STS/E) in a critical approach to economic and technological development. Issues related to proper management of natural resources – water, oceans, fisheries, atmosphere, biodiversity and forest – have been included in these curricular guidelines and may be dealt with across all subjects.

In Basic and Secondary Education, Citizenship Education was adopted as a cross-cutting topic in all programmes. In this sense, curricular programmes include the development of cross-cutting skills in various aspects of citizenship education, including Environmental, Road, Consumer, Health, and Media Education. In the specific case of most programmes in the area of science, preference is given to the STS/E approach, where interrelations established between Science, Technology, Society and Environment are integrated in the different curricular themes.

Higher Education

Higher (tertiary) education in Portugal is structured according to a binary system which includes university education and polytechnic education, provided by public and private institutions. Private higher education institutions must be previously recognised by the Ministry of Science, Technology and Higher Education (MCTES).

Binary system

University education, which includes universities, colleges and other associated institutions, is driven by the promotion of research and knowledge creation, seeking to guarantee a solid scientific and cultural education and to provide technical training for the pursuit of professional and cultural activities, by fostering the development of conceptual, innovative and critical analysis skills.

Polytechnic education, which includes polytechnic institutes and other associated institutions, is driven by a perspective of applied research and development focused on understanding and specific problem-solving, and aims to provide a solid, higher-level cultural and technical education, to develop innovative and critical analysis skills, and to provide theoretical and practical scientific knowledge and its application, enabling the pursuit of professional activities.

Structure of degrees and diplomas in higher education

In 2005, a process to reform the LBSE was initiated in order to implement the Bologna Process, with the introduction of the European Credit Transfer System (ECTS) in study cycles, mobility programmes, diploma supplement, among others.

Higher education then had a three-cycle structure of studies leading to the academic degrees of bachelor, master and doctor. This structure was introduced in 2006 and fully implemented from the 2009/2010 school year onwards.

For each cycle of studies, generic qualification descriptors were also established on the basis of the skills acquired, and the ECTS ranges were set up for the first and second cycles of studies.

In 2014, a cycle of studies in higher education was created which does not lead to an academic degree, the so-called higher vocational technical degree, corresponding to a short cycle of studies linked to the first cycle established in the Framework for Qualifications of the European Higher Education Area.

In higher education, there are several doctoral programmes in climate change, for example the Doctoral Programme on Energy Systems and Climate Change at the University of Aveiro and the Doctoral Programme on Climate Change and Sustainable Development at the Faculty of Science and Technology of Monte da Caparica together with the Faculty of Science of the University of Lisbon.

This issue is further addressed in several master's degrees such as the Master's in Ecology and Environmental Management and the Master's in Risks, Cities and Spatial Planning.

Likewise, it is included in undergraduate courses, such as the Bachelor's degrees in Environmental Engineering, in Geology, in Geography and in Ecology.

Post-secondary non-tertiary education

Technological specialisation courses (CET) provide specialised training courses in different technological areas, which enable learners to continue their studies at higher education level, due to formal recognition of acquired knowledge, and facilitate their integration in a professional context.

The successful completion of a technological specialisation course grants a diploma in technological specialisation and professional qualification at level 5, which makes it possible to attain a Vocational Training Certificate (CAP). This arrangement includes technological specialisation courses in Environmental Management and in Environmental Quality, where climate change is obviously addressed.

Education and Training for Young People and Adults

Education and training for young people and adults offers a second chance to early school leavers or pupils who are at imminent risk of leaving school early, extending this possibility to all those who have not had an opportunity to attend school while young or who, following the prospect of lifelong enrichment, go back to school seeking answers in terms of professional or personal development. Education and training for young people and adults, in whatever form, enables learners to attain a school certificate and/or a professional qualification, as well as to pursue further studies at post-secondary non-tertiary education or tertiary education.

Education and training for young people and adults covers the following arrangements:

- Second-chance education at basic and secondary levels for learners aged 16 and over, partially or totally on-campus, or 18 years and over either on-campus or not;
- Recognition, validation and certification of competences as well as the pursuit of vocational education and training paths.

This system takes place in 'Qualifica' Centres:

- Education and Training courses (CEF) for learners aged 15 or above;
- Adult Education and Training courses (EFA) and Modular Training courses for learners aged 18 or above;
- National Apprenticeship System, under the responsibility of the Institute for Employment and Vocational Training, for young people aged 15 or above.

In this context, climate change is addressed through a generic approach within the scope of scientific subjects and, in the case of adult education and training courses (EFA) and the National Apprenticeship System, it is included in the technical courses on Management of Environmental Systems and Environmental Protection.

Box 9.3 - Protocol between the Ministry of Education and the Ministry of Environment:

The cooperation protocol between the Ministries responsible for Education and Environment, concluded in 2015, formed an important instrument for promoting environmental education in Portugal, through various partnerships, resulting in multiple Programmes and the establishment of a network of teachers with technical and pedagogical competences to coordinate and launch projects developed in conjunction with NGOs or anchored in environmental education equipment.

This network of teachers, covered by the continuity of these protocols, has allowed, over the past few years, for the dissemination of innovative practices in implementing projects on environmental education, based on partnerships between schools, local authorities, non-governmental organisations and other bodies at local, regional and national level, under the coordination and/or monitoring of education professionals and environmental experts

The teachers involved are crucial players in national and international strategies in this field, as key promoters of active citizenship in the context of school communities.

Furthermore, this initiative contributes to the training of teachers working at different levels of education, on issues of Sustainability Education, and it allows for environmental education to reach citizens in general through activities of intervention and dynamism at local, regional and national level.

For close monitoring of this cooperation, the Working Group on Sustainability Education (GTEAS) was established, involving representatives of the two ministries for each area of cooperation.

It should be noted that, under this Protocol, the GTEAS has organised since 2011 annual seminars for public presentation of the projects developed by the network of teachers, in order to discuss the issue of Environmental Education for Sustainability and promote the sharing of experiences.

The issue of climate change has been present both in the work developed by teachers and in several of these seminars.

In addition to the Programmes/Projects/Actions developed in partnership between the Ministry of Education and other ministries in Portugal, there are different projects involving companies and various entities from both local and central government.

9.3. Public information campaigns

National Strategy for Environmental Education (ENEA)

Portugal has adopted the National Strategy for Environmental Education 2020 (ENEA 2020) through a unique process of public debate and participation, aimed at promoting effective ownership and accountability of civil society. This process was supported by two events: the first one was public participation, having received statements from 49 entities and individuals; the second one was public consultation, which received 35 contributions.

The delivery of this Strategy focuses on thematic and cross-cutting activities which are able to ensure the fulfilment of national and international commitments undertaken by Portugal in the area of Sustainability and Climate Change. These include, in particular, the Paris Agreement and the Sustainable Development Goals of the United Nations – 2030 Agenda.

The guiding principles of a strategy in the field of Environmental Education for Sustainability should aim for a participatory citizenship, empowering children and young people, but also civil society, economic actors, policy makers and technical staff of central, regional and local administration.

ENEA 2020 provides for 16 actions in the framework of three strategic objectives: Environmental + Cross-cutting Education; Environmental + Open Education; Environmental + Participatory Education. These objectives are based on three central pillars of the Government's environmental policy: decarbonisation of society, circular economy, and territory enhancement.

For the period 2017-2020, ENEA 2020 seeks to establish a strategic and collaborative commitment to cohesion, building up environmental literacy in Portugal which, through inclusive and visionary citizenship, leads to a paradigm shift in thinking that translates into sustainable behaviour models in all dimensions of human activity.

For the implementation of ENEA 2020, approximately 18 million euros have been allocated for the period 2017-2020 through the Environmental Fund[81].

The actions foreseen in ENEA 2010 through one of its thematic axes "decarbonisation of society" aim at contributing to active citizenship in the field of sustainable development and building a low-carbon, rational and resource-efficient society. Therefore ENEA 2020 appears as a means to achieve Portugal's objective of deep decarbonisation of society by 2050.

Projects/Programmes/Competitions

The Ministry of Education, in partnership with the Ministry of Environment, the Ministry of Agriculture, Forestry and Rural Development, various local authorities, universities, governmental institutions and non-governmental organisations, have developed several Environmental Education projects, both in schools and surrounding communities, with a thematic focus on Sustainability and Climate Change, both in terms of mitigation and adaptation.

i. **Education and Climate Change Award under ADAPT programme[82]**

Within the scope of this programme, the competition "Education and Climate Change award", developed under the coordination of the APA and the Directorate-General for Education, aimed to resort to schools as an excellent vehicle for communication and training, raising awareness of school communities on ways of preventing the effects of climate change and on adaptation measures.

The winning application was submitted by the University of Porto – Faculty of Arts, with the project "ClimaEdu.Media", which endeavoured to integrate and complement environmental education on climate change, concerning both mitigation and adaptation, in 30 pilot schools. One of the project components consisted of a award (funding) for the best project on the implementation of measures related to climate change in school context.

ii. **Campaign "O Clima é Connosco" [Climate is up to us]**

The Communication Plan "O Clima é Connosco" [Climate is up to us] presents a set of communication actions and environmental awareness measures for climate action aimed at the general public, with greater focus on educational communities, enhancing the role of partnerships in the whole process.

In this sense, the Imprensa Nacional – Casa da Moeda, S.A. (INCM) [Portuguese Mint and Official Printing Office], under the numismatic plan for 2015, minted and marketed a collector coin called "O Clima é Connosco" [Climate is up to us], as part of the series "Uma Moeda Uma Causa" [One Coin, One Cause]. A share of the revenues from the sale of this coin has gone to a non-governmental organisation (NGO), which was selected through a tendering procedure organised by the Portuguese Environment Agency.

This competition aimed at contributing to the knowledge on climate change and on the impact of choices and decisions made by citizens, as well as to an urgently needed reduction of harmful greenhouse gas emissions into the atmosphere, thus contributing to a resilient low-carbon economy. The promoters of the campaign "O clima é connosco" are ASPEA – Portuguese Association for Environmental Education, a non-governmental environmental organisation, the Imprensa Nacional – Casa da Moeda, S.A. (INCM) and the APA – Portuguese Environment Agency.

iii. **Cooperation Protocol APA – Carbon Disclosure Project (CDP)**

[81] http://www.fundoambiental.pt/

[82] Programme developed in accordance with the Memorandum of Understanding between Portugal, Norway, Iceland and Liechtenstein in 2012, in order to give financial support to actions on Climate Change Adaptation in Portugal. The Portuguese Environment Agency (APA) is the executive body of the programme.

Under the cooperation protocol between the APA and CDP (signed in November 2013), with a view to encouraging businesses and cities to share information and good environmental practices and to increasing the number of companies and cities that monitor and manage their carbon emissions in Portugal, thus contributing to increased transparency in environmental information, CDP promotes annually the dissemination of its report, with the involvement of businesses in Spain and Portugal.

CDP is a non-profit international organisation which provides one of the largest and most comprehensive global systems for environmental disclosure, with more than 4,100 companies and 126 cities around the world, which report on environmental information through its platform.

It works with market operators in order to motivate businesses and cities to measure and disclose their impacts on the environment and natural resources, and thus discover ways to reduce them. CDP also owns the largest corporate databank on climate change, water and forests. Such information generates insights that allow investors, businesses and governments to mitigate risks associated with the use of energy and natural resources, as well as identify opportunities for a more responsible approach to environment. CDP's action moves around different thematic programmes: Companies, Cities, Water, Forests, Supply Chain, etc.

In Portugal, participation has focused on Companies (invitation is addressed to the first 40 companies listed on the Lisbon Stock Exchange) and Cities (invitation is addressed to 40 Portuguese cities, selected by the highest population among the 55 signatories of the Covenant of Mayors).

iv. EDS Platform 2014

In November 2014, the EDS Platform 2014 + was presented to the public with the purpose of gathering documents related to Education for Sustainable Development produced in the decade 2005-2014.

The EDS Platform 2014 + is coordinated by the National Commission for UNESCO in Portugal and comprises representatives of different NGOs, governmental institutions and higher education institutions.

v. Project 80

Project 80 (launched in 2012/2013) is a programme at national level for the activation of the associative movement in schools, seeking to promote education for sustainability, entrepreneurship and democratic citizenship.

The project is targeted at Students' Associations at schools in the 3rd cycle of basic and secondary education which develop one or more sustainability projects, including projects that promote the efficient management of resources, the decrease of carbon and water footprint, biodiversity, entrepreneurship, green economy and social innovation, as well as volunteering or other forms of citizenship and public participation.

This project is the result of a joint initiative by the Portuguese Environment Agency, the Directorate-General for Education, the Portuguese Institute of Sports and Youth, the environmental organisation Quercus and the Green Project Awards.

vi. Competition Mission UP | United by the Planet – Competition Positive Brigades

Mission UP | United by the Planet is an educational project within the framework of the strategy set up by Galp Energia, with a national scope, dedicated to energy use, with a focus on the areas of Sustainable Mobility, Energy Efficiency, Energy Footprint and Energy Sources.

The project is developed in schools through the "Positive Brigades" competition, in which pupils and teachers are challenged to organise teams or "Brigades" with a specific mission around energy efficiency and sustainable mobility, both inside and outside the school. These Positive Brigades must suggest and implement actions among their fellow pupils, friends and parents in order to promote sustainable energy use. It is meant for implementation at national level, in schools of 1st and 2nd cycles of Basic Education, not only for children (between 6 and 12 years old), but also their teachers, parents and guardians.

The Ministry of Education, the Ministry of Economy and the Ministry of Environment in partnership with other entities support, monitor and publicise the project. The jury of the competition consists of technical staff from the different ministries.

vii. Power UP Mission

Power UP Mission is a national school project on energy consumption efficiency, organised by Galp Energia for pupils from the 2nd and 3rd cycles of Basic Education. The Power Up Mission project deals with topics such as energy sources, sustainable mobility and energy footprint, using an online learning platform in an innovative way.

The project is targeted at schools and pupils from the 2nd and 3rd cycles of Basic Education, aged between 10 and 15 years, but also teachers, guardians, parents and other members of the educational and local communities.

Power UP Mission aims to promote the creation of multi-disciplinary teams involving pupils and other members of the school community, and to contribute to attitudes and behaviours associated with more efficient energy consumption.

The Ministry of Education, the Ministry of Economy and the Ministry of Environment in partnership with other entities support, monitor and publicise the project. The jury of the competition consists of technical staff from the different ministries.

viii. School – Electron project

The School – Electron project aims to raise awareness among students and their communities on the correct disposal of waste electrical and electronic equipment (WEEE), with a clear impact on emission reduction, combining the effects of dissemination, training and participation in an inter-school competition.

This project is targeted at pupils from the 2nd and 3rd cycles of Basic and Secondary Education, it is promoted by Amb3E (Portuguese Association for the Management of Waste Electrical and Electronic Equipment), with the collaboration of the Directorate-General for Education, and it was carried out annually between 2008/2009 and 2011/2012, having been resumed in 2015/2016.

The Ministry of Education and the Ministry of Environment in partnership with other entities support, monitor and publicise the project. The jury of the competition consists of technical staff from the different ministries.

The Ministry of Education has promoted the dissemination of the project in schools, as well as its pedagogical supervision, which involved analysing and evaluating support material for the project, including the website, producing news and sending out institutional e-mails, among other related tasks/activities.

During the 5 editions of this competition, in addition to awareness-raising actions, schools collected more than 5 tonnes of waste electrical and electronic equipment (WEEE), mobilising the local school community for the correct WEEE disposal. The Project will run its sixth edition in 2017/2018.

ix. Project "Twist – a tua Energia faz a Diferença" [Your Energy makes the difference]

The project "Twist – your energy makes the difference" is an educational initiative raising awareness on Energy Efficiency, Climate Change, Renewable Energy and Sustainable Development, targeted at pupils and teachers in Secondary Education – 10th to 12th years.

This initiative is promoted by EDP (national electricity provider). Each school participates with a group of "twisters" – four pupils and one teacher – with a mission to develop actions in school aiming at identifying measures that make school more energy efficient, raising awareness and involving the whole school community.

The Twist project will be relaunched for the school year 2017/2018 and will continue the methodology applied in previous editions.

The Ministry of Environment and the Ministry of Education, along with other ministries and entities, support, monitor and publicise the project, also including technical staff in the jury.

x. Project "Ciência na Escola" [Science in School]

The "Science in School" project, organised by the Ilídio Pinho Foundation, aims at stimulating pupils' interest in science by supporting innovative projects.

Some of the projects presented are directly or indirectly related to Climate Change[83].

Applications should consist of highly practical and multi-disciplinary projects which mobilise the different subject fields for their development.

The competition is open to all pupils in pre-school education, as well as from the 1st, 2nd and 3rd cycles of Basic and Secondary Education, from the different education and training pathways, with the aim of learning about science and choosing technological areas.

The 14th edition of the competition was dedicated to the topic of "Science and Technology working for a better world".

The 15th edition is ongoing and its topic is "Science in School to the Benefit of Development and Humanisation"[84].

The Ministry of Education and the Ministry of Economy support, monitor and publicise the project. The Portuguese Environment Agency, amongst others, is part of the competition jury.

xi. Eco XXI

In line with the principles underpinning Agenda 21, the ECO XXI project aims to recognise the best sustainability practices developed at municipality level, consisting of the implementation of educational activities with the local authorities as key actors in promoting sustainable development. Good practices on sustainability developed at municipality level are directly or indirectly related to climate change.

The main objective of this project is therefore to enhance a range of issues considered key to Sustainable Development, anchored on two pillars: sustainability education and environmental quality.

Different central government bodies, such as the Directorate-General for Education and the Portuguese Environment Agency, together with other entities, are part of the National Commission of the Eco XXI project, whose task consists of supporting the implementation of the project through its monitoring within the expertise area of each body, and being established as jury.

xii. Programme "Jovens Repórteres para o Ambiente (JRA)" [Young Reporters for the Environment]

Young Reporters for the Environment (https://jra.abae.pt/plataforma/) is an international programme for environmental education developed by an international network of the Foundation for Environmental Education (FEE), which currently comprises 34 countries and it is promoted in Portugal by the ABAE – Associação Bandeira Azul da Europa [Blue Flag association], which has been the Portuguese section of the Foundation for Environmental Education (FEE) since 1994.

The project is targeted at Secondary Education pupils, who are supposed to identify a local environmental problem, after which they carry out the respective research, reporting and communication, making use of newspapers, the Internet and other media.

[83] List of projects: https://www.fundacaoip.pt/wp-content/uploads/2017/06/Lista_100-Mostra-2016_2017.pdf

[84] https://www.fundacaoip.pt/ce/

This work ends with the presentation of journalistic articles, photographs, videos or PPT presentations on the environmental issues researched by the participating pupils, and the annual participation in competitions is foreseen in order to reward the best performance. Climate Change is an underlying topic of the JRA Programme, and it has been the main theme of the competition more than once.

Different central government bodies, such as the Directorate-General for Education and the Portuguese Environment Agency, together with other entities, are part of the National Commission of the JRA project, whose task consists of supporting directly and indirectly the implementation of the project, carrying out its pedagogical and technical monitoring and being established as a jury in competitions related to it.

xiii. Eco-schools project

The Eco-schools project is an international programme of environmental education, which currently involves 49,000 schools across 63 countries, having been promoted in Portugal since 1996 by ABAE, the Portuguese section of the Foundation for Environmental Education (FEE), covering approximately 1,600 schools.

The project aims to encourage schools to develop actions in the field of Environmental Education for Sustainable Development, offering training and support, mainly providing teaching methods and materials and undertaking actions that facilitate the implementation of the programme.

Many of the activities developed by pupils take climate change into account (https://ecoescolas.abae.pt/our_news/abae-integra-projeto-climact/).

This project also shows recognition for work carried out by schools, by awarding the Eco-Schools label and other prizes meant for schools, teachers and pupils involved. Different ministries, such as the Ministry of Education and the Ministry of Environment, are part of the National Commission of the Eco-schools project, whose task consists of supporting directly and indirectly the implementation of the project, carrying out its pedagogical and technical monitoring and being established as a jury in competitions related to it.

The Portuguese Environment Agency and the Directorate-General for Education are part of the National Commission of the Eco-schools project, and, together with other entities, they support directly and indirectly the implementation of the project, carry out its pedagogical and technical monitoring and are members of the jury in competitions related to it.

xiv. Lipor generation +

The competition "Lipor Generation+", promoted by Lipor, aims to promote and support projects and/or initiatives which have at their basis consolidated practices of environmental (including from the perspective of climate change mitigation), social and economic sustainability, and to recognise the work undertaken by the institutions in this field.

The Ministry of Education and the Ministry of Environment monitor the project, publicise it and are part of the national jury.

xv. YEL project

This is an initiative under the responsibility of RNAE – Association of Energy and Environment Agencies (National Network), and it is targeted at pupils from Secondary Education, aimed at raising awareness and changing behaviour on energy efficiency and climate change.

The Ministry of Education and the Ministry of Environment monitor the project, publicise it and are part of the national jury.

xvi. Project "Nós Propomos" [We propose]

Promoted by the Institute of Geography and Spatial Planning, this project aims to promote effective local territorial citizenship, from a governance and sustainability perspective.

It seeks to develop partnerships between universities, schools, municipalities, businesses and associations, with whom it tries to establish a cooperation protocol.

The Ministry of Education monitors the project, publicises it and is part of the national jury.

9.4. Training programmes

Training actions under AdaPT programme

Under the AdaPT programme, the "ClimaEdu.media" project included teacher training in the format 'Massive Open Online Course' on using media to teach about clime change in the classroom. This course was aimed at helping teachers of science and media develop their skills to teach about climate change in the classroom using several media. The course, which had two editions, with a total of over 1,000 people enrolled, was composed of five modules. The first one addresses the concepts of media literacy and scientific literacy; the second one introduces climate change and text news; the third one looks into climate change impacts and the use of infographics; the fourth one examines the mitigation of climate change causes and the use of audio in teaching; and, finally, the fifth module introduces the subject of adaptation to climate change impacts and the use of video.

Still in the context of this programme, the "ClimAdaPT.Local" project, carried out by a consortium led by the Faculty of Science of the University of Lisbon, aimed to initiate Portugal in a continuous process of drawing up Municipal Strategies for Adaptation to Climate Change (EMAAC) and its integration into the municipal planning tools, in particular by empowering municipal technical staff. One of the objectives was the training of 52 municipal technical members of staff on Climate Change Adaptation, with the development of the following actions under specific themes:

a) General methodology and current climate vulnerabilities

b) Future vulnerabilities and adaptation

c) Identification and selection of options for adaptation

3rd International Congress on Environmental Education of Portuguese Speaking Countries and Communities

The 3rd International Congress on Environmental Education of Portuguese Speaking Countries and Communities took place from 8 to 11 July, in Torreira – Murtosa, and focused on the topic of "Environmental Education: crossings and meetings for the common good". Thematic Axis II was dedicated to Climate Change[85].

The Congress was organised by the Portuguese Association for Environmental Education in partnership with the scientific centre "Fábrica Centro Ciência Viva" of the University of Aveiro and the Municipality of Murtosa.

Several ministries, including Education and Environment, were members of the organising committee of this event, which was part of the process of strengthening networks and communities acting in the field of Environmental Education, within the Portuguese Speaking Communities and Galicia.

Building on the Treaty on Environmental Education for Sustainable Societies and Global Responsibility and on the Earth Charter, the 3rd International Congress on Environmental Education of the Portuguese Speaking Countries and Communities covered over 10 fields of work, with different dimensions and approaches, which served as a basis for exchange and debate among participants.

The 3rd International Congress on Environmental Education was accredited as training by the Council of continuing training for teachers.

[85] http://www.ealusofono.org/index.php/acerca-de/edicoes-anteriores/iii-programa

4th International Congress on Environmental Education of Portuguese Speaking Countries and Communities

The 4th International Congress on Environmental Education of Portuguese Speaking Countries and Communities took place in the Autonomous Region of Príncipe, S. Tomé, from 17 to 20 July 2017.

The Thematic Axis 2 addressed exclusively the issue of climate change: "Environmental education in response to climate change and to environmental risks and disasters"[86].

The methodology used for this congress was similar to the previous ones, aiming to contribute to the development of public policies which help to strengthen environmental education in Portuguese speaking countries and in Galicia.

The main goals include: to strengthen joint processes for research, training and information in the field of Environmental Education; to improve scientific production in Portuguese, enhancing initiatives from journals and other means of dissemination of Environmental Education; and to build a permanent learning process which is favourable to the Portuguese-speaking identity in the philosophical structure of Environmental Education.

The structure of the congress was conceived on the basis of suggestions and inputs from the participatory process carried out at REDELUSO, and it was developed around 8 thematic axes. Among these, attention is drawn to the axis "Environmental education in response to climate change and to environmental risks and disasters".

2nd International Congress on Environment and Development

The 2nd International Congress on Education, Environment and Development, organised by OIKOS – Association for Environment and Heritage Protection in the region of Leiria – and by the Polytechnic Institute of Leiria, took place from 9 to 12 November 2016.

The congress aimed primarily to foster discussion and dissemination of methodologies used and scientific studies related to the proposed topics; to present and reflect on practices considered relevant from the perspective of sustainability of contemporary societies, in order to minimise environmental disasters and tackle the phenomenon of Climate Change; to promote cooperation between public and private entities in defining new development models; to raise awareness and encourage all actors on the topics under analysis and their strategic, economic, social and environmental importance.

The Ministry of Education and the Ministry of Environment, among other ministries and public bodies, were institutional partners in the 2nd International Congress on Education, Environment and Development.

9.5. Resource or information centres

Environmental Education Equipment for Sustainable Development (EqEA)

Environmental Education Equipment nowadays plays a major role in environmental education. This equipment corresponds, by definition, to every initiative which involves appropriate facilities, specialised educational teams and an educational programme, thereby offering a range of programmes and activities of educational intervention, and providing for relevant resources, complementary to the formal education system. Examples of such equipment are the Environmental Education Centres, Interpretation Centres for Protected Areas, Educational Farms, Eco-libraries and Environmental Parks. EqEA in Portugal constitute a heterogeneous group of initiatives located in a natural, rural and urban context. This heterogeneity is a common feature of Environmental Education Equipment throughout the world.

The basic elements that should be part of Environmental Education Equipment are: having an Educational Project driven by guidelines relating to environmental education, education for sustainable development, the ways to address Climate Change and society's forms of response (mitigation and adaptation); being a physical

[86] http://www.ealusofono.org/index.php/a-programacao/programa.

space with infrastructure and resources to implement activities for the various target groups (school children and other sectors of the population); and operating regularly throughout the year (more than 120 days/year).

Thus, in order to comply with this premise, in 2011 the Portuguese Environment Agency produced two online surveys: a first Form for Identification of Environmental Education Equipment, with the purpose of identifying/locating equipment for environmental education (intended only for persons/organisations who are not owners/managers of environmental education equipment), and a second Form for Characterisation of Environmental Education Equipment, intended for entities which are owners/managers of this type of equipment.

It should be noted that the surveys mentioned above, after being submitted and validated by the APA, allow to geo-reference existing equipment in Portugal with SNIAmb, which can be consulted through the geo-visualizer, and its related information can also be imported from SNIAmb.

By 31 July 2017, 195 EqEA had been validated in accordance with the 16 questions drawn up in that survey (15 open questions and 1 closed question).

The existence of Environmental Education Equipment, its territorial distribution as well as the increased and necessary diversification of the target audience from the perspective of lifelong learning are an indicator of the ability of society to create cultural conditions enabling diversified forms of development which are environmentally sustainable, socially fairer and equitable for all citizens.

9.6. Involvement of the public and non-governmental organizations and participation in international activities

Besides all related information mentioned along different chapters, all climate policy instruments were subject of public consultation processes. General public, as well as specific stakeholders and NGO's, are also involved in many activities, and dissemination actions Climate Change related, developed by either Ministry of Environment, APA or other public and private entreprises, namely the ones involved in institutional arrangements mentioned before (SPeM; ENAAC; SNIERPA; CCV)

APA, being the entity responsible for coordinating national climate policy, and with a view to facilitating access to information related to Climate Change, both in terms of mitigation and adaptation, makes all reports produced within its field of competence publicly available, and submits them to various international bodies, as can be seen through the following link:

- https://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=1230&sub3ref=1231

All information related to policies on Climate Change is available in http://www.apambiente.pt/index.php?ref=16&subref=81 and it is organised according to the following thematic areas: Science; Mitigation; Adaptation; Monitoring and Reporting; International and European Response; Paris Agreement; Cooperation. In addition to this, the APA has other specific information systems available online, including on climate change:

- (http://www.apambiente.pt/index.php?ref=17&subref=295
- http://www.apambiente.pt/index.php?ref=17&subref=150)

We also highlight the information on climate scenarios provided by the Climate Portal (http://portaldoclima.pt), a project under the AdaPT programme that provides an easily accessible platform for the general public with the aim of disseminating the following information: historical data sets, regional climate change and climate indicators for specific sectors in Portugal.

This project contributes, thus, to increased awareness and education on climate change.

Under this project, past climate data and climate projections data from IPCC AR5 (CORDEX project) were processed for dissemination via the website. This task involved all the calculations required for the breakdown of data at NUTS3 level and for different periods of time, and the (possible) estimation of aggregated indicators (e.g. drought index, meteorological risk of fire, etc.).

Among the different activities undertaken by NGOs, the following are highlighted:

- **Quercus – National Association for Nature Conservation**

a. EEB – Water Working Group – Participation in the Water Working Group in order to exchange information and take part in the actions proposed within the context of water resources.

b. ClimAdaPT – Municipal Strategies for Adaptation to Climate Change

- **LNP – League for Nature Protection**

a. PRACTICE is a global initiative that brings together scientists and key actors of some of the most affected regions of the world, so as to gather scientific and local knowledge, drawing attention to the challenge of desertification.

b. LIFE Charcos project, implemented in Sites of Community Interest.

- **ABAE – European Blue Flag Association**

a. The 'Eco-Schools' programme is an international initiative by the Foundation for Environmental Education (FEE), currently present in 64 countries.

b. The "Green Key" programme is an international label promoting Sustainable Tourism in Portugal by recognising tourist facilities, short-term rental accommodation, campsites and restaurants that implement good environmental and social practices, enhance environmental management in their facilities and promote Environmental Education for Sustainability.

- **ASPEA – Portuguese Association for Environmental Education**

a. The EDUCO2CEAN project seeks to generate an educational model of Science-Technology-Society with the potential to be applied throughout the European Union, and raise society's awareness on the importance of research on the impact and mitigation of oceanic climate change, with a particular focus on the Atlantic Ocean and the Baltic Sea.

b. Marine Alliance for Science and Technology (Scotland, United Kingdom).

c. Caretakers of the Environment International (Poland).

d. International Congress on Environmental Education of Portuguese Speaking Countries and Communities

- **GEOTA – Study Group on Spatial Planning and Environment**

a. Coastwatch Europe is a project on the management of rivers and the implications of human activity on ecosystems and coastal erosion, in coordination with the "Free Rivers" project.

b. EUropa – The project seeks to trigger the involvement and awareness of citizens on the importance of their role as active players in promoting a sustainable economy.

- **OIKOS – Association for Environment and Heritage Protection in the region of Leiria**

a. International Congress on Education, Environment and Development

Box 9.4 - Aarhus Convention

The Convention of the United Nations Economic Commission for Europe (UNECE) on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention) was adopted on 25 June 1998 in the Danish city of Aarhus, at the 4th Environment for Europe Ministerial Conference. It entered into force on 30 October 2001, after ratification by 16 member countries of UNECE and by the European Union. Portugal signed the Aarhus Convention in 1998 and ratified it on 2003.

The objective of this Convention is to ensure citizens' rights regarding access to information, public participation and access to justice in environmental matters, with these three aspects being considered as its three fundamental pillars, assuming that sustainable development can only be achieved with the involvement of all citizens and emphasising the interactions that should be established between the public and the authorities, at all levels, in a democratic context.

In the Portuguese legal system, different pieces of legislation allow, in general, to put into practice the guiding principles of this Convention: Constitution of the Portuguese Republic; Basic Environment Law; Code of Administrative Procedures and Law governing the status of NGOs.

As regards access to justice in environmental matters, an applicant in Portugal – whether an individual or an NGO – who considers that their request for information has been ignored, wrongfully refused, in full or in part, or inadequately answered, or that EU and national law has not been complied with, can challenge the legality of a decision, act or omission in accordance with the general legislation.

With regard to knowledge and information on environment, much progress has been made in recent years in Portugal, notably due to the dynamics set in the first Basic Environment Law, which has since 1986 led to the preparation of an annual report on the state of the environment – to be submitted to the Portuguese Parliament when discussing the broad policy options/national budget for each year, making the Environment one of the areas of government with 'annual accounts', using specific indicators to measure the impact of adopted measures and the extent to which targets have been reached. The revolution of new information and communication technologies also contributed to this, along with their broad dissemination, in particular the Internet.

Equally relevant is the work that has been completed over time by the National Statistical Institute (INE), the reference statistical authority at national level, with particular emphasis on the annual edition of "Environment Statistics" and on the availability of updated monitoring indicators from the National Strategy for Sustainable Development (ENDS).

10. Additional Information on Kyoto Protocol

10.1. Supplementary relating to mechanisms under the Article 6, 12 and 17 of the Kyoto Protocol

a. For the fulfilment of its commitment under the Kyoto Protocol Portugal used, as reported in the true up period report, 302.650.818 AAU; 4.567.634 ERU; 10.119.578 CER; 44.760.045 RMU. It will also carry-over for the second commitment period 40.608.686 AAU; 595.005 ERU; and 4.149.718 CER.

b. It should be noted that the ERUs and CERs in the retirement account were used for compliance by operators in the context of the EU-ETS. Additionally, the fact that Portugal is carrying over 40.608.686 AAUs for the second commitment period demonstrates that the use of mechanisms is clearly supplementary to domestic action.

10.2. Policies and measures in accordance with Article 2

The Constitution of the Portuguese Republic establishes the right to a healthy, healthy and ecologically balanced living environment, consecrating sustainable development as an eminent social value. For this reason, the State is given the following tasks:

a. to prevent and control pollution;

b. to organize the territory with a view to balanced socio-economic development;

c. to classify, protect and value landscapes and sites, so as to guarantee the conservation of nature and the preservation of cultural values of historical or artistic interest;

d. to promote the rational use of natural resources, with respect for the principle of intergenerational solidarity;

e. to promote the integration of environmental objectives into sectoral policies;

f. to promote education and respect for environmental values; and

g. to ensure that fiscal policy harmonizes development with environmental protection and quality of life.

This dimension of action gains special relevance in the National Reform Program and in the Program Portugal 2020, as well as in the Great Options of the Plan for 2016-19 assumed by the current Government, thus showing that environmental sustainability and territorial cohesion are priorities of the XXI constitutional government.

Climate change and the loss of biodiversity are the main environmental threats of today and adequate responses to these threats have been sought at international, regional and local level.

In this context, the Ministry of the Environment currently has the mission of formulating, conducting and evaluating policies on the environment, urban planning, cities, housing, urban, suburban and road passenger transport, climate change and nature conservation with a view to sustainable development and social and territorial cohesion.

Portugal has also identified as priorities the decarbonisation of society, with the pledge of reaching carbon neutrality by 2050, the development of a circular economy and the valorisation of the territory. The integration of the transport policy under the remit of the Ministry of Environment is an innovation, which fits with the logic of an integrated vision of sustainability.

In terms of regional commitments, it should be noted that Portugal is involved in the implementation of the Europe 2020 Strategy, with regard to the objective of promoting sustainable growth. The preservation of the environment and the reduction of human impact are pillars of this strategy, which are understood to include the size of economic growth and contribute to the economic and social development of the European area. The political understanding that the EU - reflecting its greater historical responsibility and economic capacity - should take on the ambitious goal of reducing internal emissions by between 80-95% by 2050 (compared to 2005 levels) led to the adoption of the EU Strategy for Adaptation to Climate Change.

Portugal has been working in this policy field in line with its international commitments, in particular the Agenda 2030, the Kyoto Protocol and the Paris Agreement.

As regards the strategy pursued for the valorisation of the territory, the following aspects should be highlighted:

- Urban rehabilitation as a motor for the requalification of cities, instead of promoting new constructions, and as a multifaceted policy with direct impacts on the settlement of cities, on the promotion of social inclusion, energy efficiency and the creation of jobs;
- Sustainable urban mobility as a promoter of energy efficiency and social cohesion, maximizing the accessibility of all citizens to various goods and services;
- Territorial cohesion, seen as an integrated instrument for optimizing the use of the various national endogenous resources, such as the sea, in its economic and environmental aspects, and the unexplored resources of the interior of Portugal;
- The circular economy, as the transition movement to a restorative and regenerative economic system, based on the encouragement and development of business models, collaborative strategies, products and services focused on the efficient use of resources, improving the competitiveness of the national economy, generating initiatives with impact on exports and with local impact;
- The promotion of biodiversity and natural assets through an integrated approach to both climate change, with its effects on natural systems, economic activity and living conditions of citizens, as well as the conservation of nature, treating classified areas as strategic assets for national development.

The Government's strategy is based on the utilization of four specific resources: the sea, the territorial connectivity, the country's interior and the forest. To this end, it is necessary to ensure the integration and interdependence of national and regional development programs with territorial management instruments, avoiding the duplication of plans and strategies, thus promoting a real strategic planning of sustainable development and fostering its effective operationalization.

The sustainability of this territorial context requires the recognition of the importance of planning in advance of the political decision making and imposes efficiency in the use and sharing of resources. A sustainable territory must provide its inhabitants with a sufficient response to basic needs as regards health, food and education, safeguarding social, ecological and economic well-being.

The National Strategy for Adaptation to Climate Change 2020, based on the alignment with the European Union and the national framework, sets the vision of "a country adapted to the effects of climate change through the continuous implementation of solutions based on technical-scientific knowledge and good practices", setting goals, through the continuous implementation of solutions based on technical-scientific knowledge and good practices, in particular by:

a. improving the level of knowledge on climate change, risks, impacts and consequences;
b. implementing adaptation measures; and
c. promoting the integration and monitoring of the climate change adaptation component into public and sectoral policies, including spatial planning, sustainable urban development and water resource management policies.

10.3. Participation at ICAO and IMO Decision-making Process

Portugal has participated regularly and systematically in the discussions on emissions from the international air and maritime transport sub-sectors, both at UNFCCC and Community levels (namely with regard to aviation), as well as in following developments by the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO).

The National Civil Aviation Institute (INAC) is the responsible body for following issues relating to GHG emissions from the international civil aviation sector, ensuring the country’s participation at the various international fora, both at the level of the ECCA52 at the meetings of Director-Generals, and the ICAO, at the plenary sessions of the Assembly.

The Directorate-General for Natural Resources, Sfety and Maritime Services (DGRM) has been directly involved in the International Maritime Organisation through meetings of the Marine Environment Protection Committee.

Portugal has ratified the Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) approving the Decree Law 1/2008 (January the 9th).

10.4. Progress achieved by ICAO

The International Civil Aviation Organization (ICAO) has set as targets for the international aviation sector, improve the fuel efficiency by 2% per year and keep CO2 emissions from 2020 at the same level, this means, achieving its stabilization from 2020.

In order to achieve its goals, the ICAO Committee has developed a set of mitigation measures to reduce CO2 emissions from international aviation, being this measures related with aircraft technology, operational improvements, the use of sustainable alternative fuels and the implementation of a global market-based measure (GMBM).

Therefore, ICAO and its Member States, in cooperation with the aviation sector, have been developing the first global market-based measure to reduce substantially greenhouse gas emissions in this sector. This measure, is known as Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), and consists of a global carbon offsetting scheme to be applied to international aviation in several phases, that will become mandatory from 2027 for all countries with an aviation sector developed, being launched in 2021 an optional "pilot phase".

By June 2017, 71 states, representing more than 87.7% of international air activity, have indicated their intention to participate in the voluntary phase. It should be noted that, once a country agrees to participate in the regime, it is considered as being under an obligation to comply with any and all future decisions.

The Standards and Recommended Practices (SARPs) for CORSIA are expected to be approved by June 2018, which will be applied from 1 of January 2019.

The emissions monitoring period will occur in 2019 and 2020, and the average CO2 emissions of these years will be the basis for comparison with future emissions, with the goal of carbon neutrality from 2020 onwards. Thus, in any year from 2021, when CO2 emissions from international aviation covered by CORSIA exceed the average emissions of those years (2019 and 2020), the difference obtained will correspond to the carbon offsetting that the aircraft operator will have to carry out in that year.

10.5. Efforts for the Minimization of Adverse Effects

Portugal's contribution to the minimization of the adverse effects of climate change in other Parties, particularly developing countries, is carried out first of all through a strong commitment to implementing the Convention and the Kyoto Protocol.

By working on the implementation of the Protocol, Portugal is struggling to minimize not only the adverse effects of climate change in specific sectors, industries or other Parties, but also any adverse effects due to the reduction of greenhouse gases. This is due to the development of different actions and implementation of different instruments conceived to promote sustainable development and the commitment to support developing countries.

The policies and measures implemented, adopted or foreseen in the National Plan for Climate Change (PNAC), targeting the six GHG of the Kyoto Protocol through its broad portfolio of instruments and wide-ranging coverage of all sectors of the economy, make up a significant effort by the Portuguese Government to address climate change, including the minimization of adverse effects of such policies.

The transition to a lower carbon Portuguese economy relies on the contribution of all sectors. Particularly, the Portuguese Energy Strategy relies to a great extent in the diversification of energy sources (including those referring to fossil fuels) and to the increase of endogenous resources (renewable). In some cases, the measures pertaining to the diversification of primary energy sources (namely shifting to natural gas), can simultaneously have positive effects on Portugal's emissions reduction and in the economy of some fossil fuel exporting countries.

As a member of the EU, Portugal also pursues the minimization of adverse effects of the policies and measures in this context through the implementation of activities such as the:

a. EU Emissions Trading System (EU ETS): the EU's main policy mechanism for reducing CO2 emissions from energy intensive sectors;

b. Inclusion of aviation in the EU emission trading scheme which addresses the challenge of reducing emissions from this sector, and enables the creation of additional financial resources for climate change mitigation and adaptation in developing countries through the auction of emission allowances by member states;

c. EU Renewables Directive (Directive 2009/28/EC): sets ambitious targets for each member state for the share of renewable energy generation by 2020 and the proportion of renewable energy in the transport sector (includes biofuels, biogas, hydrogen and electricity from renewables);

d. Effort Sharing Decision (Decision 406/2009/EC) which sets targets for emissions reductions or growth limits in those sectors of Member States' economies not covered by the EU ETS (excluding Land Use, Land Use Change and Forestry);

e. Roadmap for moving to a competitive low carbon economy in 2050, which outlines a strategy to meet the long-term target of reducing domestic emissions by 80 to 95% by 2050.

Portugal developed an integrated framework of policy instruments in the 2020/2030 timeframe which includes the main national policy instruments in the areas of climate change mitigation and adaptation: the National Programme for Climate Change 2020/2030 (PNAC) and the National Strategy for Adaptation to Climate Change 2020 (ENAAC).

PNAC provides the national response to the commitments made for 2020 and put forward for 2030, at national level, as regards climate change.

It establishes a National System for Policies and Measures (SPeM) and a governance, monitoring and reporting structure for the ENAAC and integrates the National System for the Inventory of Emissions by Sources and Removals by Sinks of Air Pollutants (SNIERPA). The integration of these support mechanisms represents and articulated framework for the implementation and follow-up of the national climate policy, constituting the national reference for Monitoring, Reporting and Verification (MRV).

PNAC 2020/2030 is focused on climate change mitigation and covers all sectors of the national economy. It identifies the climate policy objectives, in line with the cost-effective emissions' reduction potential, to maintain a low carbon trajectory, consolidating the progress achieved in the past years. The PNAC sets guidelines, defines sectoral emissions reduction targets and identifies a set of policies and measures to be developed together with the relevant policy sectors in areas such as transports, energy, agriculture and forestry. The PNAC therefore features a compilation of other policy instruments (being a "plan of plans") and becomes a dynamic reference framework for the identification and definition of sectoral policies and measures, based on their ex-ante and ex-post evaluation as regards the low carbon dimension.

PNAC 2020/2030 sets the following objectives:

a. Promote the low carbon transition, generating more wealth and employment and contributing to green growth;

b. Ensure a sustainable national GHG emissions reduction trajectory to achieve the target of -18 % to -23 % in 2020 and -30 % to -40 % in 2030 compared to 2005, thus fulfilling the national mitigation commitments and keeping Portugal in line with the European objectives;

c. Mainstream mitigation objectives into sectoral policies.

Furthermore, the cooperation of Portugal with third countries looks to the integration of the adaptation dimension of climatic change in the several sectoral policies and instruments of planning, vulnerabilities and risks associates to climate change. The action of the Portuguese cooperation is developed on the basis of geographical priorities which are centered in the countries of Portuguese official language, in particular the Portuguese-speaking African countries/ Países Africanos de Língua Oficial Portuguesa (PALOP) and East Timor. All these countries are within the group of more vulnerable countries to the variations caused by climate

changed either, because they are situated in its majority in Africa, or belong to the set of least developed countries and/or are small insular States.

At a multilateral level, Portugal supports the implementation of adaptation measures in the most vulnerable countries, in particular within the Community of Portuguese Speaking Countries/ Comunidade dos Países de Língua Portuguesa (CPLP), and contributes to the green climate fund.

At a bilateral level, Portugal supports projects in Angola, Cabo Verde, Guiné-Bissau, Moçambique and São Tomé e Príncipe; and promotes the sectoral integration of the adaptation component in the Cooperation Programs, in particular in the scope of Superior education and of Research in the field of Environmental Engineering, Agriculture and Rural Development, and Health

10.6. Domestic and regional programmes and/ or legislative arrangements and enforcement and administrative procedures

Environmental protection is regulated by the Framework Law on the Environment (Law 11/87 of 7 April) . This law postulates a general protection principle which is that all citizens have the right to an ecologically balanced human environment and the duty of protecting it, while the State is entrusted with improving the quality of life, both individual and collective, through the activities of its institutions, as well as through grassroots and community initiatives.

This Framework Law contains a series of clauses on preventive and repressive interventions, concerning the environment, which can be carried out by the Public Administration, such as: articles 33 and 36, on licensing and emergency situations; article 42, on administrative embargos; and article 47, on environmental infractions. In short, the Law defines the institutions responsible for environmental policy and their main types of intervention.

Such law, in coordination with the other sectoral policies, sets the frame for Portugal's climate change policy, namely through national and Community legislation for the implementation of the UNFCCC and the Kyoto Protocol.

As an EU Member State, Portugal is subject to compliance with Community rules, and in particular the extensive body of legislation with relevance to climate change policy, namely the Burden Sharing Agreement (Council Decision 2002/358/EC of 25 April), which determines the GHG emissions limitation objective (following from article 4 of the Protocol), and Regulation (EU) n.º 525/2013 of the European Parliament and of the Council of 21 May 2013 (monitoring mechanism regulation – MMR).

10.7. Information under Article 10 of the Kyoto Protocol

Information required under this heading can be found in other appropriate chapters of the National Communication.

ANNEX I

3rd Biennial Report

A. INTRODUCTION

This report constitute the 3rd Biennial Report of Portugal, as required under Decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC).

B. INFORMATION ON GREENHOUSE GAS EMISSIONS AND TRENDS

The GHG emission inventory is the official annual accounting of all anthropogenic emissions and removals of greenhouse gases in Portugal. The inventory measures Portugal's progress against obligations under the United Nations Framework Convention on Climate Change (Climate Change Convention), the Kyoto Protocol and the European Union's Climate and Energy obligations.

As a general rule the inventory covers emissions occurring in the all of the Portuguese territory, i.e., mainland Portugal and the two autonomous regions of Madeira and Azores.

This chapter summarizes the latest information (May 2017) on Portuguese GHG emissions (1990-2015), communicated to the UNFCCC through the compilation of the Common Reporting Format (CRF) and the National Inventory Report (NIR), and available at:

https://www.apambiente.pt/index.php?ref=17&subref=150 .

This chapter also outlines the main components of the Portuguese national system, and a description of the structure and functions of the national registry (Portuguese National Registry of Emissions Units).

Specific data on emmissions by gas and sector are included in Chapter 3.of 7th National Communication (tables 3.1-3.3).

Greenhouse Gas Emissions by Gas

In 2015, total Portuguese GHG emissions, including indirect CO_2, without land-use, land-use change and forestry (LULUCF) were estimated at about 68.9 Mt CO_{2e}, representing an increase of 15.7 % compared to 1990 levels and an increase of 7.1 % compared to the previous year (2014).

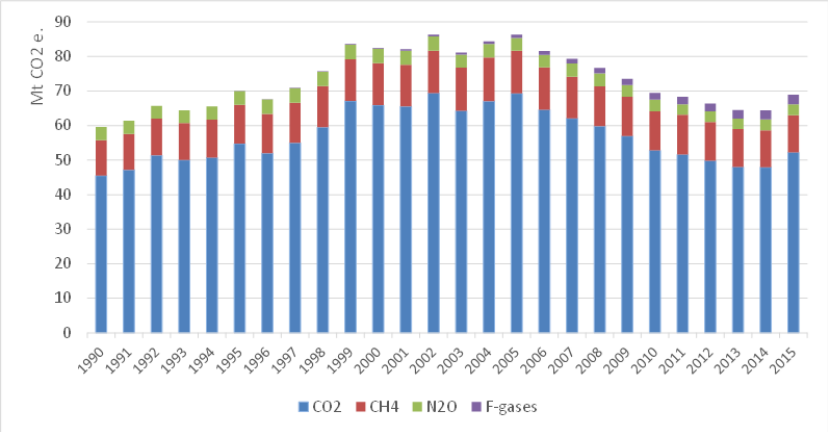


Figure.1
Greenhouse Gas Emissions by Gas (without LULUCF).

CO_2 is the primary GHG, accounting for about 76% of Portuguese emissions on a carbon equivalent basis in 2015 (LULUCF excluded), and having registered an increase of 15% between 1990 and 2015. The second most important gas is CH4, followed by N_2O, representing, respectively, 16% and 4% of total emissions in 2015. CH_4 emission levels have risen by 6.0% from 1990 to 2015, while N_2O has decreased by about 17%. F-gases have been increasingly important particularly in latest years, representing in 2015 4% of the total emissions. NF3 emissions do not occur in Portugal.

The largest GHG gas emitted - CO_2 - is mainly generated from fossil fuel combustion in energy-related activities (categories 1A), as illustrated in the figure below. The increase of CO_2 emissions since 1990 is driven by the growth of energy industries and transport that have registered, respectively, a 12% and 62% growth from 1990 to 2015.

Some other non-energy production processes, such as cement production (included in category 2A), are also responsible for considerable quantities of CO_2 emissions. Manufacturing industries and construction, and other subsectors (e.g chemical) which appear among the most significant CO_2 sector emitters have lost importance since 1990.

Fugitive emissions resulting from oil refining, transport and distribution of fossil fuels, as well as storage and transportation of natural gas, have become more relevant in recent years, presenting an increase of approximately 900% since 1990.

CH_4 is primarily generated through anaerobic decomposition of organic matter in biological systems, like the decay of municipal and animal wastes, waste-water handling systems, or enteric fermentation in animals. Other sources are also responsible for these emissions, such as biomass burning, the distribution of natural gas and petroleum, and the incomplete combustion of fossil fuel. The overall growth of CH_4 emissions (6% since 1990) was determined by the importance of deposition of waste on land disposal sites.

N_2O emissions registered an overall decreasing trend of 17% in the period 1990-2015, and are associated with direct and indirect emissions from agricultural soils, mainly related to the use of synthetic and organic fertilizers, manure deposition by livestock in the soil, nitrogen fixation by N-fixing crops (leguminous plants), and incorporation of crop residues into soils.

Other significant sources are:

- Fossil fuel combustion, particularly in the transport sector. In this sector N2O emissions have increased by 64% in the period 1990-2015, which relates primarily to the road transport sector and is explained by the introduction of catalytic converters;
- Chemical industry (nitric acid production), which reduced emissions due to the implementation of new catalytic (Platinum-rhodium alloy catalysts) in 2011;
- Wastewater treatment; and
- Biomass burning, including the burning of agricultural residues, residential combustion, and waste incineration.

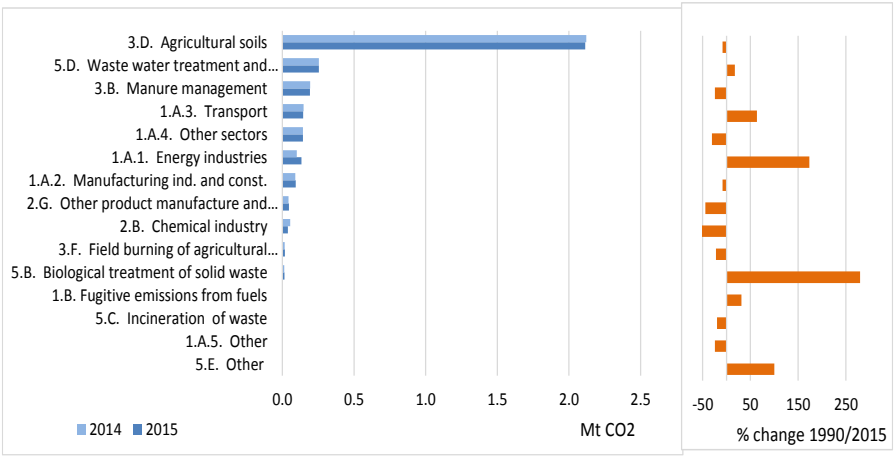


Figure 2
Source categories of N_2O: 2014, 2015 and per cent change 1990-2015.

Fluorinated gases have become increasingly important since 1995, driven by the gradual replacement of fluorinated gases as substitutes for substances that deplete the ozone layer in refrigeration, air conditioning, foam, asthma inhalers and fire protection systems.

The most relevant sectors are: fixed Air Conditioning (36%), commercial refrigeration (34%) and mobile Air Conditioning (21%).

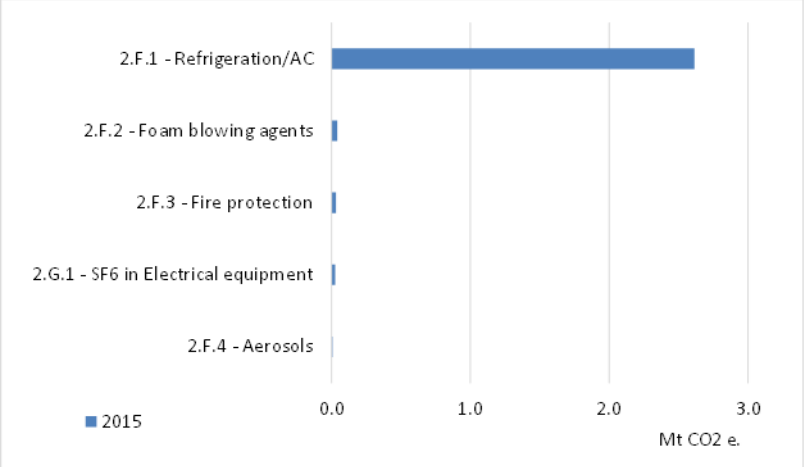


Figure 3
Source categories of F-gases: 2015.

GHG emissions by sector

According to the UNFCCC Reporting Guidelines, emissions estimates are grouped into five large IPCC categories: Energy, Industrial Processes and Product Uses (IPPU), Agriculture, Land-Use, Land-Use Change and Forestry (LULUCF), and Waste.

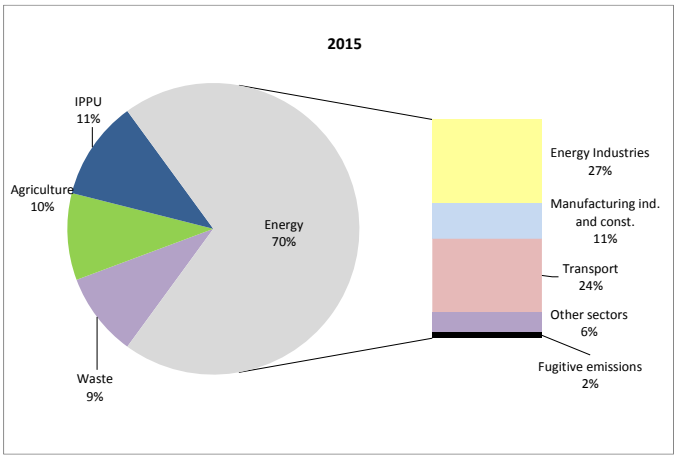


Figure 4
GHG emissions in Portugal by sector: 2015.

Energy is by far the most important sector, accounting for 70 % of total emissions in 2015, followed by IPPU (11%), agriculture (10%) and waste (9%).

Within the Energy sector, energy industries (in particular, public electricity and heat production) and transport are the two most important sub-sources representing, respectively, 27% and 24% of total emissions.

The trend of emissions by sector is shown in the figure below.

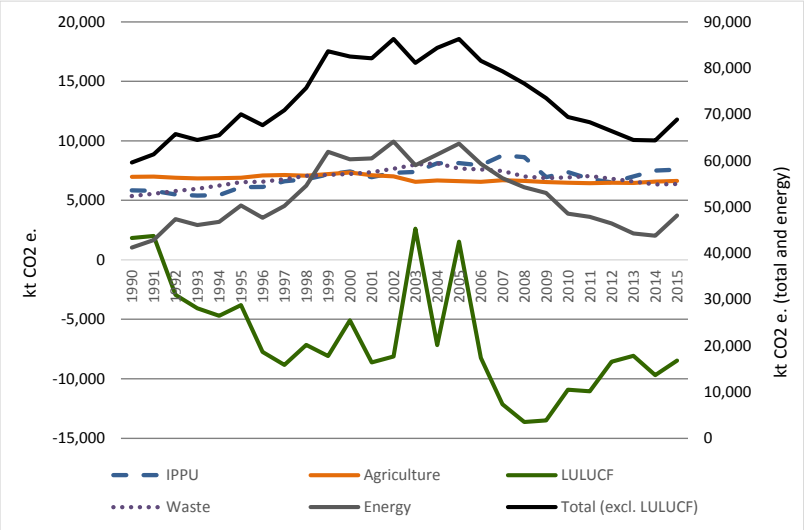


Figure 5
Trends in GHG emissions and removals: total and by sector.

The total emissions trend presents different phases along the time. The steady increase of emissions during the 90s, was followed by a more moderate rate and started to stagnate in the early 2000s, registering thereafter, in particular after 2005, a decrease.

The overall trend of emissions echoes essentially the evolution of the energy sector, which presented a 17% increase over the 1990-2015 period, and reflects the country's important dependence on fossil fuels for electricity generation and transportation and, more recently, the results of large scale investments in renewable energy and energy efficiency.

The trend of CO2 emissions follows to a large extent the evolution of energy consumption. Nevertheless, a decoupling between CO2 emissions and energy consumption can be observed in the figure bellow, that shows a decrease of CO2 intensity (GHG emissions per total energy consumption) since the early 2000s. The decline of this trend relates to the implementation of several measures, such as the introduction of natural gas (1997), the installation of combined cycle thermoelectric plants using natural gas (1999), the progressive installation of co-generation units, the amelioration of energetic and technologic efficiency of industrial processes, the improvement in car efficiency, the improvement of fuels quality, and the expansion of renewable energy in electricity production.

Furthermore, the continuous decline of energy consumption and consequent decrease of emissions verified in the country since 2005, with a bigger expression after 2010, can also be explained by the internal economic recession, along with the European economic and financial crisis. In 2015, there was however an inversion of the emissions declining trend, with an emissions increase of 7.1% compared to the 2014. This growth reflects in part the positive variation of GDP, that was first verified in 2014 (0.9% growth) and was accentuated in 2015 (1.6%).

The level of emissions show however significant inter-annual variations, which are mostly occurring in the power sector and are related to the pronounced fluctuations of hydroelectric power generation that is highly affected by annual variations in precipitation. The growth in emissions verified in 2015, results also from the particularly unfavourable hydrologic conditions which contributed to a greater use of coal and natural gas in the electro producer sector.

Mobile sources, which are largely dominated by road traffic, are one of the sectors that have risen faster. In the period 1990-2015 the emissions of transportation sources increased 61 %, due to the steady growth of vehicle fleets (in particular with more powerful engines) and road travel from 1990 to the early 2000s, reflecting the increase in family income and the strong investment in the road infrastructure of the country in the 1990s decade. Indirectly, the increase in road traffic activity also augmented the emissions from fossil fuel storage, handling and distribution. The situation seems however to have stabilized in the early 2000s and

then started to decline since 2005. An inversion of this tendency is registered in the most recent years, with an increase in transport emissions of 3.4 % from 2013 to 2015.

Combustion in manufacturing industries and construction registered a 19% decrease of emissions since 1990, reflecting the reduction of production in some subsectors (e.g iron and steel, construction) due to the effects of the recession of the Portuguese economy, which has been accompanied by the slowdown of industrial activity and consequent reduction in fuel consumption.

Still within the energy sector, the category "other sectors", which include the residential and commercial activities, registered also a significant increase of emissions in the 1990-2005 period (with almost 55% rise), but this tendency has decelerated (7% decrease in the 1990-2015 period), due to the implementation energy conservation measures, but in the most recent years also to the stagnation of the economic growth and recession.

Industrial processes represented 11 % of the Portuguese emissions in 2015, and have grown 30% since 1990. These emissions which are generated as by-product of many non-energy-related activities, are mostly related to the increase of cement production, road paving, limestone and dolomite use, lime and glass production. There is also a relevant increase in sub-category 2F, consumption of Halocarbons and SF6, which represents in 2015 about 35.9% of total GHG emissions from this source sector, and shows a fast grow over the years.

Agriculture was, in the period analysed, a significant source of GHG emissions, responsible for 10 % of the Portuguese emissions in 2015, corresponding to a decrease of 5 % since 1990. This fact is related to the relatively decrease of importance of the sector in terms of the national economy, and also associated with the reduction of the livestock production of certain categories of animals (e.g. swine), the extensification of cattle production and the decrease of fertilizer consumption, and, to a certain extent, to the conversion of arable crops to pastures.

Waste represented approximately 9 % of Portuguese emissions in 2015, recording an increase of approximately 19 % since 1990. This increase in emissions is primarily related to the rise of waste generation, associated with the development of family income and the change in consumption patterns, in particular in the years following the Portuguese accession to the EU in 1986. This trend was accompanied by the growth of urbanization registered in the country during the last decades. The increase of the emissions is related in majority to the CH4 emissions generated in Municipal Solid Waste landfilling, which represent 37% of the sector emissions in 2015 and have registered a 92% increase since 1990, and relates to the fact that until the late '90s, landfilling remained almost exclusively the main waste disposal practice. With the start of operation of two incineration units in 1999/2000, waste start to be diverted from Solid Waste Disposal Sites.

The strongest increase of emissions occurred until 2004. In mid-2000's, emissions have first stabilized and started after to decrease, due in particular to the increasing importance of biogas recovery in several units which produce and sell electricity to the grid.

Estimates of emissions and sinks from land use change and forestry category show that this category has changed from being a net emitter in 1990 (1.8 Mt CO2e) to a carbon sink in 1992. This situation was again reverted in the years 2003 and 2005 due to the severe forest wildfires events registered in these years. In 2015 this sector represents a net sink of -8.5 Mt CO2e.

Indirect GHG and SOx emissions

Several gases do not have a direct influence in climate change but affect the formation or destruction of other GHG. CO, NOx, and NMVOC are precursor substances for ozone which is a GHG. SOx produce aerosols, which are extremely small particles or liquid droplets that can also affect the absorptive characteristics of the atmosphere.

In 2015, all these gases emissions have decreased from 1990 levels: SOx -85 %, CO -67 %, NMVOC -35 % and NOx -28 %.

Energy is the major responsible sector for emissions of NOx, SOx and CO. Its contribution for NMVOC emissions is also significant, together with Industrial processes and Product use sector.

Within energy, transportation is responsible for the major share of NOx, emissions, approx. 46% of 2015 totals. Despite the fast growing trends of the transport sector (mainly road) since the 90s, the introduction of new petrol-engine passenger cars with catalysts converters and stricter regulations on diesel vehicles emissions, limited the growth of these emissions or even resulted in its decrease. In fact, the situation started to change in the last years, as transport emissions growth has first stabilized and started to decline since 2005. In the most recent years the situation has been inversed with an increase of emissions after 2013. In the period analysed, 1990-2015, NOx emissions from transport decreased -10%; and CO and NMVOC emissions registered reductions of more than -85%.

Other sectors (commercial/institutional, residential and agriculture/forestry) are a primary source of CO emissions representing 51 % of the 2015 total.

SOx emissions are mainly generated in the energy industry sector (approximately 30% of total emissions in 2015) and combustion in manufacturing industries (approximately 35% of total emissions in 2015), which are major consumers of fossil fuels. Oil and coal represent the biggest share of the fuel mix used in thermal electrical production in the country, and they are mostly imported. The situation is however improving with a significant development of renewable sources (mainly wind and hydro) and energy efficiency measures, among other factors as reflect the introduction of new stricter laws regulating the residual fuel oil (Decree-Law 281/2000 from November 10th). The introduction of natural gas and its increasing use, since 1997, is also another positive factor that has contributed to control of SOx emissions. The emissions variation in the period 1990-2015 shows a substantial decrease in SOx emissions in both sub-categories: energy industries and manufacturing industries -93% and -79%. Since 2007, SOx emissions from the energy industries registered a significant reduction (approximately -87%) which is explained by the implementation of two new abatement systems (desulfurization in two Large Point Source Energy Plants in Mainland Portugal)

National inventory system

The newest legal national arrangement for a National Inventory System was adopted in 2015 (Council of Ministers Resolution no. 20/2015). It builds on the previous version (DATA), which has been revised and reorganized to take into account the developments at international level relating to the UNFCCC and the Kyoto Protocol, and the monitoring and reporting requirements under the EU Regulations.

The new Council of Ministers Resolution, restructures and elaborates the previous legal framework on the National System (SNIERPA), specifying its 4 different components:

i) a calculation and archiving system of the national inventory;

ii) the QA\QC System;

iii) the Methodological Development Plan (PDM);

iv) the Archiving System.

Furthermore, it identifies the several outputs and formats of reporting to the international bodies, and specifies the functions of the entities making part of SNIERPA:

i) the coordinating entity;

ii) the sectorial Focal Points;

iii) the Involved Entities.

APA is the Responsible Body for: the overall coordination and updating of the National Emissions Inventory (INERPA); the inventory's approval, after consulting the Focal Points and the involved entities; and its submission to EC and international bodies to which Portugal is associated, in the several communication and information formats, thus ensuring compliance with the adopted requirements and directives.

APA's Climate Change Department (DCLIMA) is the unit responsible for the general administration of the inventory and for all aspects related to its compilation, reporting and quality management. Data from different sources are collected and processed by the inventory team, who is also responsible for the application of Quality Assurance / Quality Control procedures, the assessment of uncertainty and key category analysis, the compilation of the Common Reporting Format tables, the preparation of the National Inventory Report, the response to the International and European review processes and data archiving and documentation.

The sectorial Focal Points work with APA/DCLIMA in the preparation of INERPA, and are responsible for fostering intra and inter-sectorial cooperation to ensure a more efficient use of resources. Their main task includes coordinating the work and participation of the relevant sectorial entities over which they have jurisdiction. It is also a Focal Points duty to provide expert advice on methodological development, emission factor determination and accuracy of the activity data used. Focal Points play a vital role in sectorial quality assurance and methodological development. They are also responsible for the production of statistical information and data publication that are used in the inventory estimates.

The involved entities are public or private entities which generate or hold information which is relevant for the INERPA, and which actions are subordinate to the Focal Points or directly to the Responsible Body.

All governmental entities have the responsibility to ensure, at a minimum, co-funding of the investment needed to ensure the accuracy, completeness and reliability of the emissions inventory in their respective sectors.

Following the publication of the Council of Ministers Resolution No. 20/2015 of 14 April, which restructured the SNIERPA, a set of implementing procedures were agreed within SNIERPA to facilitate the good functioning of the national system, defining in more detail some competences, such as the regularity of the meetings and the deadlines for the information´ transmission, among other issues.

Next figure presents the main entities that make part of the national system.

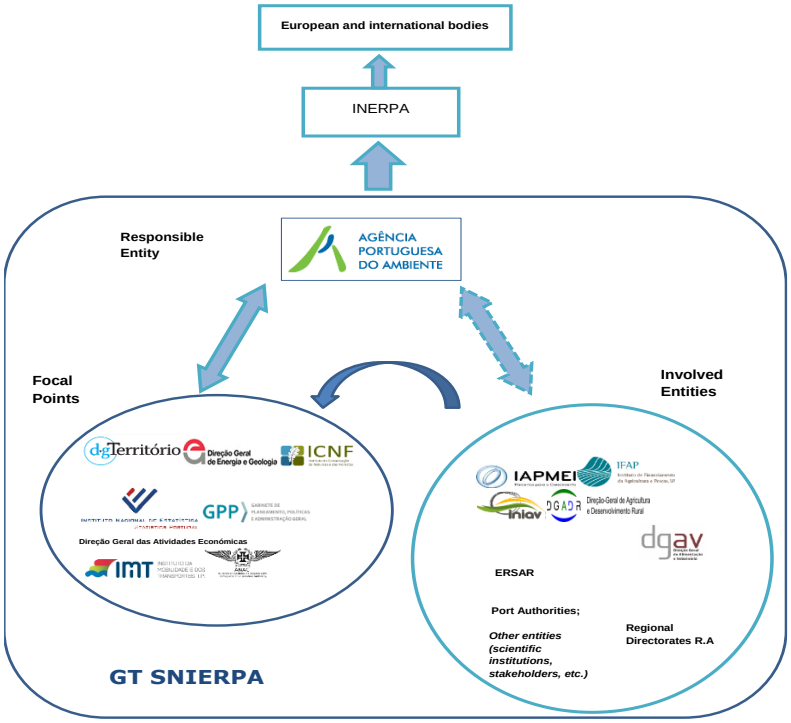


Figure 6
Main bodies of national system (SNIERPA)

Overview of inventory planning

All the participating organizations represented in SNIERPA support the annual production of the national inventories and the fulfilment of the reporting requirements.

Future planned improvements are compiled annually for each sector by the relevant inventory experts and the inventory coordinator, having as a basis the issues raised and the recommendations from the annual review processes and the problems identified from the application of QA/QC procedures, as well as future new reporting obligations. All identified items are gathered in a Methodological Development Plan (PDM – Plano de Desenvolvimento Metodológico) which is updated every year. A priority level is attributed to each issue identified, considering their importance in terms of the contribution to total GHG emissions, the level of uncertainty associated and the economic and technical resources available.

C. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET

For 2020, the EU has set an EU GHG emission reduction target of at least 20 % when compared to 1990. At European level, sectors covered by the EU Emissions Trading Scheme (EU ETS) should reduce their emissions by 21 % compared to 2005 levels and other sectors not covered by the EU ETS (non-ETS) should reduce their emissions by 10 % in relation to 2005 levels. Within the scope of the Climate and Energy Package for 2020, this emission reduction target was coupled with the establishment of EU targets of 20 % share of renewable energy in final energy consumption and an increase in energy efficiency by 20 % (EE).

In the context of the Climate and Energy Package for 2020, Portugal should limit the rise of GHG emissions from non-ETS sectors to 1 % between 2013 and 2020, as compared to 2005, and set annual ceilings for non-ETS emissions during that period. Portugal has also set itself a target of 31 % of energy from renewable sources in gross final energy consumption, of which 10 % in transport, as well as an overall goal of 25 % EE (more ambitious than the 20 % goal set at EU level) and a specific target of 30 % EE for Public Administration

For the period 2021-2030, targets at EU level were adopted by the European Council of October 2014 in the framework of the Climate and Energy Package for 2030, establishing the following:

e) An emission reduction of at least 40 % compared to 1990 (43 % reduction in ETS and 30 % in non-ETS compared to 2005 levels);
f) A target of at least 27 % of energy from renewable sources in gross final energy consumption by 2030;
g) An indicative EE target of 27 % to be reviewed in 2020;
h) A target of 15 % of interconnection capacity for energy interconnections, so as to ensure the full participation of all Member States in the internal energy market.

Emission targets have also been set for the national economy as a whole by 2020 (-18 % to -23 % compared to 2005) and by 2030 (-30 % to -40 % compared to 2005), ensuring the fulfilment of national commitments in terms of mitigation and placing Portugal in line with the European objectives.

In this context, PNAC 2020/2030 constitutes the core instrument of mitigation policies, also aiming specifically at promoting the integration of mitigation measures into sectoral policies and ensuring the fulfilment of national commitments within the above mentioned EU and international frameworks.

PNAC 2020/2030 establishes a set of specific guidelines for the transition to a low-carbon economy while aggregating input from sectoral policies. Although it is a national plan, thereby covering the total of national emissions, its priority focus in terms of public policy is directed at the sectors not covered by the EU ETS (non-ETS sectors) by establishing sectoral reduction targets as shown below.

Table 1

PNAC sectoral targets[87] for sectors not covered by the EU ETS compared to 2005.

Sector	2020 targets	2030 targets
Services	-65%	-69%
Households	-14%	-15%
Transport	-14%	-26%
Agriculture	-8%	-11%
Waste*	-14%	-26%

* Including wastewater.

Global warming potentials

The former GWP considered (IPCC's 2nd Assessment Report[88]), have been replaced by the values proposed by the IPCC's 4th Assessment Report[89], as required by the revised UNFCCC reporting guidelines, and are currently used for inventories and accounting for economy wide reduction targets.

Table 2
Global Warming Potentials (100-year time horizon).

GHG	SAR	AR4
CO2	1	1
CH4	21	25
N2O	310	298
HFC-23	11 700	14800
HFC-32	650	675
HFC-43-10mee	1 300	1640
HFC-125	2 800	3500
HFC-134ª	1 300	1430
HFC-152ª	140	124
HFC-143ª	3 800	4470
HFC-227ea	2 900	3220
HFC-236fa	6 300	9810
CF4	6 500	7390
C2F6	9 200	12200
C4F10	7000	8860
C6F14	7400	9300
SF6	23 900	22800
NF3	NA	17200

D. PROGRESS IN ACHIEVEMENT OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGETS AND RELEVANT INFORMATION

Mitigation actions and their effects

In the last few years, Portugal reached a more mature stage of climate policy with the completion of a cycle regarding the implementation of the main climate policy instruments in terms of mitigation and adaptation, in particular the National Programme for Climate Change (PNAC – Programa Nacional para as Alterações Climáticas)[90] and the National Strategy for Adaptation to Climate Change (ENAAC – Estratégia Nacional de Adaptação às Alterações Climáticas)[91]. It also established a National System of Policies and Measures (SPeM)[92].

[87] The sectoral reduction targets were established by maintaining in 2020 the emission levels of 2012, with the exception of the waste sector, where the emission reduction target laid down in the National Waste Management Plan 2014-2020 (PNGR) was applied. For 2030 the average emission reduction levels for the policy scenarios examined were considered.

[88] SAR: IPCC (1996).

[89] AR4: IPCC (2007).

[90] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=117&sub3ref=1376

[91] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=118&sub3ref=955

[92] http://www.apambiente.pt/index.php?ref=16&subref=81&sub2ref=117&sub3ref=1379

We are now faced with a new generation of climate policy instruments which should respond to the ambition of a forward-looking climate policy that enables the achievement of the targets set for Portugal in this context. To this end, it has become necessary to coordinate objectives, instruments and institutions, recognising the cross-cutting nature of climate policies. The goal was to take a more dynamic approach to planning, with a view to increase the involvement of the different sectors and to promote their accountability, in order to integrate climate policy into sectoral policies.

For further details on the policy-making process and the main climate policy instruments see section 4.1 of the Nacional Communication.

To ensure the shift to a low-carbon economy, it is also essential to align energy policy objectives with climate policy objectives, in particular regarding the level of ambition set for EE and market penetration of renewable energy sources, harvesting their benefits in terms of energy security, balance of payments of petroleum products and the path to a low-carbon future. Climate and energy objectives are mutually reinforcing and this is why the PNAC must also integrate and accommodate sectoral policies and measures allowing to achieve a reduction of 30 % on the energy baseline and 40 % of renewable energy sources in final energy consumption by 2030.

Low-carbon policies and measures identified in the PNAC for these non-ETS sectors, in the 2020/2030 horizon, were based on relevant sectoral policy documents, guidelines drawn from modelling exercises undertaken under the PNAC and contributions from the different sectors.

In this context, the following instruments of national policy are are highlighted due to their relevance:

a. Commitment for Green Growth (CCV);
b. Green tax reform (RFV);
c. National Action Plan for Energy Efficiency (PNAEE);
d. National Action Plan for Renewable Energy (PNAER);
e. Strategic Plan for Municipal Solid Waste (PERSU 2020);
f. National Waste Management Plan 2014-2020 (PNGR);
g. PENSAAR 2020 – A New Strategy for the Water Supply and Sewage Treatment Sector;
h. Rural Development Programme for 2014-2020 (RDP 2020);
i. National Strategy for Forests (ENF);
j. National Strategy for the Sea 2013-2020 (ENM 2013-2020);
k. Strategic Plan for Transport and Infrastructure (PETi3+);
l. National Strategy for Sustainable Cities 2020;
m. National Smart Specialisation Strategy for Research and Innovation;
n. National Action Plan for Circular Economy (PNAEC);
o. National Programme for Spatial Planning Policy (PNPOT).

The programmes listed provide for and are consistent with the established decarbonisation objectives, as they include low-carbon options and integrate climate change mitigation measures, some of which are listed in the PNAC.

The methodology used to identify policy options and low-carbon measures was underpinned whenever possible by the cost-effectiveness criterion, which was taken into account in modelling exercises carried out. For each non-ETS sector, a set of efficient measures of technological nature was identified, which were at the same time considered the most effective and as having the greatest impact on building a low-carbon economy, given the state-of-the-art of (sectoral) policies and measures in force (more effective because they have a higher reduction potential; greater impact given their effects on the economy, integration in other sectoral policies and potential to induce behavioural change).

These measures are included in the PNAC, in a non-exhaustive list of options considered interesting and feasible in the context of the transition to a low-carbon economy. These proposed policies and measures constitute therefore a starting point for the design and establishment of cost-effective measures to be implemented by sectors in the context of SPeM for 2020/2030.

The SPeM, aims to streamline progress assessment in the implementation of sectoral mitigation policies and measures, enhancing the involvement and strengthening the accountability of the sectors in terms of integrating the climate dimension into sectoral policies, with the objective of helping to meet the requirements laid down in Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 (MMR).

Under the SPeM a new platform for the management of information will also be developed, in order to facilitate the identification, follow-up, monitoring and reporting of the implementation of policies and measures and their effects, as well as the projections and the assessment of the fulfilment of national obligations. This platform will replace the previous CumprirQuioto.pt platform, which is currently inactive.

The list of policies and measures reported in section 4.2 in the Nacional communication should thus be considered in the light of an ongoing process involving all sectors, of which we presented the ones considered most relevant.

More recently, in Marrakech, the Portuguese Government committed to the national objective of reaching carbon neutrality by 2050.

For that purpose, a new modelling exercise for the 2050 horizon is being prepared, aiming at identifying and analysing the implications of cost-effective paths on the pursuit of this national objective, as well as identifying the main related means of decarbonisation within the framework of the development of a Roadmap to Carbon Neutrality 2050 in Portugal.

The aim is also to perform an assessment for the year 2030 to the same level of detail as for 2050. This exercise should take place during 2017-2019.

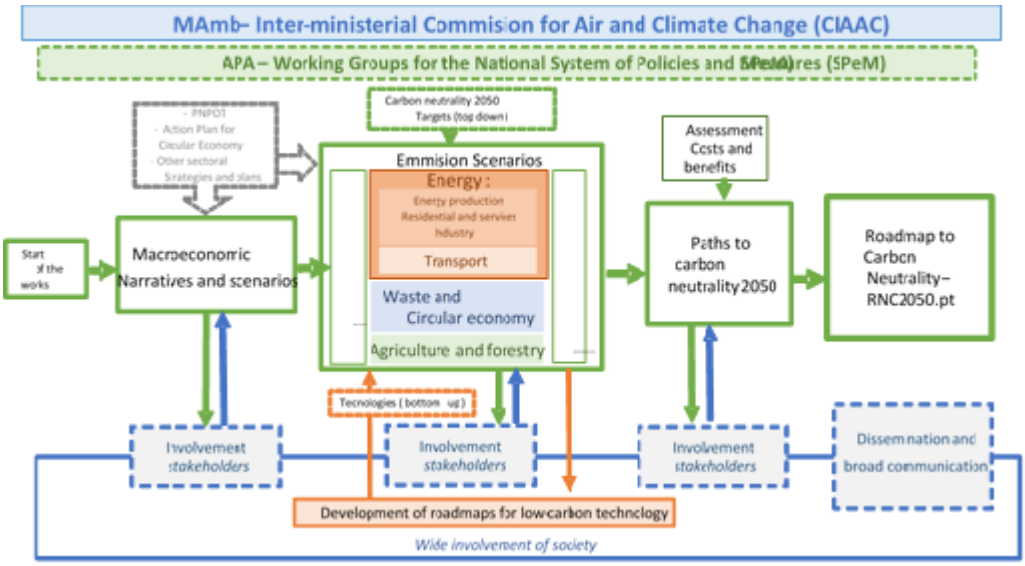


Figure 7

Schematic representation of the work to be undertaken for the Roadmap to Carbon Neutrality.

For the fulfilment of its commitment under the Kyoto Protocol Portugal used, as reported in the true up period report, 302.650.818 AAU; 4.567.634 ERU; 10.119.578 CER; 44.760.045 RMU. It will also carry-over for the second commitment period 40.608.686 AAU; 595.005 ERU; and 4.149.718 CER.

It should be noted that the ERUs and CERs in the retirement account were used for compliance by operators in the context of the EU-ETS. Additionally, the fact that Portugal is carrying over 40.608.686 AAUs for the second commitment period demonstrates that the use of mechanisms is clearly supplementary to domestic action.

E. PROJECTIONS

In the context of preparing the National Programme for Climate Change 2020/2030 (PNAC 2020/2030), projections were carried out, which began in 2013 and were completed in 2014, and were reported under the previous biennial report (2015). Therefore, for the period 2015-2030 the projection data presented were

obtained in the context of those proceedings. These projections are thus an update of the data reported in the 6th National Communication.

In the context of preparing the PNAC, a projection exercise was carried out regarding the activity paths and respective GHG emissions for the relevant sectors of activity, i.e. energy system (including sectors of energy production, transmission and consumption), industry (including fluorinated gases) and waste (including wastewater). In this context, there are two socio-economic scenarios – High Case (HC) and Low Case (LC) – and three policy scenarios with slightly differentiating assumptions.

The results of this exercise allow for an assessment of the national emission reduction potential. Analysing the behaviour of the different sectors under the conditions laid down for the different policy HC and LC scenarios helps to identify critical factors, trends and behaviours within those sectors for the timeframe under consideration.

Therefore, the underlying exercise for the projections undertaken allows for an assessment of the reduction potential, rather than for emission projections in the narrower sense of assessing where Portugal could be in 2020/2030 on the basis of current policies. These results are, however, considered to be representative of the national emission path in the timeframe under analysis.

For the purpose of reporting, the results of High Case scenarios are considered, since they reflect the most ambitious scenario in socio-economic terms and the most significant development of emissions. Values should be read as the maximum emissions possible under the projection assumptions.

The latest available GHG projections show that under the "With Existing Measures" (WEM) scenario, total GHG emissions (without LULUCF) are projected to be 6 % higher in 2020 than in 1990 and 6 % lower in 2030 compared to 1990.

Under the "With Additional Measures" (WAM) scenario, the projected GHG emissions (without LULUCF) compared to 1990 would be 6% higher in 2020, and would decrease by 12 % in 2030.

As showed in Table 6a and 6c, the most significant sectoral contribution in absolute GHG emission reductions in the WEM scenario from 1990 to 2020 is projected to stem from the energy sector (without transport) where emissions are projected to decrease by 20 % compared to 1990 in 2020 and by 33 % up to 2030 under the WEM, and 20 % in 2020 and 41 % in 2030 under the WAM scenario.

This reduction is diluted by an increase in the projected emissions of all the other sectors, especially in the transport and waste sectors. Under both scenarios GHG emissions from the transport sector are projected to be 49 % higher than 1990 levels in 2020 and 46 % higher in 2030. Under the WEM scenario GHG emissions from the waste sector are projected to be 54 % higher than 1990 levels in 2020 and 30 % higher in 2030 and in the WAM scenario projected to be 54 % higher than 1990 levels in 2020 and 27 % higher in 2030.

Reductions in CO2 emissions are expected to contribute most to overall emission reductions.

As mentioned in the Nacional communication, work is ongoing on a new modelling exercise with a 2050 horizon, aiming at identifying and analysing the implications of cost-effective paths in order to achieve the national target of net-zero GHG emissions by 2050, as well as identifying the primary means of decarbonisation associated. This work, which is being developed under the Roadmap to Carbon Neutrality 2050, started in October 2017 and will go on until the first quarter of 2019.

For more information about projection methodology and projections by sector and gas see section 5.1 and 5.2 of the National communication.

F. PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILING SUPPORT TO DEVELOPING COUNTRY PARTIES

In light of (national and international) best practices on transparency, accountability and reporting, as well as recommendations from DAC to Portugal and various commitments made by Portugal in this context, Camões – Instituto da Cooperação e da Língua I.P. (Institute for Cooperation and Language), as the coordinating entity for development cooperation, currently provides the Integrated Information System on Portuguese Cooperation.

This involves providing on-line information about Official Development Assistance (ODA), both in aggregate terms (global data) and per project, in Portuguese and English, both in EUR and in USD, relating to a fixed period of time. For a more detailed and in-depth analysis of the Portuguese ODA, please refer to http://www.instituto-camoes.pt/activity/o-que-fazemos/cooperacao/atuacao/reportamos/reportamos-2.

Provision of "new and additional" resources

As a EU Member State, Portugal made the commitment to mobilise 0.15 % to 0.20 % of its GNI as ODA allocated to Least Developed Countries (LDCs) by 2030. It also endorsed the commitment derived from the 2014 ministerial-level meeting of the Development Assistance Committee (OECD/DAC) to focus the support from member countries on countries most in need (which includes Fragile States, Least Developed Countries and Small Island Developing States).

In the absence of an international definition accepted by all Parties of 'new and additional' financing, Portugal has decided to consider the framework set out below.

The Portuguese Carbon Fund (FPC) was established in 2006 with the aim of "*supporting the shift towards a low-carbon competitive economy through funding or co-funding of measures which contribute to meeting the commitments of the Portuguese State under the Kyoto Protocol and other international and Community commitments in the field of climate change*".

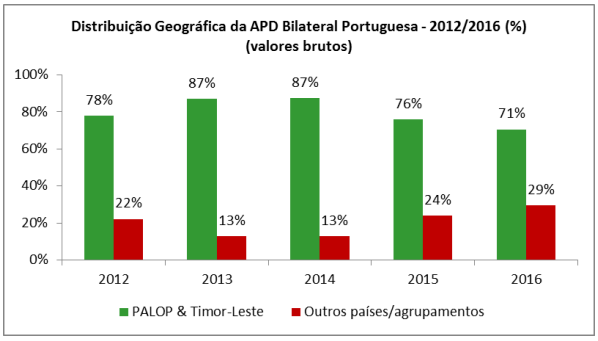
In 2010, it was decided that the FPC (currently the Environmental Fund), as an additional source of funding complementary to the conventional ODA, would also support development cooperation projects in the field of climate change. This decision was a response to the need to implement commitments undertaken by Portugal at international level, including with the EU and the United Nations Framework Convention for Climate Change, in the context of so-called 'fast start' initiative and given the fact that the budget traditionally allocated to development cooperation was not able to accommodate yet another financing burden. Thus, since 2011, FPC has funded development cooperation projects whose main objective is climate change (both mitigation and adaptation, including institutional capacity-building and technology transfer). Development financing through the FPC is considered ODA, however these resources are independent and derive entirely from stand-alone income of the Fund.

However, it is worth emphasising the importance of the two above-mentioned financial instruments in taking climate change in particular to a higher level of priority in the context of the Strategic Concept of Portuguese Cooperation for 2014-2020.

Assistance to developing country Parties that are particularly vulnerable to Climate Change

The Portuguese ODA features a regular and strong geographical concentration in the PALOP countries (Portuguese-speaking African countries) and in Timor-Leste, in line with the principle of geographical concentration set out in the Strategic Concept of Portuguese Cooperation for 2014-2020, which can be found at http://www.instituto-camoes.pt/images/cooperacao/rcm_17_2014.pdf. This trend, which was very strong in 2010 and 2011, with the PALOP and Timor-Leste together having received respectively 80 % and 90 % of bilateral ODA, fell in 2012 to 78 % and increased again in 2013 and 2014 (87 %). As of 2015 the weight of the PALOP countries and Timor-Leste followed once again a decreasing trend.

Figure 8



Source: Camões, I.P./DPC

In 2016, the main beneficiaries of bilateral ODA were, in descending order, Mozambique, Cape Verde, São Tome and Príncipe, Timor-Leste, Guinea-Bissau and Angola.

Until 2016 the geographical priorities of the Portuguese cooperation in the field of climate change were focussed on the PALOP countries and Timor-Leste, all of whom belong to the group of the most vulnerable countries (Least Developed Countries, Small Island Developing States and/or in Africa). This priority is also in line with the strong focus of the Portuguese ODA on the Least Developed Countries and Fragile States.

Portugal, as a member country of the OECD/DAC, reports ODA finance flows in compliance with the rules of the Creditor Reporting System (CRS).

Applying the Rio markers, which include climate change mitigation and adaptation, means the use of a scoring system of three values, according to which the ODA amount reported within the DAC/CRS is screened and marked as:

iv. Targeting the Convention as a 'principal' objective (score "2"): when the objective (climate change mitigation or adaptation) is explicitly stated as fundamental in the design of, or the motivation for, the activity, and promoting the objectives of the Convention is thus stated in the activity documentation as one of the principal reasons for undertaking it. In other words, the activity would not have been undertaken that particular way, had it not been for that specific objective.

v. As a 'significant' objective (score "1"): when the objective (climate change mitigation or adaptation) is explicitly stated but it is not the fundamental driver or motivation for designing or undertaking the activity. The activity has other prime objectives but it has been formulated or adjusted to help meet the relevant climate concerns, particularly in the field of climate change mitigation and adaptation.

vi. Not targeting the objectives of the Convention (score "0"): it means that the activity was examined but found not to target the objective (climate change mitigation or adaptation) in any significant way.

It is therefore on the basis of the procedures described above that the amounts provided in the tables below are calculated and reported, i.e. the finance flows of ODA which contribute to the objectives of the UNFCCC, in particular for the period reported in the context of this national communication (from 2012 to 2016).

Climate related ODA is not significant when compared to the total amounts due to the strategic priorities established, which focus primarily on areas such as education, health, security and justice, with a view to sustainable development and fight against poverty. However, following the OECD/DAC recommendations, Portugal has sought to develop wherever possible the integration of environmental and climate change issues in activities targeted at other sectors.

In its efforts to strengthen its work on fighting climate change and reinforcing resilience, Portugal is involved, together with other EU Member States, in the implementation of projects in the form of delegated cooperation (on behalf of the EU). In this respect, Portugal has been implementing in Timor-Leste since 2013, together with GIZ and the Ministry of Agriculture and Fisheries (MAF), the EU support programme for Climate Change, which aims at contributing to the sustainable well-being of rural communities in Timor-Leste and strengthening the capacity of people living in selected sub-districts and vulnerable to climate change to address the effects of climate change through the sustainable management of natural resources and the improvement of their life choices by using local development mechanisms. The beneficiaries are MAF–Timor-Leste and small primary producers (including agricultural livestock husbandry). For more detailed information on this programme, please refer to the EU National Communication or http://www.gccatl.eu/. Information concerning the amounts of this financial support is available in the EU National Communication, the total amount being EUR 4 million.

Provision of financial resources

Regarding climate change in particular, the amounts of financing considered, especially those that have been assigned score 2, are still heavily influenced by the 'fast start' initiative, so it can be inferred that the decrease of finance flows of approximately 82.50 % in 2016, compared to 2012 and 2013 (Table XX), results from the progressive completion of the cooperation projects funded in this context. These projects were

carried out primarily in the PALOP countries and Timor-Leste. This significant decrease is also influenced by the fact that there has been less use of concessional credit lines, in particular the one granted to Cape Verde for imports of goods and services within the scope of projects in the areas of renewable energy, environment and water.

Table 3
Bilateral cooperation, committed amount per year and per country (principal objective only)

Country	Year				
	2012	2013	2014	2015	2016
Cape Verde	16.939.057,00	17.224.843,00	8.327.869,00	3.171.584,00	1.119.652,00
Cuba	0.00	0.00	0.00	0.00	128.997,00
El Salvador	15.878,00	0.00	0.00	0.00	0.00
Guinea-Bissau	144.488,00	193.757,00	312.736,00	21.631,00	123.640,00
Mozambique	1.509.789,00	3.584.279,00	3.029.159,00	364.727,00	802.570,00
São Tomé and Principe	20.933,00	207.635,00	474.388,00	461.638,00	392.222,00
Timor-Leste	0.00	0.00	81.291,00	111.550,00	0.00
DC Not specified	13.436,00	0.00	0.00	2.773.156,00	6.141,00
Total	18.643.580,00	21.210.514,00	12.225.442,00	6.904.285,00	2.573.221,00

Amounts in USD (OECD/DAC exchange rate for each year).
Committed amounts in compliance with the MMR guidelines.
Source: Camões, I.P./DPC

Table 4
Multilateral cooperation, disbursed amount per year

Year	Multilateral financial institutions, including regional development banks	Specialised United Nations bodies	Total
2012	15.872.793,00	667.992,00	**16.540.785,00**
2013	9.524.973,00	98.595,00	**9.623.569,00**
2014	4.494.344,00	109.508,00	**4.603.852,00**
2015	4.297.455,00	214.956,00	**4.512.411,00**
2016	14.168.286,00	125.298,00	**14.293.584,00**

Amounts in USD (OECD/DAC exchange rate for each year).
Disbursed amounts in compliance with the MMR rules.
Source: Camões, I.P./DPC

As agreed in the context of the OECD/DAC, it is up to the multilateral financial institutions themselves to apply the system of Rio markers to the amounts of multilateral ODA and to inform OECD/DAC by reporting the activities undertaken (CRS). On the basis of that report and the core multilateral contributions, the OECD/DAC allocates annually to each donor country the part corresponding to activities related to climate.

As regards contributions to the Global Environment Facility (GEF), Portugal has not formalised any commitment aimed at its potential participation in the replenishment of this facility since 2010.

Activities related to transfer of technology

In what concerns technology transfer, and considering the definition set out in the text of the Convention, particularly Article 4, paragraph 1(c) and paragraph 5, it can be said that the majority of programmes, projects and actions (PPA) developed by the Portuguese cooperation within ODA involve the transfer of technology, practices and procedures appropriate to each PPA area, as well as the knowledge necessary for the application of those technologies.

OECD/DAC guidelines on statistical reporting do not currently provide for a marker concerning technology transfer that would allow classifying the PPA in this way or specifically and systematically identify the technology or technologies transferred in each case. This gap in the statistical reporting benchmark does not mean that the process of analysis and approval does not take into account the technologies identified and that its assessment is not part of the criteria considered.

Therefore, in terms of technology transfer, the following projects are highlighted:

Table 5

Description of projects or programmes promoting practical steps to facilitate and/or finance access to technology transfer.

Programme/project title: Installation of photovoltaic systems in 50 towns			
Objective: To promote access to renewable energy			
Beneficiary	**Sector**	**Total funding**	**Duration**
Mozambique	Energy	5,16 M USD[93]	2011-2016
Description: Equipping 50 remote towns across all provinces with solar photovoltaic systems in schools, health centres and associated homes, allowing for basic access to electricity, not only for lighting systems, but also for vaccine refrigerators and water pumping systems, enabling access to health and education for people without these resources.			
Facts leading to the success of the project: Promotion of access to quality education and healthcare through the electrification of schools and health centres in rural areas.			
Transferred technology: Solar photovoltaic systems			
Impact of GHG emissions: The system does not include an emissions monitoring system			

Programme/project title: Bioenergy in São Tomé and Príncipe: Harnessing the energy of Biogas			
Objective: To promote access to renewable energy			
Beneficiary	**Sector**	**Total funding**	**Duration**
São Tomé and Príncipe	Energy	772.141 USD[94]	2014-2016
Description: Promoting sustainable access to energy using renewable energy sources in rural communities of STP through the use of waste produced in agriculture. Implementation of anaerobic digestion through the construction and installation of small-scale anaerobic digesters.			
Facts leading to the success of the project: Is has allowed to equip populations of rural communities in remote areas and the technical staff of the National Directorate for the Environment (DNA) the capacity to build and operate small-scale anaerobic digesters			
Transferred technology: Anaerobic digestion			
Impact of GHG emissions: The system does not include an emissions monitoring system			

In general, the PPAs supported by the Portuguese cooperation have a strong component of technical assistance targeted at national capacity-building. It is endeavoured to give special attention to the implementation of the aid effectiveness principles enshrined in the Paris Declarations and developed in Accra and Busan, mainly: leadership and control by beneficiaries so that they can strategically allocate their resources; to enhance existing capacities as a starting point, avoiding the creation of parallel structures and using national systems in a systematic manner to implement aid; technical cooperation driven by partner demand.

It was in this specific context of capacity-building that Portugal supported a project from CPLP (Community of Portuguese-speaking Countries) with EUR 500,000 through the Portuguese Carbon Fund in 2015.

In the area of development cooperation, particularly with the PALOP countries and Timor-Leste, both in the bilateral context and in the CPLP, Portugal has given particular attention to capacity-building at institutional level. This applies to the PPAs exclusively dedicated to this subject as well as to the inclusion of a capacity-building component in the different PPAs as an effort to adapt them to a demand for change, to the beneficiary institutions and to the potentialities and weaknesses of existing national systems in beneficiary countries, so as to build capacities of independent problem-solving.

In particular with regard to cooperation projects in the field of climate change, Portugal intends for partners to lead and control, and often uses national systems for the implementation of aid.

As already mentioned, projects supported by the Portuguese cooperation have a strong component of institutional capacity-building and those in the field of climate change are no exception to this, with some projects being even exclusively dedicated to institutional capacity-building, which are shown in the table below.

[93] Amount in USD (OECD/DAC average exchange rate over 2011-2016).

[94] Amount in USD (OECD/DAC average exchange rate over 2014-2016).

Table 6

Project title	Partner country	Area	Description
Atlas of Renewable Energy	Mozambique	Mitigation	Mapping and evaluation of renewable resources in Mozambique: wind, solar, water, geothermal, biomass and wave energy. http://www.atlasrenovaveis.co.mz/
Capacity-building for the Development of Resilient Low Carbon Strategies	Cape Verde, Mozambique and São Tomé and Príncipe	Mitigation	To equip the countries involved with the necessary expertise to develop, implement, measure, report and verify a development strategy with low GHG emissions, adapted to the impacts of climate change.
Integration of Climate Change Adaptation into Development	Cape Verde, Mozambique and São Tomé and Príncipe	Adaptation	To contribute to the reduction of vulnerability to the impacts of climate change in CV, MOZ and STP. To build capacity in order to integrate a response to vulnerability to climate change through the creation of expertise in the design of policies and projects which are resilient to the impacts of climate change.
Roadmap to Waste Management in Cape Verde	Cape Verde	Mitigation	Mapping technologies, sites, collection methods as well as defining capacity-building and establishing the necessary legislative framework for the waste sector in Cape Verde, for future implementation of projects aimed at reducing GHG emissions.
National Plan Supporting Urban Sanitation for Emissions Reduction and Climate Change Adaptation	Mozambique	Adaptation	To contribute to the development of policies and strategies for further development of urban sanitation, with concerns for mitigation of GHG emissions, adaptation of infrastructure to climate change and capacity-building of institutions. Development and transfer of know-how to the relevant institutions of this sector in Mozambique, in the area of sustainable development of urban sanitation with adaptation to climate change impacts.

ANNEX II (Common Table Format)

Table1s1

Emission trends: summary [(1)] (Sheet 1 of 3) PRT_BR3_v0.3

GREENHOUSE GAS EMISSIONS	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt CO_2 eq								
CO_2 emissions without net CO_2 from LULUCF	45,371.32	45,371.32	46,992.23	51,226.39	49,828.98	50,569.69	54,532.67	51,827.03	54,823.54
CO_2 emissions with net CO_2 from LULUCF	46,259.54	46,259.54	47,914.60	47,616.17	45,128.96	45,165.59	49,741.06	43,353.25	45,436.21
CH_4 emissions without CH_4 from LULUCF	10,201.16	10,201.16	10,399.18	10,557.78	10,685.24	10,952.51	11,287.61	11,358.95	11,587.09
CH_4 emissions with CH_4 from LULUCF	10,565.25	10,565.25	10,887.17	10,712.06	10,818.39	11,162.95	11,740.47	11,591.56	11,676.44
N_2O emissions without N_2O from LULUCF	3,830.66	3,830.66	3,798.55	3,767.73	3,748.89	3,781.48	3,966.10	4,199.61	4,188.36
N_2O emissions with N_2O from LULUCF	4,419.91	4,419.91	4,392.69	4,277.34	4,235.06	4,270.36	4,499.35	4,686.81	4,644.57
HFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	35.42	59.05	100.88
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	0.09
Unspecified mix of HFCs and PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
SF_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	13.93	14.40	15.46
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (without LULUCF)	59,403.14	59,403.14	61,189.97	65,551.90	64,263.12	65,303.68	69,835.74	67,459.04	70,715.44
Total (with LULUCF)	61,244.70	61,244.70	63,194.47	62,605.57	60,182.42	60,598.90	66,030.23	59,705.07	61,873.66
Total (without LULUCF, with indirect)	59,584.26	59,584.26	61,365.25	65,746.52	64,453.96	65,508.61	70,034.66	67,655.79	70,919.86
Total (with LULUCF, with indirect)	61,425.81	61,425.81	63,369.75	62,800.19	60,373.26	60,803.83	66,229.15	59,901.83	62,078.08

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt CO_2 eq								
1. Energy	41,221.95	41,221.95	42,837.71	47,375.97	46,062.76	46,768.39	50,290.84	47,655.40	50,209.11
2. Industrial processes and product use	5,839.26	5,839.26	5,800.73	5,503.54	5,397.51	5,428.50	6,107.10	6,130.91	6,607.53
3. Agriculture	6,981.16	6,981.16	7,001.15	6,890.62	6,837.60	6,863.85	6,903.12	7,099.71	7,123.95
4. Land Use, Land-Use Change and Forestry[b]	1,841.56	1,841.56	2,004.50	-2,946.33	-4,080.70	-4,704.78	-3,805.51	-7,753.96	-8,841.78
5. Waste	5,360.77	5,360.77	5,550.37	5,781.78	5,965.25	6,242.93	6,534.68	6,573.02	6,774.85
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	61,244.70	61,244.70	63,194.47	62,605.57	60,182.42	60,598.90	66,030.23	59,705.07	61,873.66

Note: All footnotes for this table are given in sheet 3.

[1] The common tabular format will be revised, in accordance with relevant decisions of the Conference of the Parties and, where applicable, with decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol."

Table1s2

Emission trends: summary [(1)] (Sheet 2 of 3) PRT_BR3_v0.3

GREENHOUSE GAS EMISSIONS	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt CO_2 eq									
CO_2 emissions without net CO_2 from LULUCF	59,297.22	66,910.85	65,682.92	65,362.17	69,199.11	64,076.09	66,859.69	69,141.97	64,428.86	61,937.07
CO_2 emissions with net CO_2 from LULUCF	51,162.82	58,150.83	59,684.28	56,004.58	60,298.96	65,147.13	58,949.38	69,257.08	55,570.67	49,352.29
CH_4 emissions without CH_4 from LULUCF	11,899.27	12,042.37	12,105.06	12,108.97	12,296.53	12,524.93	12,679.88	12,292.97	12,215.28	12,031.96
CH_4 emissions with CH_4 from LULUCF	12,349.58	12,238.50	12,510.10	12,371.83	12,585.89	13,469.62	12,949.91	13,134.16	12,402.67	12,103.62
N_2O emissions without N_2O from LULUCF	4,149.18	4,234.20	4,203.90	4,067.97	4,111.62	3,744.62	3,899.85	3,762.48	3,638.38	3,807.10
N_2O emissions with N_2O from LULUCF	4,672.94	4,704.25	4,710.74	4,542.99	4,587.79	4,344.83	4,364.20	4,326.03	4,061.76	4,186.62
HFCs	146.23	211.77	281.22	365.11	481.23	616.71	731.46	907.13	1,088.25	1,321.08
PFCs	0.43	0.77	1.13	1.51	1.91	2.34	2.80	3.30	3.99	4.74
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF_6	15.83	16.53	16.61	17.87	18.16	21.64	26.54	26.63	28.44	31.38
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (without LULUCF)	75,508.17	83,416.50	82,290.85	81,923.59	86,108.56	80,986.33	84,200.21	86,134.48	81,403.21	79,133.33
Total (with LULUCF)	68,347.83	75,322.66	77,204.08	73,303.89	77,973.94	83,602.27	77,024.28	87,654.33	73,155.79	66,999.73
Total (without LULUCF, with indirect)	75,714.32	83,627.00	82,502.37	82,101.27	86,277.85	81,157.17	84,377.31	86,308.17	81,575.24	79,308.62
Total (with LULUCF, with indirect)	68,553.99	75,533.17	77,415.60	73,481.56	78,143.23	83,773.11	77,201.38	87,828.02	73,327.82	67,175.02

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt CO_2 eq									
1. Energy	54,603.09	61,906.76	60,311.31	60,492.93	64,128.56	59,038.61	61,303.39	63,708.45	59,317.52	56,210.27
2. Industrial processes and product use	6,771.56	7,167.87	7,421.29	6,956.15	7,319.20	7,390.74	8,112.36	8,138.95	7,934.81	8,788.26
3. Agriculture	7,070.69	7,203.26	7,343.64	7,113.47	7,007.25	6,552.93	6,663.75	6,613.00	6,551.88	6,681.10
4. Land Use, Land-Use Change and Forestry[b]	-7,160.34	-8,093.83	-5,086.77	-8,619.70	-8,134.61	2,615.94	-7,175.93	1,519.85	-8,247.42	-12,133.60
5. Waste	7,062.82	7,138.60	7,214.61	7,361.03	7,653.54	8,004.04	8,120.72	7,674.08	7,599.01	7,453.69
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	68,347.83	75,322.66	77,204.08	73,303.89	77,973.94	83,602.27	77,024.28	87,654.33	73,155.79	66,999.73

NoteG: All footnotes for this table are given on sheet 3.

Table1s3

Emission trends: summary (1)	(Sheet 3 of 3)							PRT_BR3_v0.3
GREENHOUSE GAS EMISSIONS	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	kt CO_2 eq								(%)
CO_2 emissions without net CO_2 from LULUCF	59,633.78	56,800.52	52,615.65	51,470.97	49,658.41	47,866.48	47,740.65	52,017.49	14.65
CO_2 emissions with net CO_2 from LULUCF	45,616.86	42,769.65	41,006.26	39,894.73	40,390.54	39,064.79	37,645.26	43,044.06	-6.95
CH_4 emissions without CH_4 from LULUCF	11,554.66	11,339.81	11,346.47	11,456.92	11,209.40	10,924.58	10,703.28	10,812.34	5.99
CH_4 emissions with CH_4 from LULUCF	11,592.04	11,499.77	11,641.78	11,609.87	11,502.19	11,249.73	10,744.20	10,953.22	3.67
N_2O emissions without N_2O from LULUCF	3,709.50	3,402.76	3,376.88	3,100.74	3,113.31	3,109.45	3,178.52	3,191.67	-16.68
N_2O emissions with N_2O from LULUCF	4,061.09	3,779.13	3,780.52	3,477.20	3,517.74	3,520.82	3,534.97	3,558.88	-19.48
HFCs	1,569.49	1,763.70	1,910.10	2,078.09	2,216.47	2,382.54	2,534.80	2,679.24	100.00
PFCs	5.58	6.61	7.93	9.05	10.18	11.36	12.59	13.89	100.00
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO	NO	NO	NO	NO	0.00
SF_6	30.36	33.14	34.69	28.97	30.47	30.94	25.78	26.19	100.00
NF3	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total (without LULUCF)	76,503.36	73,346.54	69,291.72	68,144.74	66,238.24	64,325.35	64,195.61	68,740.82	15.72
Total (with LULUCF)	62,875.41	59,852.01	58,381.30	57,097.91	57,667.59	56,260.18	54,497.60	60,275.48	-1.58
Total (without LULUCF, with indirect)	76,675.46	73,507.01	69,459.50	68,304.29	66,398.85	64,494.48	64,360.38	68,915.74	15.66
Total (with LULUCF, with indirect)	63,047.51	60,012.49	58,549.07	57,257.46	57,828.21	56,429.31	54,662.37	60,450.41	-1.59

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
									(%)
1. Energy	54,241.84	52,998.33	48,530.40	47,870.85	46,422.83	44,280.28	43,786.66	48,157.50	16.82
2. Industrial processes and product use	8,623.19	6,943.93	7,367.93	6,788.13	6,514.21	7,002.50	7,503.08	7,578.89	29.79
3. Agriculture	6,630.12	6,541.58	6,472.12	6,436.58	6,481.31	6,468.34	6,566.04	6,623.53	-5.12
4. Land Use, Land-Use Change and Forestry[b]	-13,627.95	-13,494.53	-10,910.43	-11,046.82	-8,570.65	-8,065.17	-9,698.01	-8,465.34	-559.68
5. Waste	7,008.20	6,862.70	6,921.27	7,049.17	6,819.89	6,574.23	6,339.83	6,380.89	19.03
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total (including LULUCF)	62,875.41	59,852.01	58,381.30	57,097.91	57,667.59	56,260.18	54,497.60	60,275.48	-1.58

Notes:

(1) Further detailed information could be found in the common reporting format tables of the Party's greenhouse gas inventory, namely "Emission trends (CO_2)", "Emission trends (CH_4)", "Emission trends (N_2O)" and "Emission trends (HFCs, PFCs and SF_6)", which is included in an annex to this biennial report.

(2) 2011 is the latest reported inventory year.

(3) 1 kt CO_2 eq equals 1 Gg CO_2 eq.

Abbreviation: LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Includes net CO_2, CH_4 and N_2O from LULUCF.

Custom Footnotes

Table1(a)s1

Emission trends (CO2)	(Sheet 1 of 3)								PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year*[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	40,104.05	40,104.05	41,719.68	46,246.32	44,855.22	45,499.91	48,990.24	46,282.98	48,871.91
A. Fuel combustion (sectoral approach)	39,984.83	39,984.83	41,600.14	46,113.85	44,695.59	45,090.56	48,436.25	45,783.07	48,271.27
1. Energy industries	16,328.35	16,328.35	16,956.35	20,039.32	18,075.02	17,248.23	19,883.90	15,914.94	16,640.89
2. Manufacturing industries and construction	9,605.58	9,605.58	9,728.97	10,144.23	10,128.95	10,486.65	10,705.82	10,978.20	11,962.07
3. Transport	9,883.38	9,883.38	10,512.39	11,383.80	11,795.71	12,399.79	13,035.19	13,687.03	14,476.22
4. Other sectors	4,063.02	4,063.02	4,288.76	4,460.20	4,616.58	4,870.46	4,729.21	5,097.71	5,091.04
5. Other	104.51	104.51	113.68	86.30	79.33	85.44	82.12	105.19	101.06
B. Fugitive emissions from fuels	119.22	119.22	119.54	132.48	159.63	409.35	553.99	499.91	600.63
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	119.22	119.22	119.54	132.48	159.63	409.35	553.99	499.91	600.63
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	5,226.53	5,226.53	5,231.77	4,939.23	4,932.88	5,028.84	5,511.48	5,501.33	5,906.16
A. Mineral industry	3,668.75	3,668.75	3,800.61	3,693.54	3,759.78	3,899.45	4,128.60	4,052.12	4,290.57
B. Chemical industry	1,201.26	1,201.26	1,095.23	876.12	827.66	771.18	1,027.12	1,071.81	1,229.28
C. Metal industry	108.55	108.55	91.26	132.22	126.62	129.42	127.39	130.47	135.77
D. Non-energy products from fuels and solvent use	247.97	247.97	244.68	237.34	218.82	228.79	228.36	246.93	250.54
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	33.87	33.87	33.87	33.87	33.87	33.87	23.84	35.03	36.92
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Liming	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59	12.59
H. Urea application	21.28	21.28	21.28	21.28	21.28	21.28	11.25	22.43	24.33
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	888.23	888.23	922.37	-3,610.22	-4,700.02	-5,404.09	-4,791.61	-8,473.79	-9,387.34
A. Forest land	-5,690.84	-5,690.84	-5,327.41	-9,559.66	-10,309.11	-10,441.76	-8,260.08	-11,628.46	-12,706.45
B. Cropland	4,068.84	4,068.84	3,756.00	3,443.21	3,130.32	2,882.52	2,701.67	2,465.31	2,228.96
C. Grassland	3,228.00	3,228.00	3,305.68	3,383.36	3,461.04	3,541.26	2,534.91	2,545.95	2,556.99
D. Wetlands	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	117.50	145.67	173.83
E. Settlements	30.49	30.49	39.33	41.83	44.24	46.74	553.49	681.14	809.04
F. Other land	925.27	925.27	603.39	281.39	-40.80	-362.85	-1,494.38	-1,554.68	-1,614.97
G. Harvested wood products	-1,673.53	-1,673.53	-1,454.62	-1,200.34	-985.70	-1,070.01	-944.71	-1,128.71	-834.73
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	6.86	6.86	6.91	6.96	7.01	7.07	7.12	7.69	8.56
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Biological treatment of solid waste									
C. Incineration and open burning of waste	6.86	6.86	6.91	6.96	7.01	7.07	7.12	7.69	8.56
D. Waste water treatment and discharge									
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
International bunkers	2,932.64	2,932.64	2,941.58	3,028.38	2,724.83	2,628.14	2,749.24	2,795.31	2,816.74
Aviation	1,532.67	1,532.67	1,552.57	1,642.60	1,556.35	1,564.99	1,630.47	1,615.05	1,666.21
Navigation	1,399.97	1,399.97	1,389.01	1,385.79	1,168.48	1,063.15	1,118.77	1,180.27	1,150.53
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	11,409.84	11,409.84	11,441.47	11,393.20	11,148.54	10,920.81	11,050.70	11,126.07	11,317.93
CO2 captured	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE
Indirect N2O									
Indirect CO2 (3)	181.12	181.12	175.28	194.62	190.84	204.93	198.92	196.75	204.43
Total CO2 equivalent emissions with land use, land-use change and forestry	46,259.54	46,259.54	47,914.60	47,616.17	45,128.96	45,165.59	49,741.06	43,353.25	45,436.21
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	46,440.66	46,440.66	48,089.88	47,810.79	45,319.80	45,370.53	49,939.99	43,550.00	45,640.63

Note: All footnotes for this table are given at the end of the table on sheet 6.

Note: All footnotes for this table are given on sheet 3.

Table1(a)s2

Emission trends (CO2)	(Sheet 2 of 3)									PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt									
1. Energy	53,297.18	60,532.46	59,155.05	59,342.85	62,952.68	57,917.34	60,158.81	62,540.09	58,182.05	55,100.26
A. Fuel combustion (sectoral approach)	52,713.15	60,017.82	58,694.04	58,789.11	62,403.11	57,307.53	59,536.19	61,932.79	57,587.78	54,502.13
1. Energy industries	19,261.01	25,318.33	21,510.42	21,945.27	25,349.46	20,838.21	22,310.80	25,331.13	22,362.59	19,713.84
2. Manufacturing industries and construction	11,831.83	11,841.72	12,286.55	11,247.24	10,772.43	10,164.96	10,655.39	10,354.30	10,077.79	10,165.84
3. Transport	16,238.89	17,082.49	18,846.96	19,170.17	19,652.68	19,550.43	19,525.36	19,318.05	19,390.65	19,011.30
4. Other sectors	5,276.06	5,694.72	5,954.42	6,330.74	6,561.38	6,700.39	7,003.90	6,856.02	5,680.64	5,537.80
5. Other	105.36	80.57	95.69	95.69	67.17	53.54	40.74	73.29	76.10	73.36
B. Fugitive emissions from fuels	584.02	514.64	461.01	553.73	549.57	609.81	622.62	607.29	594.27	598.12
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	584.02	514.64	461.01	553.73	549.57	609.81	622.62	607.29	594.27	598.12
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	5,967.90	6,335.92	6,477.56	5,976.09	6,216.51	6,124.98	6,666.30	6,562.49	6,193.64	6,778.32
A. Mineral industry	4,323.00	4,648.22	4,682.97	4,534.97	4,794.78	4,459.05	4,882.52	4,922.97	4,823.83	5,049.51
B. Chemical industry	1,255.18	1,308.83	1,398.17	1,110.34	1,125.59	1,362.64	1,474.35	1,332.28	1,052.90	1,414.01
C. Metal industry	126.33	136.26	142.83	71.38	45.72	59.15	69.49	77.42	91.90	88.62
D. Non-energy products from fuels and solvent use	263.40	242.61	253.58	259.39	250.42	244.13	239.95	229.82	225.01	226.18
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	24.95	35.73	45.31	40.53	28.64	27.31	25.32	29.81	43.39	47.66
A. Enteric fermentation										
B. Manure management										
C. Rice cultivation										
D. Agricultural soils										
E. Prescribed burning of savannas										
F. Field burning of agricultural residues										
G. Liming	12.59	12.59	12.59	12.59	12.59	12.59	12.24	10.92	10.80	12.62
H. Urea application	12.36	23.14	32.72	27.94	16.05	14.72	13.08	18.89	32.60	35.03
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-8,134.40	-8,760.02	-5,998.63	-9,357.59	-8,900.15	1,071.04	-7,910.31	115.11	-8,858.19	-12,584.78
A. Forest land	-11,767.24	-11,939.22	-8,768.34	-12,073.19	-11,457.95	-1,202.79	-10,074.28	-2,092.45	-10,894.04	-13,818.05
B. Cropland	1,992.66	1,890.87	1,793.61	1,691.88	1,590.04	1,488.21	1,386.33	1,263.33	1,139.59	815.76
C. Grassland	2,568.03	2,431.34	2,294.92	2,158.22	2,021.54	1,884.80	1,748.10	1,586.82	1,425.94	1,132.92
D. Wetlands	201.99	230.16	258.32	286.49	314.65	342.81	370.98	399.14	427.49	365.36
E. Settlements	936.87	1,064.97	1,193.07	1,321.02	1,449.09	1,577.31	1,705.44	1,833.88	1,962.05	1,941.18
F. Other land	-1,675.19	-1,735.36	-1,795.54	-1,855.69	-1,915.94	-1,976.00	-2,036.10	-2,096.13	-2,156.55	-2,514.33
G. Harvested wood products	-391.52	-702.78	-974.67	-886.33	-901.59	-1,043.29	-1,010.78	-779.49	-762.67	-507.62
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	7.19	6.74	4.99	2.70	1.28	6.46	9.25	9.58	9.78	10.84
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Biological treatment of solid waste										
C. Incineration and open burning of waste	7.19	6.74	4.99	2.70	1.28	6.46	9.25	9.58	9.78	10.84
D. Waste water treatment and discharge										
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
International bunkers	2,921.50	3,458.52	3,669.31	3,112.30	3,084.22	3,556.30	3,967.98	3,832.72	4,106.13	4,327.09
Aviation	1,762.51	1,944.02	2,002.31	1,951.37	1,854.86	2,037.99	2,195.21	2,279.59	2,411.89	2,545.34
Navigation	1,158.99	1,514.51	1,667.01	1,160.93	1,229.36	1,518.30	1,772.77	1,553.12	1,694.24	1,781.76
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass	11,148.10	11,420.67	11,696.16	11,322.35	11,171.05	10,852.84	11,316.76	11,250.09	11,590.23	11,764.50
CO2 captured	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Indirect N2O										
Indirect CO2 (3)	206.16	210.51	211.52	177.67	169.29	170.85	177.10	173.69	172.03	175.29
Total CO2 equivalent emissions with land use, land-use change and forestry	51,162.82	58,150.83	59,684.28	56,004.58	60,298.96	65,147.13	58,949.38	69,257.08	55,570.67	49,352.29
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	51,368.98	58,361.34	59,895.80	56,182.25	60,468.25	65,317.98	59,126.48	69,430.77	55,742.70	49,527.58

Note: All footnotes for this table are given at the end of the table on sheet 6.

Table1(a)s3

Emission trends (CO2)	(Sheet 3 of 3)							PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	kt								%
1. Energy	53,151.88	51,963.77	47,521.48	46,894.23	45,481.38	43,366.91	42,878.94	47,204.75	17.71
A. Fuel combustion (sectoral approach)	52,579.40	51,437.72	46,897.47	46,322.26	44,810.24	42,131.17	41,823.31	46,032.26	15.12
1. Energy industries	19,109.36	19,253.91	14,365.66	16,344.77	17,315.76	15,106.83	14,432.61	18,233.60	11.67
2. Manufacturing industries and construction	9,478.35	8,370.90	8,974.66	8,329.26	7,421.48	7,359.50	7,438.07	7,729.15	-19.53
3. Transport	18,751.61	18,746.15	18,530.29	17,217.98	15,858.81	15,504.82	15,838.83	16,020.83	62.10
4. Other sectors	5,154.28	4,980.61	4,940.49	4,352.57	4,165.39	4,101.28	4,045.07	3,972.52	-2.23
5. Other	85.79	86.15	86.38	77.68	48.80	58.75	68.73	76.17	-27.12
B. Fugitive emissions from fuels	572.48	526.05	624.01	571.97	671.14	1,235.74	1,055.63	1,172.49	883.49
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Oil and natural gas and other emissions from energy production	572.48	526.05	624.01	571.97	671.14	1,235.74	1,055.63	1,172.49	883.49
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Industrial processes	6,422.74	4,773.26	5,043.61	4,519.08	4,121.67	4,447.25	4,790.08	4,731.69	-9.47
A. Mineral industry	4,937.45	4,030.61	4,112.08	3,622.57	3,466.57	3,650.69	3,931.52	3,794.81	3.44
B. Chemical industry	1,162.24	478.20	684.59	653.52	416.59	556.63	613.07	650.22	-45.87
C. Metal industry	107.84	69.10	45.63	49.88	57.92	61.80	61.76	94.96	-12.52
D. Non-energy products from fuels and solvent use	215.22	195.35	201.30	193.12	180.59	178.13	183.73	191.69	-22.70
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	55.21	52.92	34.57	42.95	41.63	34.08	45.61	58.65	73.15
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Liming	13.75	14.56	12.49	7.57	8.34	9.26	7.33	7.33	-41.76
H. Urea application	41.46	38.36	22.09	35.38	33.29	24.82	38.27	51.31	141.16
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	0.00
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land Use, Land-Use Change and Forestry	-14,016.92	-14,030.87	-11,609.39	-11,576.24	-9,267.86	-8,801.70	-10,095.39	-8,973.43	-1,110.26
A. Forest land	-14,800.51	-15,002.33	-13,111.47	-12,845.91	-10,945.94	-11,364.64	-12,587.70	-11,081.78	94.73
B. Cropland	668.80	648.67	607.79	600.94	596.02	594.40	595.48	575.08	-85.87
C. Grassland	866.37	746.45	613.42	473.76	371.87	241.37	152.91	103.02	-96.81
D. Wetlands	372.64	379.92	387.20	394.48	401.76	409.04	416.32	395.25	100.00
E. Settlements	2,022.85	2,104.49	2,186.16	2,265.61	2,344.99	2,424.33	2,503.63	2,457.82	7,961.46
F. Other land	-2,573.96	-2,311.53	-2,049.09	-1,786.69	-1,524.28	-1,261.89	-999.53	-998.60	-207.92
G. Harvested wood products	-573.11	-596.54	-243.39	-678.44	-512.28	155.68	-176.51	-424.23	-74.65
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	3.95	10.57	15.99	14.70	13.72	18.25	26.02	22.40	226.36
A. Solid waste disposal	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Biological treatment of solid waste									
C. Incineration and open burning of waste	3.95	10.57	15.99	14.70	13.72	18.25	26.02	22.40	226.36
D. Waste water treatment and discharge									
E. Other	NA	NA	NA	NA	NA	NA	NA	NA	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
International bunkers	4,609.77	4,195.46	4,271.63	4,685.07	4,851.85	5,036.40	4,963.02	5,241.27	78.72
Aviation	2,635.51	2,396.56	2,637.08	2,733.08	2,754.51	2,826.18	3,001.84	3,141.38	104.96
Navigation	1,974.26	1,798.89	1,634.54	1,951.99	2,097.35	2,210.21	1,961.18	2,099.89	50.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass	11,641.60	11,979.45	12,863.22	11,306.29	11,143.81	11,249.97	11,368.86	11,459.87	0.44
CO2 captured	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	0.00
Long-term storage of C in waste disposal sites	NE	NE	NE	NE	NE	NE	NE	NE	0.00
Indirect N2O									
Indirect CO2 (3)	172.10	160.48	167.77	159.55	160.61	169.13	164.77	174.92	-3.42
Total CO2 equivalent emissions with land use, land-use change and forestry	45,616.86	42,769.65	41,006.26	39,894.73	40,390.54	39,064.79	37,645.26	43,044.06	-6.95
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	45,788.96	42,930.13	41,174.04	40,054.27	40,551.16	39,233.91	37,810.03	43,218.99	-6.94

Note: All footnotes for this table are given at the end of the table on sheet 6.

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Fill in net emissions/removals as reported in CRF table Summary 1.A of the latest reported inventory year. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

Table1(b)s1

Emission trends (CH4)		(Sheet 1 of 3)							PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	26.84	26.84	26.17	25.98	25.51	24.83	23.12	22.92	22.55
A. Fuel combustion (sectoral approach)	22.23	22.23	21.90	21.86	21.37	21.12	21.13	21.09	20.66
1. Energy industries	0.24	0.24	0.25	0.29	0.27	0.28	0.31	0.27	0.28
2. Manufacturing industries and construction	1.29	1.29	1.38	1.44	1.41	1.45	1.53	1.56	1.68
3. Transport	4.14	4.14	4.43	4.81	4.69	4.53	4.44	4.35	4.18
4. Other sectors	16.55	16.55	15.83	15.32	15.00	14.85	14.85	14.92	14.52
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	4.61	4.61	4.27	4.11	4.14	3.72	1.99	1.83	1.89
1. Solid fuels	3.54	3.54	3.29	2.96	3.02	2.32	0.67	0.63	0.59
2. Oil and natural gas and other emissions from energy production	1.07	1.07	0.98	1.15	1.11	1.39	1.32	1.21	1.30
C. CO2 transport and storage									
2. Industrial processes	1.28	1.28	1.00	1.18	1.16	1.20	1.19	1.06	1.41
A. Mineral industry									
B. Chemical industry	1.02	1.02	0.75	0.85	0.82	0.88	0.85	0.72	1.01
C. Metal industry	0.22	0.22	0.20	0.27	0.28	0.27	0.27	0.28	0.32
D. Non-energy products from fuels and solvent use	0.04	0.04	0.05	0.06	0.06	0.06	0.07	0.06	0.08
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	174.62	174.62	176.12	173.34	171.79	172.20	175.66	177.42	178.65
A. Enteric fermentation	140.83	140.83	142.07	140.48	139.32	140.00	142.79	145.03	145.99
B. Manure management	26.95	26.95	27.84	27.78	27.92	27.60	27.35	26.60	26.55
C. Rice cultivation	5.36	5.36	4.76	3.69	3.20	3.27	4.16	4.43	4.74
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1.49	1.49	1.46	1.39	1.34	1.32	1.36	1.36	1.37
G. Liming									
H. Urea application									
I. Other carbon-containing fertilizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	14.56	14.56	19.52	6.17	5.33	8.42	18.11	9.30	3.57
A. Forest land	7.16	7.16	9.59	3.07	2.61	4.19	8.88	3.27	1.42
B. Cropland	0.36	0.36	0.48	0.15	0.13	0.20	0.45	0.12	0.03
C. Grassland	0.18	0.18	0.24	0.08	0.07	0.10	0.22	0.14	0.03
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	6.86	6.86	9.21	2.88	2.52	3.92	8.56	5.78	2.10
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	205.31	205.31	212.68	221.81	228.96	239.87	251.52	252.96	260.87
A. Solid waste disposal	109.14	109.14	114.55	120.40	126.45	132.71	139.35	146.23	153.48
B. Biological treatment of solid waste	0.20	0.20	0.20	0.20	0.20	0.35	0.44	0.44	0.46
C. Incineration and open burning of waste	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
D. Waste water treatment and discharge	95.96	95.96	97.91	101.20	102.29	106.80	111.72	106.28	106.93
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions with CH4 from LULUCF	422.61	422.61	435.49	428.48	432.74	446.52	469.62	463.66	467.06
Memo items:									
Aviation	0.13	0.13	0.13	0.13	0.12	0.12	0.13	0.12	0.12
Navigation	0.13	0.13	0.13	0.13	0.11	0.10	0.10	0.11	0.11
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O									
Indirect CO2 (3)									

Note: All footnotes for this table are given on sheet 3.

Table1(b)s2

Emission trends (CH4)	(Sheet 2 of 3)									PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt									
1. Energy	22.46	22.33	22.07	21.57	21.30	20.67	20.37	19.75	19.11	18.57
A. Fuel combustion (sectoral approach)	20.30	20.01	19.54	18.63	18.28	17.47	16.93	16.35	15.64	15.06
1. Energy industries	0.32	0.49	0.56	0.54	0.59	0.56	0.59	0.64	0.59	0.55
2. Manufacturing industries and construction	1.70	1.78	1.80	1.79	1.85	1.82	1.89	1.91	1.91	1.98
3. Transport	4.17	4.02	3.85	3.38	3.34	3.01	2.78	2.54	2.31	2.13
4. Other sectors	14.12	13.72	13.33	12.92	12.51	12.08	11.67	11.26	10.83	10.40
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	2.16	2.32	2.54	2.94	3.02	3.20	3.44	3.41	3.47	3.52
1. Solid fuels	0.56	0.54	0.52	0.50	0.48	0.46	0.45	0.43	0.42	0.41
2. Oil and natural gas and other emissions from energy production	1.60	1.78	2.02	2.44	2.54	2.74	2.99	2.97	3.05	3.11
C. CO2 transport and storage										
2. Industrial processes	1.38	1.39	1.48	1.20	1.25	1.38	1.68	1.68	1.56	1.83
A. Mineral industry										
B. Chemical industry	0.97	0.96	1.00	0.73	0.81	0.93	1.12	1.07	0.92	1.15
C. Metal industry	0.32	0.36	0.40	0.36	0.34	0.37	0.47	0.50	0.56	0.60
D. Non-energy products from fuels and solvent use	0.09	0.07	0.08	0.11	0.09	0.07	0.09	0.11	0.08	0.08
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	180.06	183.14	182.76	177.82	173.66	169.94	171.36	174.33	175.21	174.28
A. Enteric fermentation	147.50	150.45	150.12	146.12	143.11	140.03	141.23	144.05	145.04	144.32
B. Manure management	26.64	27.03	26.66	25.74	24.50	23.50	23.21	23.13	23.14	23.07
C. Rice cultivation	4.57	4.32	4.70	4.70	4.79	5.18	5.80	6.08	5.97	5.79
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1.35	1.33	1.28	1.26	1.25	1.22	1.12	1.07	1.07	1.10
G. Liming										
H. Urea application										
I. Other carbon-containing fertilizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	18.01	7.85	16.20	10.51	11.57	37.79	10.80	33.65	7.50	2.87
A. Forest land	7.21	3.81	6.07	4.01	6.00	24.61	4.38	20.92	3.60	1.16
B. Cropland	0.21	0.12	0.36	0.09	0.32	1.75	0.39	0.48	0.18	0.20
C. Grassland	0.24	0.10	0.27	0.09	0.13	0.46	0.22	0.18	0.07	0.05
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	10.35	3.82	9.50	6.32	5.13	10.97	5.82	12.06	3.64	1.45
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	272.07	274.84	277.89	283.77	295.66	309.00	313.78	295.95	292.73	286.59
A. Solid waste disposal	161.27	170.56	179.99	186.22	191.43	196.00	196.95	190.86	188.51	185.96
B. Biological treatment of solid waste	0.47	0.46	0.55	0.56	0.30	0.93	0.52	0.52	0.52	0.53
C. Incineration and open burning of waste	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
D. Waste water treatment and discharge	110.32	103.81	97.35	96.99	103.92	112.06	116.30	104.56	103.68	100.08
E. Other	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions with CH4 from LULUCF	493.98	489.54	500.40	494.87	503.44	538.78	518.00	525.37	496.11	484.14
Memo items:										
Aviation	0.14	0.15	0.10	0.09	0.09	0.09	0.08	0.07	0.07	0.07
Navigation	0.11	0.14	0.15	0.11	0.11	0.14	0.16	0.14	0.15	0.16
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O										
Indirect CO2 (3)										

Note: All footnotes for this table are given on sheet 3.

Table1(b)s3

Emission trends (CH4)	(Sheet 3 of 3)							PRT_BR3_v0.3

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	kt								%
1. Energy	18.00	17.38	17.05	17.30	17.19	17.37	17.05	17.47	-34.93
A. Fuel combustion (sectoral approach)	14.36	13.93	13.35	13.74	13.54	13.66	13.53	13.51	-39.22
1. Energy industries	0.57	0.60	0.57	0.60	0.58	0.56	0.53	0.60	146.60
2. Manufacturing industries and construction	1.94	2.00	1.99	1.95	1.93	1.93	1.95	1.96	51.67
3. Transport	1.88	1.77	1.63	1.43	1.29	1.21	1.15	1.11	-73.14
4. Other sectors	9.97	9.56	9.15	9.75	9.74	9.96	9.90	9.85	-40.52
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-65.71
B. Fugitive emissions from fuels	3.64	3.45	3.70	3.56	3.66	3.71	3.52	3.95	-14.26
1. Solid fuels	0.40	0.39	0.38	0.37	0.37	0.36	0.35	0.35	-90.23
2. Oil and natural gas and other emissions from energy production	3.24	3.06	3.32	3.18	3.29	3.35	3.17	3.61	237.46
C. CO2 transport and storage									
2. Industrial processes	1.56	1.25	1.54	1.60	1.25	1.50	1.69	1.75	36.81
A. Mineral industry									
B. Chemical industry	0.83	0.64	0.98	0.91	0.56	0.81	1.00	1.06	4.23
C. Metal industry	0.65	0.52	0.50	0.63	0.63	0.65	0.66	0.65	193.27
D. Non-energy products from fuels and solvent use	0.08	0.08	0.06	0.06	0.05	0.04	0.03	0.03	-3.71
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	0.00
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	173.85	172.30	170.53	169.16	168.58	166.62	167.58	169.68	-2.83
A. Enteric fermentation	143.64	142.36	140.53	138.86	138.42	136.76	137.80	139.18	-1.17
B. Manure management	23.21	23.44	23.32	23.15	23.01	22.92	23.16	23.65	-12.23
C. Rice cultivation	5.92	5.37	5.53	5.99	5.97	5.77	5.46	5.68	6.03
D. Agricultural soils	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	1.09	1.14	1.14	1.17	1.17	1.17	1.16	1.17	-21.24
G. Liming									
H. Urea application									
I. Other carbon-containing fertilizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	1.50	6.40	11.81	6.12	11.71	13.01	1.64	5.64	-61.31
A. Forest land	0.65	1.73	5.24	1.87	6.11	4.95	0.50	2.66	-62.79
B. Cropland	0.07	0.10	0.13	0.13	0.30	0.44	0.05	0.07	-81.27
C. Grassland	0.03	0.16	0.17	0.11	0.09	0.15	0.02	0.08	-54.95
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Other land	0.75	4.42	6.27	4.01	5.21	7.46	1.07	2.82	-58.87
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	268.76	262.66	264.74	270.22	261.35	251.50	241.81	243.60	18.65
A. Solid waste disposal	182.07	181.22	175.34	173.76	167.01	158.37	149.27	148.36	35.94
B. Biological treatment of solid waste	0.69	0.83	0.89	0.84	0.92	0.88	0.97	0.92	359.05
C. Incineration and open burning of waste	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	-43.90
D. Waste water treatment and discharge	85.97	80.59	88.50	95.62	93.41	92.24	91.58	94.31	-1.72
E. Other	0.00	0.00	0.00	0.00	NO	NO	NO	0.00	100.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total CH4 emissions with CH4 from LULUCF	463.68	459.99	465.67	464.39	460.09	449.99	429.77	438.13	3.67
Memo items:									
Aviation	0.08	0.07	0.08	0.08	0.08	0.07	0.09	0.08	-39.83
Navigation	0.18	0.16	0.15	0.18	0.19	0.20	0.18	0.19	49.79
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O									
Indirect CO2 (3)									

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

Table1(c)s1

Emission trends (N2O)	(Sheet 1 of 3)								PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year[a]*	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	1.50	1.50	1.56	1.61	1.91	2.17	2.42	2.68	2.60
A. Fuel combustion (sectoral approach)	1.49	1.49	1.55	1.60	1.90	2.16	2.41	2.67	2.59
1. Energy industries	0.16	0.16	0.17	0.19	0.19	0.19	0.22	0.20	0.20
2. Manufacturing industries and construction	0.34	0.34	0.35	0.36	0.36	0.37	0.38	0.39	0.41
3. Transport	0.30	0.30	0.32	0.35	0.63	0.88	1.10	1.33	1.33
4. Other sectors	0.69	0.69	0.70	0.70	0.72	0.72	0.70	0.76	0.64
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C. CO2 transport and storage									
2. Industrial processes	1.95	1.95	1.83	1.79	1.46	1.24	1.73	1.78	1.84
A. Mineral industry									
B. Chemical industry	1.67	1.67	1.55	1.53	1.20	0.99	1.50	1.54	1.60
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	0.28	0.28	0.27	0.27	0.26	0.25	0.24	0.24	0.24
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	8.66	8.66	8.60	8.47	8.42	8.47	8.35	8.82	8.79
A. Enteric fermentation									
B. Manure management	0.85	0.85	0.86	0.85	0.84	0.84	0.84	0.83	0.82
C. Rice cultivation									
D. Agricultural soils	7.74	7.74	7.68	7.55	7.51	7.57	7.44	7.93	7.91
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
G. Liming									
H. Urea application									
I. Other carbon containing fertlizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.98	1.98	1.99	1.71	1.63	1.64	1.79	1.63	1.53
A. Forest land	0.18	0.18	0.22	0.13	0.13	0.15	0.22	0.15	0.13
B. Cropland	1.08	1.08	0.99	0.90	0.81	0.74	0.68	0.61	0.55
C. Grassland	0.54	0.54	0.56	0.58	0.60	0.63	0.63	0.63	0.63
D. Wetlands	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	NO, IE	0.01	0.02	0.02
E. Settlements	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.08	0.12
F. Other land	0.09	0.09	0.13	0.04	0.03	0.05	0.12	0.09	0.04
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.74	0.74	0.76	0.77	0.79	0.80	0.80	0.81	0.82
A. Solid waste disposal									
B. Biological treatment of solid waste	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.03
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	0.73	0.73	0.75	0.76	0.77	0.78	0.77	0.78	0.79
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions with N2O from LULUCF	14.83	14.83	14.74	14.35	14.21	14.33	15.10	15.73	15.59
Memo items:									
Aviation	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.05	0.05
Navigation	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA
Indirect CO2 (3)									

Note: All footnotes for this table are given on sheet 3.

Table1(c)s2

Emission trends (N2O)	(Sheet 2 of 3)									PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt									
1. Energy	2.50	2.74	2.03	2.05	2.16	2.03	2.13	2.26	2.21	2.17
A. Fuel combustion (sectoral approach)	2.49	2.73	2.02	2.04	2.15	2.02	2.12	2.25	2.20	2.16
1. Energy industries	0.23	0.44	0.38	0.40	0.46	0.41	0.50	0.54	0.51	0.48
2. Manufacturing industries and construction	0.40	0.41	0.41	0.40	0.41	0.40	0.43	0.43	0.45	0.46
3. Transport	1.39	1.41	0.74	0.73	0.76	0.75	0.75	0.73	0.72	0.70
4. Other sectors	0.46	0.46	0.49	0.51	0.52	0.46	0.44	0.55	0.52	0.52
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C. CO2 transport and storage										
2. Industrial processes	2.04	1.91	2.04	1.90	1.91	1.98	2.16	2.00	1.95	2.04
A. Mineral industry										
B. Chemical industry	1.80	1.67	1.82	1.68	1.69	1.77	1.96	1.81	1.77	1.85
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	0.23	0.23	0.22	0.22	0.22	0.22	0.20	0.20	0.18	0.19
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	8.54	8.69	9.16	8.82	8.85	7.64	7.90	7.47	7.14	7.64
A. Enteric fermentation										
B. Manure management	0.83	0.87	0.89	0.86	0.84	0.79	0.77	0.76	0.74	0.72
C. Rice cultivation										
D. Agricultural soils	7.64	7.75	8.21	7.89	7.95	6.79	7.07	6.66	6.35	6.87
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06
G. Liming										
H. Urea application										
I. Other carbon containing fertlizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.76	1.58	1.70	1.59	1.60	2.01	1.56	1.89	1.42	1.27
A. Forest land	0.21	0.17	0.21	0.18	0.22	0.48	0.20	0.42	0.17	0.12
B. Cropland	0.48	0.45	0.43	0.40	0.37	0.36	0.32	0.29	0.25	0.21
C. Grassland	0.64	0.60	0.56	0.52	0.49	0.45	0.41	0.37	0.32	0.27
D. Wetlands	0.03	0.04	0.05	0.06	0.06	0.07	0.08	0.09	0.10	0.10
E. Settlements	0.15	0.19	0.23	0.26	0.30	0.33	0.37	0.41	0.44	0.47
F. Other land	0.16	0.07	0.15	0.11	0.10	0.18	0.12	0.21	0.09	0.07
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.85	0.88	0.88	0.89	0.87	0.91	0.90	0.89	0.91	0.93
A. Solid waste disposal										
B. Biological treatment of solid waste	0.03	0.03	0.03	0.03	0.02	0.06	0.03	0.03	0.03	0.03
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
D. Waste water treatment and discharge	0.82	0.84	0.84	0.85	0.85	0.85	0.86	0.85	0.87	0.89
E. Other	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions with N2O from LULUCF	15.68	15.79	15.81	15.24	15.40	14.58	14.64	14.52	13.63	14.05
Memo items:										
Aviation	0.05	0.05	0.06	0.05	0.05	0.06	0.06	0.06	0.07	0.07
Navigation	0.03	0.04	0.04	0.03	0.03	0.04	0.05	0.04	0.04	0.05
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA
Indirect CO2 (3)										

Note: All footnotes for this table are given on sheet 3.

Table1(c)s3

Emission trends (N2O)	(Sheet 3 of 3)							PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	kt								%
1. Energy	2.15	2.01	1.96	1.83	1.72	1.61	1.62	1.73	15.49
A. Fuel combustion (sectoral approach)	2.14	2.01	1.95	1.82	1.71	1.60	1.61	1.72	15.41
1. Energy industries	0.51	0.53	0.46	0.49	0.44	0.35	0.33	0.44	173.23
2. Manufacturing industries and construction	0.45	0.42	0.44	0.30	0.30	0.29	0.30	0.31	-8.39
3. Transport	0.68	0.60	0.60	0.55	0.50	0.48	0.49	0.49	63.67
4. Other sectors	0.49	0.46	0.45	0.47	0.46	0.48	0.48	0.48	-30.69
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-24.46
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	31.26
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	31.26
C. CO2 transport and storage									
2. Industrial processes	1.87	1.13	1.12	0.38	0.35	0.31	0.33	0.28	-85.52
A. Mineral industry									
B. Chemical industry	1.68	0.94	0.96	0.22	0.21	0.16	0.18	0.13	-92.37
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Non-energy products from fuels and solvent use	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	0.18	0.18	0.16	0.16	0.14	0.15	0.14	0.15	-44.36
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
3. Agriculture	7.48	7.32	7.30	7.26	7.47	7.61	7.82	7.80	-10.03
A. Enteric fermentation									
B. Manure management	0.72	0.72	0.72	0.71	0.68	0.66	0.65	0.65	-24.22
C. Rice cultivation									
D. Agricultural soils	6.71	6.54	6.52	6.50	6.73	6.90	7.12	7.09	-8.35
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	-22.14
G. Liming									
H. Urea application									
I. Other carbon containing fertlizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
4. Land use, land-use change and forestry	1.18	1.26	1.35	1.26	1.36	1.38	1.20	1.23	-37.68
A. Forest land	0.10	0.12	0.16	0.11	0.17	0.15	0.09	0.12	-35.41
B. Cropland	0.17	0.17	0.17	0.17	0.17	0.18	0.17	0.17	-84.48
C. Grassland	0.23	0.21	0.19	0.16	0.14	0.12	0.10	0.10	-82.17
D. Wetlands	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	100.00
E. Settlements	0.49	0.51	0.53	0.56	0.58	0.60	0.62	0.61	7,780.22
F. Other land	0.06	0.11	0.14	0.11	0.13	0.16	0.07	0.10	2.16
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	0.00
5. Waste	0.96	0.96	0.96	0.94	0.91	0.90	0.90	0.90	21.37
A. Solid waste disposal									
B. Biological treatment of solid waste	0.04	0.05	0.05	0.05	0.05	0.04	0.04	0.05	279.47
C. Incineration and open burning of waste	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-20.19
D. Waste water treatment and discharge	0.91	0.90	0.91	0.88	0.86	0.85	0.86	0.85	17.26
E. Other	0.00	0.00	0.00	0.00	NO	NO	NO	0.00	100.00
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Total direct N2O emissions with N2O from LULUCF	13.63	12.68	12.69	11.67	11.80	11.81	11.86	11.94	-19.48
Memo items:									
Aviation	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.09	104.95
Navigation	0.05	0.05	0.04	0.05	0.05	0.06	0.05	0.05	49.79
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	NO, NE, NA	0.00
Indirect CO2 (3)									

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

Table1(d)s1

Emission trends (HFCs, PFCs and SF6)	(Sheet 1 of 3)							PRT_BR3_v0.3	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year*[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
Emissions of HFCs and PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	35.42	59.05	100.98
Emissions of HFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	35.42	59.05	100.88
HFC-23	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-32	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00	0.00	0.00
HFC-41	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-43-10mee	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-125	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00	0.00	0.01
HFC-134	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-134a	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.02	0.02	0.04
HFC-143	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-143a	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00	0.00	0.01
HFC-152	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-152a	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.01	0.01	0.02
HFC-161	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-227ea	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00	0.00	0.00
HFC-236cb	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-236ea	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-236fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-245ca	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-245fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
HFC-365mfc	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
CF_4	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
C_2F_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
C_3F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	0.00
C_4F_{10}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
c-C_4F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
C_5F_{12}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
C_6F_{14}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
C10F18	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
c-C3F6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO	NO	NO
SF_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	0.00	0.00	0.00
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table1(d)s2

Emission trends (HFCs, PFCs and SF6)	(Sheet 2 of 3)									PRT_BR3_v0.3
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
	kt									
Emissions of HFCs and PFCs - (kt CO2 equivalent)	146.66	212.55	282.36	366.62	483.14	619.05	734.26	910.43	1,092.25	1,325.82
Emissions of HFCs - (kt CO2 equivalent)	146.23	211.77	281.22	365.11	481.23	616.71	731.46	907.13	1,088.25	1,321.08
HFC-23	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-32	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.05
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-125	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.07	0.08	0.11
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-134a	0.05	0.07	0.10	0.12	0.16	0.21	0.26	0.30	0.35	0.40
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-143a	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.04	0.05	0.07
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-152a	0.04	0.06	0.09	0.12	0.14	0.28	0.30	0.30	0.30	0.30
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-236fa	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CF_4	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_2F_6	NO	NO	NO	NO	NO	NO	NO	0.00	0.00	0.00
C_3F_8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_6F_{14}	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NF3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table1(d)s3

Emission trends (HFCs, PFCs and SF6)	(Sheet 3 of 3)	PRT_BR3_v0.3

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	kt								%
Emissions of HFCs and PFCs - (kt CO2 equivalent)	1,575.07	1,770.31	1,918.03	2,087.14	2,226.65	2,393.90	2,547.39	2,693.13	100.00
Emissions of HFCs - (kt CO2 equivalent)	1,569.49	1,763.70	1,910.10	2,078.09	2,216.47	2,382.54	2,534.80	2,679.24	100.00
HFC-23	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-32	0.06	0.07	0.08	0.09	0.11	0.12	0.13	0.15	100.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-125	0.13	0.16	0.17	0.19	0.21	0.24	0.26	0.28	100.00
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-134a	0.45	0.48	0.53	0.56	0.58	0.61	0.65	0.67	100.00
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-143a	0.08	0.09	0.10	0.11	0.11	0.12	0.12	0.13	100.00
HFC-152	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-152a	0.29	0.28	0.29	0.28	0.27	0.27	0.27	0.27	100.00
HFC-161	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-227ea	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	100.00
HFC-236cb	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236ea	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-236fa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-245fa	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-365mfc	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
CF_4	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_2F_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_3F_8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
C_4F_{10}	NO	NO	NO	NO	NO	NO	NO	NO	0.00
c-C_4F_8	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_5F_{12}	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C_6F_{14}	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C10F18	NO	NO	NO	NO	NO	NO	NO	NO	0.00
c-C3F6	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	0.00
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
NF3	NO	NO	NO	NO	NO	NO	NO	NO	0.00

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[c]Enter actual emissions estimates. If only potential emissions estimates are available, these should be reported in this table and an indication for this be provided in the documentation box. Only in these rows are the emissions expressed as CO2 equivalent emissions.

[d]In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.)

Table2(a)

Description of quantified economy-wide emission reduction target: base year[a]

Party	*Portugal*	
Base year /base period	1990	
Emission reduction target	% of base year/base period	% of 1990 [b]
	20.00	
Period for reaching target	BY-2020	

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Optional.

Table2(b)

Description of quantified economy-wide emission reduction target: gases and sectors covered[a]

Gases covered		*Base year for each gas (year):*
CO_2		1990
CH_4		1990
N_2O		1990
HFCs		1990
PFCs		1990
SF_6		1990
NF_3		
Other Gases (specify)		
Sectors covered[b]	Energy	Yes
	Transport[f]	Yes
	Industrial processes[g]	Yes
	Agriculture	Yes
	LULUCF	Yes
	Waste	Yes
	Other Sectors (specify)	
Abbreviations: LULUCF = land use, land-use change and forestry.		
[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.		
[b] More than one selection will be allowed. If Parties use sectors other than those indicated above, the explanation of how these sectors relate to the sectors defined by the IPCC should be provided.		
[f] Transport is reported as a subsector of the energy sector.		
[g] Industrial processes refer to the industrial processes and solvent and other product use sectors.		

Table2(c)

Description of quantified economy-wide emission reduction target: global warming potential values (GWP)[a]

Gases	*GWP values* [b]
CO_2	4th AR
CH_4	4th AR
N_2O	4th AR
HFCs	4th AR
PFCs	4th AR
SF_6	4th AR
NF_3	4th AR
Other Gases (specify)	
Abbreviations: GWP = global warming potential	
[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.	
[b] Please specify the reference for the GWP: Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) or the Fourth Assessment Report of the IPCC.	

Table2(d)

Description of quantified economy-wide emission reduction target: approach to counting emissions and removals from the LULUCF sector[a]

Role of LULUCF	LULUCF in base year level and target	Excluded
	Contribution of LULUCF is calculated using	

Abbreviation: LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

Table2(e)I

Description of quantified economy-wide emission reduction target: market-based mechanisms under the Convention[a]

Market-based mechanisms under the Convention	*Possible scale of contributions (estimated kt CO_2 eq)*
CERs	10,119.58
ERUs	4,567.63
AAUs[i]	302,650.81
Carry-over units[j]	45,353.41
Other mechanism units under the Convention (specify)[d]	

Abbreviations: AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[d] As indicated in paragraph 5(e) of the guidelines contained in annex I of decision 2/CP.17 .

[i] AAUs issued to or purchased by a Party.

[j] Units carried over from the first to the second commitment periods of the Kyoto Protocol, as described in decision 13/CMP.1 and consistent with decision 1/CMP.8.

Table2(e)II

Description of quantified economy-wide emission reduction target: other market-based mechanisms[a]

Other market-based mechanisms (Specify)	*Possible scale of contributions (estimated kt CO_2 eq)*

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

Table2(f)

Description of quantified economy-wide emission reduction target: any other information[a,b]

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] This information could include information on the domestic legal status of the target or the total assigned amount of emission units for the period for reaching a target. Some of this information is presented in the narrative part of the biennial report.

Table3

Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects

Name of mitigation action[a]	*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*[f]			
									2007 [f]	*2008* [f]	*2009* [f]	*2020*
Reduction of the carbon intensity of the passenger transport system for medium and long haul*	Transport	CO2	Efficiency improvements of vehicles, Demand management/reduction	Regulatory	Implemented	Build a low carbon mobility pattern; reduce energy intensity (GJ / pkm) and increase the efficiency of passenger and freight transport through the following actions: effective incorporation and enhancement of environmental and low carbon performance criteria in the process of contracting public passenger transport concessions; promotion of Mobility Plans of companies and generating poles and attractors of displacements.	2016	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Promotion of the use of public transport (modal shift) for passangers and freight for medium and long haul*	Transport	CO2	Modal shift to public transport or non-motorized transport	Other (Regulatory)	Implemented	Build a low carbon mobility pattern, reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport, including through: expansion and modernising the rail network; promoting multimodal interurban public transport (improvement of quality of service, tariff integration, intermodality, information to the public); promoting public transport on demand (flexible) in low density areas.	2014	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Modal shift for rail and maritime freight transport for medium and long haul*	Transport	CO2	Modal shift from road to rail or maritime	Other (Planning)	Implemented	Build a low carbon mobility pattern, reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport by: promoting initiatives to promote rail and maritime transport and remove barriers to their use, Including articulation between operators and companies with high freight transport needs.	2014	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Reducing of the carbon intensity of the freight transport system in medium and long haul*	Transport	CO2	Efficiency improvements of vehicles, Demand management/reduction	Other (Planning)	Implemented	Build a low carbon mobility pattern; Reduce energy intensity (GJ/pkm) and increase the efficiency of passenger and freight transport through the following actions: efficient management of freight transport, including through logistics management, including reverse logistics, fleet management, route optimization, among others; optimisation of the operation of multimodal logistics chains.	2016	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Reduction of the carbon intensity of the urban and suburban transport and logistics system*	Transport	CO2	Modal shift to public transport or non-motorized transport, Demand management/ reduction	Other (Planning)	Implemented	Promote sustainable mobility by creating the conditions for a paradigm change in urban mobility, through the following actions: Development and implementation of Mobility and Transport Plans (PMT), Plans of Action for Sustainable Urban Mobility (PAMUS) or other Mobility Plans Sustainable Mobility by CIM/AM and municipalities with priority for those over 50,000 inhabitants or that are district capitals, or CIM/AM; Promotion of Mobility Plans of companies and poles generators and attractors of displacements and School mobility plans; Demand management (passengers and freight) and urban planning in order to reduce the volume of journeys (traffic) and distance of journeys; Creation of Zero Emission Zones (ZERs), where applicable; Encourage shared mobility initiatives such as car sharing, bike sharing and car pooling; Adoption of tools to support mobility management and information systems and technologies in support of mobility and communication - intelligent mobility - aimed at users (generalization of real-time information at stops, public information portals, mobile apps); Effective incorporation and enhancement of environmental and low carbon performance criteria in the process of contracting public passenger transport service concessions.	2012	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Promotion of the use of in urban and suburban public transport (modal shift)*	Transport	CO2	Modal shift to public transport or non-motorized transport	Other (Planning)	Implemented	To promote sustainable mobility by creating conditions for the paradigm shift in urban mobility, through the following actions: Expansion and modernization of medium and large capacity transportation networks and services: electric/light rail network; Transport corridors in own place; Direct services; Public transport promotion actions (improvement of territorial coverage / density of the network, frequencies, quality of service, tariff integration, intermodality conditions, with a view to increasing the use of public transport in the modal split; Transport solutions to demand (urban lines and services in minibus, flexible transport services in areas / periods of low demand - peripheral crowns and night time - and new solutions for the organization and Taxi) Restrictions on the use of Individual Transportation (worsening of car use costs, urban design, implementation of residential areas and coexistence) Measures of positive discrimination of the use of vehicles of high environmental performance in particular electric.	2014	National Institute for Transport and Mobility (IMT) (Government); Administration of Metropolitan Area of Lisboa (AML) (Local); Administration of Metropolitan Area of Porto (AMP) (Local)				
Adoption of low carbon technologies in road, rail and sea fleets*	Transport	CO2	Low carbon fuels/electric cars, Efficiency improvements of vehicles	Other (Planning)	Implemented	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low-carbon technologies, namely on the electric vehicle (VE) and adopt clean fuels, through the following actions: Reduction of the average age of the fleets of public transport vehicles of passengers and goods and establishment of age limit ; Establishment of age limit for taxis; Promotion of the acquisition of vehicles of high environmental performance, namely of low carbon by individuals and companies, in particular hybrids and electric; Encourage the use of ships and boats powered by cleaner fuels in transport and other maritime activities; Promote the reduction of emissions from ships in port.	2014	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Metro de Lisboa (Companies); Metro do Porto (Companies); Sociedade de Transportes Coletivos do Porto, S.A. (Companies)				
Promotion of electric mobility*	Transport	CO2	Low carbon fuels/electric cars, Improved transport infrastructure	Fiscal|Economic| Regulatory| Planning	Implemented	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low carbon technologies, namely on the electric vehicle (VE) and adopt clean fuels, through the following actions: Consecration of the new model for electric mobility; Measures to encourage electric mobility (incentives to slaughter VE); Promotion of VE in taxi fleets; Promotion of VE in urban micrologistics; Promotion of VE of two wheels; deployment of charging infrastructure Electric mobility management structure	2010	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Sociedade de Transportes Coletivos do Porto, S.A. (Companies)				
Promotion of the use of biofuels*	Transport	CO2	Low carbon fuels/electric cars	Regulatory	Implemented	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); Disseminate and build knowledge on low-carbon technologies, namely on the electric vehicle (VE) and adopt clean fuels, through the following actions: Promotion of at least 10% of the incorporation of renewable energy into final energy consumption in transport ; Increase in the quantity (tep) of advanced biofuels incorporated in road transport.	2014	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government); CARRIS (Companies); Sociedade de Transportes Coletivos do Porto, S.A. (Companies)				
Promotion of the development of the network of alternative fuel stations	Transport	CO2	Improved transport infrastructure	Other (Planning)	Planned	Reduce the carbon intensity of the vehicle fleet (light, mixed and heavy passenger and freight); To disseminate and build knowledge about low-carbon technologies, namely on the electric vehicle (VE) and to adopt clean fuels, through the following actions: Support the expansion of the electric energy charging network and the natural gas supply network for Land and sea transport; Complete regulations for the supply of LNG in seaports.	2017	National Institute for Transport and Mobility (IMT) (Government); Directorate-General for Energy and Geology (DGEG) (Government)				
Eco-driving promotion	Transport	CO2	Improved behaviour	Other (Regulatory)	Planned	Promote more efficient behaviors through the following actions: Promote eco-driving courses (ecological and efficient driving); Incorporate eco-driving in the training of drivers.	2017	National Institute for Transport and Mobility (IMT) (Government); Portuguese National Councils Association (ANMP) (Government); Directorate-General for Energy and Geology (DGEG) (Government); Comboios de Portugal, E.P.E. (CP) (Companies)				
Promotion of the use of new technologies to induce sustainable mobility behavior	Transport	CO2	Improved behaviour, Demand management/reduction	Other (Regulatory)	Planned	To promote more efficient behavior, through the following actions: Promotion of the use of information technologies to induce more sustainable behavior (of the users of the transport, systems of support to the driver and of information in travel); Support for eco-driving monitoring technologies; Reduction of the need to travel through the adoption of videoconferencing or other forms of distance communication and telework; Dissemination of information on urban mobility options.	2017	National Institute for Transport and Mobility (IMT) (Government); Portuguese National Councils Association (ANMP) (Government)				
System for the management of energy intensive - SGCIE*	Energy, Industry/ industrial processes	CO2	Efficiency improvement in industrial end-use sectors, Demand management/ reduction, Reduction of losses (Energy); Reduction of losses (Industrial processes)	Other (Voluntary Agreement)	Implemented	Promote energy efficiency and monitor the energy consumption of energy-intensive consumer installations. Monitoring and control; Effluent treatment; Integration of processes; Maintenance of energy-consuming equipment; Thermal insulation; Training and sensitization of human resources; Reduction of reactive energy.	2008	Directorate-General for Energy and Geology (DGEG) and Portuguese Agency for Energy (ADENE) (Government)				
Implementation of the fluorinated gas regulation	Industry/ industrial processes	HFCs, PFCs, SF6	Replacement of fluorinated gases by other substances, Reduction of emissions of fluorinated gases	Regulatory	Implemented	Implementation of the provisions of Regulation (eu) N.º 517/2014 and adaptation of national legislation to reflect the provisions of this Regulation, including the allocation of new fines and the operationalization of the communication of purchases and sales of these gases, as well as the communication on the form Of f-gases, as well as to reduce the imported quantity of these gases and to promote their substitution by other substances with lesser or no PAG.	2015	Portuguese Environment Agency (APA) (Government)				
Prevention of waste production	Waste management/ waste	CH4, N2O	Demand management/ reduction, Reduced landfilling	Planning| Regulatory| Voluntary Agreement	Implemented	Voluntary agreements and prevention measures with industry aiming clean production and sustainable manufactoring of products.	2014	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Councils (Local); Waste management systems (Companies)				

Name of mitigation action[a]	Sector(s) affected[b]	GHG(s) affected	Objective and/or activity affected	Type of instrument[c]	Status of implementation[d]	Brief description[e]	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2 eq)[f]			
									2007 [f]	2008 [f]	2009 [f]	2020
Increased of the preparation for recycling re-use and quality of recyclables	Waste management/ waste	CH4, N2O	Demand management/ reduction, Reduced landfilling, Enhanced recycling	Other (Planning)	Implemented	Increasing the quantity and quality of materials taken up and recovered through the implementation of technical specifications and selectively collected biodegradable municipal waste.	2014	Portuguese Environment Agency (APA) (Government); Specific flow management entities (Companies); Waste management systems (Companies)				
Reduction of landfill	Waste management/ waste	CH4	Reduced landfilling	Other (Planning)	Implemented	Diversion of recyclables and biodegradable municipal waste from landfill. Landfill diversion of refuse and waste from urban waste treatment.	2014	Portuguese Environment Agency (APA) (Government); Waste management systems (Companies); Councils (Local)				
Economic recovery and disposal of recyclables and by-products	Energy, Transport, Waste management/ waste	CH4, CO2	Increase in renewable energy (Energy); Low carbon fuels/electric cars (Transport); Enhanced CH4 collection and use (Waste)	Other (Planning)	Implemented	Streamline the market for recyclable materials and enhance classification as a by-product and end of waste status. Promote the use of biogas for energy production and the incorporation of waste into biofuels.	2014	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Industry (Companies); Waste management systems (Companies)				
Consolidate and optimize the waste management network	Waste management/ waste	CH4, N2O	Improved landfill management, Enhanced recycling	Other (Planning)	Implemented	Encourage the proximity of the collection network to the user and the selective separation and enhance the synergies of waste collection and treatment in a complementarity logic. Improving treatment efficiencies in the urban waste sector.	2014	Portuguese Environment Agency (APA) (Government); Water and Waste Services Regulatory Body (ERSAR) (Government)				
Promotion the transition to a circular economy	Waste management/ waste, Industry/ industrial processes	CO2, CH4, N2O	Demand management/ reduction, Improved landfill management (Waste); Installation of abatement technologies (Industrial processes)	Planning	Implemented	Strengthening the specific flow management systems, with a view to creating synergies and evaluating the application of Producer Extended Responsibility (RAP) to emerging flows. Promote the establishment of new industrial areas developed in an industrial symbiosis perspective, with plans for rationalization of materials and energy and the rehabilitation of existing industrial areas.	2014	Portuguese Environment Agency (APA) (Government); Directorate-General for Economic Activities (Government); Industry (Companies); Waste management systems (Companies)				
Improvement of wastewater management	Waste management/ waste	CO2, CH4	Improved wastewater management systems	Economic	Planned	Main Purposes: Improvements in the treatment of the solid phase of the WWTP in order to optimize the process from the environmental, economic and technical point of view and the recovery of sludge; Promoting the use of energy production capacity in wastewater treatment systems, including through the use of biogas; Reduction and control of infiltrations and rainwater in public wastewater drainage systems; Development of innovation projects in the area of the conversion of WWTP to factories of valorization of resources with zero emissions of CO2.	2014	Portuguese Environment Agency (APA) (Government)				
Promotion of more efficient livestock effluent management systems*	Agriculture	CH4, N2O	Improved animal waste management systems	Other (Planning)	Implemented	Reduce the carbon intensity of livestock effluents, through better management (individual and collective). Reduce the carbon intensity of livestock effluents through its better control (guarantee of application of the rules of management of licensed livestock effluents).	2014	2020 Rural Development Programme Management Authority (PDR2020) (Government); 2020 Madeira Rural Development Programme Management Authority (PRODERAM2020) (Regional); 2020 Azores Rural Development Programme Management Authority (PRORURAL2020) (Regional)				
Incentive to reduce the use of nitrogen fertilizers*	Agriculture	N2O	Reduction of fertilizer/manure use on cropland	Regulatory	Implemented	Decrease of the consumption of nitrogen fertilizers by applying mandatory standards under cross-compliance. It applies to the 1st pillar and to the beneficiaries of the agro-environment and areas subject to natural conditioning of the 2nd pillar. Monitoring of GHG in the monitoring systems of policies and measures to incentivize the reduction of the use of nitrogen fertilizers (with reference to the Code of Good Agricultural Practices) and the National Emission Ceilings Directive, using methodologies compatible with the emissions inventory.	2005	Financing Institute for Agriculture and Fisheries (Government)				
Promotion of energy efficiency in the agricultural sector*	Energy	CO2	Demand management/reduction, Energy efficiency in the agricultural sector (Energy)	Regulatory| Planning| Economic	Implemented	Establishment of incentives for energy efficiency measures in the sector, including irrigation, associated with improvements in water efficiency, aimed at reducing the energy intensity of the sector by 2030. Monitoring of GHG in systems for monitoring policies and measures to encourage energy efficiency, Using methodologies compatible with the emissions inventory.	2014	Rural Development Program Management Authority (2014-2020) (Government)				
Promotion of renewables in the agricultural sector*	Energy	CO2	Increase in renewable energy, Efficiency improvement in industrial end-use sectors, Demand management/ reduction (Energy)	Economic| Regulatory| Planning	Implemented	Establishment of incentives for production by the agricultural sector of renewable energies (solar thermal, green heat, biomass, minicompanies, biomethane, others). Monitoring of GHG in the monitoring systems of policies and measures to encourage the use of renewable energy in the sector, using methodologies compatible with the inventory of emissions.	2014	Rural Development Program Management Authority (2014-2020) (Government)				
Increase the resistance and resilience of the forest to the abiotic and biotic agents*	Forestry/LULUCF	CO2	Strengthening protection against natural disturbances, Enhanced forest management (LULUCF)	Economic| Regulatory| Planning	Implemented	Reducing the number of fires, the burnt area and the emissions from fires through implementation of fire prevention actions	2014	ICNF, GPP (Government)				
Support for afforestation and improving of the environmental value of forests*	Forestry/LULUCF	CO2	Afforestation and reforestation, Enhanced forest management, Enhancing production in existing forests, Conservation of carbon in existing forests, Substitution of GHG-intensive feedstocks and materials with harvested wood products, Restoration of degraded lands (LULUCF)	Economic| Regulatory| Planning	Implemented	Increase forest area by planting agricultural land, non-agricultural land and areas prone to desertification. It also aims at improving the conservation and condition of forest habitats, riparian corridors and other NATURA 2000 areas and to improve the management standards of existing forests	2014	ICNF, GPP (Government)				
Conserving, restoring and improving agricultural and forest soils and preventing their erosion*	Agriculture, Forestry/LULUCF	CO2	Other activities improving cropland management, Activities improving grazing land or grassland management (Agriculture); Conservation of carbon in existing forests, Enhanced forest management (LULUCF)	Economic| Regulatory| Planning	Implemented	Promote agricultural and forestry techniques that increase the carbon stock in the soil. Support the installation of improved permanent pasture. Support the conservation of traditional permanent crops. Support for investment in agricultural holdings, which may include operations to improve fertility and soil structure. Promote the use of crops / species appropriate to the soil characteristics, which are contrary to the processes of acidification and salinization. Ensure compliance with Good Agricultural and Environmental Conditions (BCAA) and Legal Requirements for Management (RLG) as a prerequisite for access to funding under the Common Agricultural Policy (CAP).	2014	Rural Development Program Management Authority (2014-2020) (Government); Financing Institute for Agriculture and Fisheries (IFAP) (Government				
Promotion of the use of forest products as substitutes for fossil raw materials*	Energy, Forestry/LULUCF	CO2	Increase in renewable energy (Energy); Substitution of GHG-intensive feedstocks and materials with harvested wood products (LULUCF)	Other (Planning)	Implemented	Promote the use of biomass for energy through the establishment of short rotation biomass production and to promote the substitution of fossil based raw materials with forest products	2014	ICNF, GPP (Government)				
Plan for sustainable mobility in the public administration	Transport	CO2	Low carbon fuels/electric cars, Modal shift to public transport or non-motorized transport, Efficiency improvements of vehicles, Improved behaviour, Demand management/ reduction	Information| Regulatory| Planning	Implemented	Set the example by creating a low carbon transport and mobility system; Reduce energy intensity (GJ/ pkm) and increase transport efficiency, through the following instruments and actions: support program for the electric vehicle in the Public Administration, promotion of the decarbonization of the State fleet through technological changes in vehicles, promotion of management Including promoting the use of public transport and car pooling and car pooling initiatives and promoting behavior change, including the development of eco-driving training actions. Main purpose: achieve a 20% reduction in fleet emissions by 2030	2015	Directorate-General for Energy and Geology (DGEG) (Government)				
Decarbonization Public Administration buildings*	Energy	CO2	Efficiency improvements of buildings, Demand management/reduction	Other (Planning)	Implemented	Promoting energy efficiency measures targeting the Public Administration: - Energy certification of State buildings and energy efficiency management contracts - Action Plan for Energy Efficiency in Public Administration (ECO.AP) - More efficient public administration transport - Efficient public lighting	2014	DGEG (Government)				
Promotion of production and self-consumption of renewables	Energy	CO2	Increase in renewable energy	Other (Regulatory)	Implemented	Increase the introduction of renewable energies in final energy consumption, reducing the carbon intensity of the building stock (residential and commercial), through the following actions: promoting the integration of solar thermal collectors in the built-up park and building and renovation of the Park of existing equipment at end of life and promotion of the production of electricity for self consumption from renewable sources.	2015	Directorate-General for Energy and Geology (DGEG) (Government)				
Energy efficiency in buildings*	Energy	CO2	Efficiency improvements of buildings, Efficiency improvement of appliances, Efficiency improvement in services/ tertiary sector, Demand management/ reduction (Energy)	Other (Planning)	Implemented	To increase the energy performance rating of residential buildings and services and reduce their carbon intensity by extending the system in line with the guidelines of the Energy Efficiency Directive; To reduce the energy consumption and carbon intensity of the building stock (residential and commercial) by promoting the application of efficient insulating materials (roofing, flooring and walls) in the building stock with repair and Promotion of the use of double glazing, thermal cut-off frames and efficient (low-emissivity) glass in the park of buildings with repair needs. To use energy more efficiently in the building stock (residential and commercial), through the following actions: promotion of the replacement of fireplaces by heat recuperators in residential buildings and promotion of the acquisition of heat pumps for heating in replacement of active air conditioning. To use energy more efficiently in the park of buildings (residential and commercial), through the adoption of national programs leading to the promotion of efficient lighting, through the renovation of the park by the replacement of energy-efficient lamps and their respective phase-out. To use energy more efficiently in the building stock (residential and commercial), by promoting the replacement of household appliances and other electrical equipment for essentially domestic use, reducing the specific consumption of the domestic equipment fleet.	2013	Directorate-General for Energy and Geology (DGEG) (Government)				

Name of mitigation action[a]	*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*[f]			
									2007[f]	*2008*[f]	*2009*[f]	*2020*
Regenerate and revitalize urban centers and contain urban expansion	Cross-cutting	CO2	Territorial Cohesion and Urban Policy (Cross-cutting)	Other (Planning)	Implemented	Promotion of the functional densification of urban fabrics, including the diversification and strengthening of the supply of services and proximity trade, promoting a sustainable mobility standards; Promotion of urban rehabilitation associated with the introduction of solutions for renewable energy use in buildings; Promotion of the extension, qualification and integration of urban green areas by enhancing their role as carbon sinks and urban microclimate regulators.	2015	Directorate-General for Territory (DGT) (Government)				
Phasing out fuel oil cogeneration*	Energy	CO2	Efficiency improvement in industrial end-use sectors, Switch to less carbon-intensive fuels (Energy)	Other (Regulatory)	Implemented	Reduction or phasing out of the tariff for cogeneration plants using fuel oil.	2010	Diretorate-General for Energy and Geology (DGEG) (Government)				
Carbon Tax	Energy, Transport, Cross-cutting	CO2	Demand management/reduction (Energy); Demand management/reduction (Transport); Multi-sectoral policy (Cross-cutting)	Fiscal	Implemented	Carbon tax on non-ETS sectors linked to ETS allowances average prive in the previous year.	2015	Ministry of Environment (Government); Ministry of Finance (Government)				
CO2 Component on Motor Vehicles Taxes*	Transport	CO2	Efficiency improvements of vehicles, Low carbon fuels/electric cars (Transport)	Fiscal	Implemented	Positive discrimination on motor vehicles taxes: 1) CO2 component on registration tax; 2) CO2 component on the annual circulation tax; 3) Exemption of registration and annual circulation taxes for electric vehicles.	2007	Ministry of Finance (Government)				
Tax Incentives for Efficiency and Low Carbon Options	Energy, Transport, Cross-cutting	CO2	Switch to less carbon-intensive fuels, Increase in renewable energy (Energy); Efficiency improvements of vehicles, Low carbon fuels/electric cars, Modal shift to public transport or non-motorized transport (Transport); Multi-sectoral policy (Cross-cutting)	Fiscal	Implemented	Tax incentives for: 1) Plug-in hybrid and LPG/NGV vehicles; 2) Renewables in urban buildings; 3) Car-sharing/ Bike-sharing systems; 4) Velocipede fleets.	2015	Ministry of Finance (Government)				
Emissions Trading Scheme*	Energy, Transport, Industry/ industrial processes	CO2, N2O	Switch to less carbon-intensive fuels, Efficiency improvement in the energy and transformation sector, Increase in renewable energy, Efficiency improvement in industrial end-use sectors, Demand management/ reduction (Energy); Installation of abatement technologies (Industrial processes); Demand management/ reduction (Transport)	Other (Regulatory)	Implemented	Implementation of the EU ETS - Industrial installations and aviation.	2005	Portuguese Environment Agency (APA) (Government); National Authority for Civil Aviation (ANAC) (Government)				
Regulation on CO2 for Cars and Vans*	Transport	CO2	Efficiency improvements of vehicles	Regulatory	Implemented	Implementation of the Regulation 2009/443/EC of the European Parliament and the Council of 23rd of April; Implementation of the Regulation 2011/510/EC of the European Parliament and the Council of 11nd of May;	2009	Ministry of Finance (Government)				
Renewables: Heating and Cooling*	Energy	CO2	Increase in renewable energy, Enhanced non-renewable low carbon generation (nuclear) (Energy)	Other (Regulatory)	Implemented	Measures promoting of renewables: Thermal solar energy; Green heat; Registration of installers of small renewables systems.	2013	Diretorate-General for Energy and Geology (Government)				
Renewables: Electricity*	Energy	CO2	Increase in renewable energy, Switch to less carbon-intensive fuels, Efficiency improvement in the energy and transformation sector (Energy)	Economic| Regulatory| Information| Planning	Implemented	"Promoting renewables in the electricity sector: Introduction of a general remuneration regime; Operationalisation of the market facilitator role; Operationalisation of Origin Guarantees; Biomass power plants (decentralised network); One stop shop electricity; National Dam Plan including reinforcement of capacity and installation of pumping systems; Offshore energy pilot zone; Over-equipment for wind fams";	2013	Diretorate-General for Energy and Geology (Government)				

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Table4

Reporting on progress[a, b]

Year[c]	Total emissions excluding LULUCF	Contribution from LULUCF[d]	Quantity of units from market based mechanisms under the Convention		Quantity of units from other market based mechanisms	
	(kt CO_2 eq)	(kt CO_2 eq)	(number of units)	(kt CO_2 eq)	(number of units)	(kt CO_2 eq)
Base year/period (1990)						
1990						
2010						
2011						
2012						
2013						
2014						
2015						
2016						

Abbreviation: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For the base year, information reported on the emission reduction target shall include the following: (a) total GHG emissions, excluding emissions and removals from the LULUCF sector; (b) emissions and/or removals from the LULUCF sector based on the accounting approach applied taking into consideration any relevant decisions of the Conference of the Parties and the activities and/or land that will be accounted for; (c) total GHG emissions, including emissions and removals from the LULUCF sector. For each reported year, information reported on progress made towards the emission reduction targets shall include, in addition to the information noted in paragraphs 9(a–c) of the UNFCCC biennial reporting guidelines for developed country Parties, information on the use of units from market-based mechanisms.

[c] Parties may add additional rows for years other than those specified below.

[d] Information in this column should be consistent with the information reported in table 4(a)I or 4(a)II, as appropriate. The Parties for which all relevant information on the LULUCF contribution is reported in table 1 of this common tabular format can refer to table 1.

Table4(a)I

Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector in 2015 [a,b]

	Net GHG emissions/removals from LULUCF categories [c]	Base year/period or reference level value [d]	Contribution from LULUCF for reported year	Cumulative contribution from LULUCF [e]	Accounting approach [f]
	(kt CO_2 eq)				
Total LULUCF	-8,973.44				
A. Forest land	-11,081.78				
1. Forest land remaining forest land	-8,079.00				
2. Land converted to forest land	-3,002.78				
3. Other [g]					
B. Cropland	575.08				
1. Cropland remaining cropland	-204.58				
2. Land converted to cropland	779.66				
3. Other [g]					
C. Grassland	103.02				
1. Grassland remaining grassland	-369.05				
2. Land converted to grassland	472.07				
3. Other [g]					
D. Wetlands	395.25				
1. Wetland remaining wetland					
2. Land converted to wetland	395.25				

3. Other [g]					
E. Settlements	2,457.82				
1. Settlements remaining settlements					
2. Land converted to settlements	2,457.82				
3. Other [g]					
F. Other land	-998.60				
1. Other land remaining other land					
2. Land converted to other land	-998.60				
3. Other [g]					
G. Other	-424.23				
Harvested wood products	-424.23				

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Parties that use the LULUCF approach that is based on table 1 do not need to complete this table, but should indicate the approach in table 2. Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[c] For each category, enter the net emissions or removals reported in the most recent inventory submission for the corresponding inventory year. If a category differs from that used for the reporting under the Convention or its Kyoto Protocol, explain in the biennial report how the value was derived.

[d] Enter one reference level or base year/period value for each category. Explain in the biennial report how these values have been calculated.

[e] If applicable to the accounting approach chosen. Explain in this biennial report to which years or period the cumulative contribution refers to.

[f] Label each accounting approach and indicate where additional information is provided within this biennial report explaining how it was implemented, including all relevant accounting parameters (i.e. natural disturbances, caps).

[g] Specify what was used for the category "other". Explain in this biennial report how each was defined and how it relates to the categories used for reporting under the Convention or its Kyoto Protocol.

Table4(a)I

Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector in 2016 [a, b]

	Net GHG emissions/removals from LULUCF categories [c]	*Base year/period or reference level value* [d]	*Contribution from LULUCF for reported year*	*Cumulative contribution from LULUCF* [e]	*Accounting approach* [f]
	(kt CO_2 eq)				
Total LULUCF					
A. Forest land					
1. Forest land remaining forest land					
2. Land converted to forest land					
3. Other [g]					
B. Cropland					
1. Cropland remaining cropland					
2. Land converted to cropland					
3. Other [g]					
C. Grassland					
1. Grassland remaining grassland					
2. Land converted to grassland					
3. Other [g]					
D. Wetlands					
1. Wetland remaining wetland					
2. Land converted to wetland					
3. Other [g]					
E. Settlements					
1. Settlements remaining settlements					
2. Land converted to settlements					
3. Other [g]					
F. Other land					
1. Other land remaining other land					
2. Land converted to other land					
3. Other [g]					
G. Other					
Harvested wood products					

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Parties that use the LULUCF approach that is based on table 1 do not need to complete this table, but should indicate the approach in table 2. Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[c] For each category, enter the net emissions or removals reported in the most recent inventory submission for the corresponding inventory year. If a category differs from that used for the reporting under the Convention or its Kyoto Protocol, explain in the biennial report how the value was derived.

[d] Enter one reference level or base year/period value for each category. Explain in the biennial report how these values have been calculated.

[e] If applicable to the accounting approach chosen. Explain in this biennial report to which years or period the cumulative contribution refers to.

[f] Label each accounting approach and indicate where additional information is provided within this biennial report explaining how it was implemented, including all relevant accounting parameters (i.e. natural disturbances, caps).

[g] Specify what was used for the category "other". Explain in this biennial report how each was defined and how it relates to the categories used for reporting under the Convention or its Kyoto Protocol.

Table4(a)II

Progress in achievement of the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol[a,b,c]

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Base year[d]	Net emissions/removals[e]									Accounting parameters[h]	Accounting quantity[i]
		2013	2014	2015	2016	2017	2018	2019	2020	Total[g]		
	(kt CO_2 eq)											
A. Article 3.3 activities												
A.1. Afforestation/reforestation		-3,434.60	-3,606.14	-3,392.46						-10,433.20		-10433.20
Excluded emissions from natural disturbances(5)		NO	NO	NO						NO		NO
Excluded subsequent removals from land subject to natural disturbances(6)		NO	NO	NO						NO		NO
A.2. Deforestation		2,123.35	2,099.96	2,075.63						6,298.95		6298.95
B. Article 3.4 activities												
B.1. Forest management										-24,360.16		-13777.77
Net emissions/removalse		-7,468.76	-8,992.84	-7,898.57						-24,360.16		
Excluded emissions from natural disturbances(5)		NO	NO	NO						NO		NO
Excluded subsequent removals from land subject to natural disturbances(6)		NO	NO	NO						NO		NO
Any debits from newly established forest (CEF-ne)(7),(8)		NA	NA	NA						NA		NA
Forest management reference level (FMRL)(9)											-6830.00	
Technical corrections to FMRL(10)											3302.54	
Forest management capl											16996.56	-13777.77
B.2. Cropland management (if elected)	3354.25	346.30	358.11	356.34						1,060.75		-9001.98
B.3. Grazing land management (if elected)	1443.65	42.93	22.37	-39.59						25.71		-4305.23
B.4. Revegetation (if elected)	NA	NA	NA	NA						NA		NA
B.5. Wetland drainage and rewetting (if elected)	NA	NA	NA	NA						NA		NA

Note: 1 kt CO_2 eq equals 1 Gg CO_2 eq.

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Developed country Parties with a quantified economy-wide emission reduction target as communicated to the secretariat and contained in document FCCC/SB/2011/INF.1/Rev.1 or any update to that document, that are Parties to the Kyoto Protocol, may use table 4(a)II for reporting of accounting quantities if LULUCF is contributing to the attainment of that target.

[c] Parties can include references to the relevant parts of the national inventory report, where accounting methodologies regarding LULUCF are further described in the documentation box or in the biennial reports.

[d] Net emissions and removals in the Party's base year, as established by decision 9/CP.2.

[e] All values are reported in the information table on accounting for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, of the CRF for the relevant inventory year as reported in the current submission and are automatically entered in this table.

[f] Additional columns for relevant years should be added, if applicable.

[g] Cumulative net emissions and removals for all years of the commitment period reported in the current submission.

[h] The values in the cells "3.3 offset" and "Forest management cap" are absolute values.

[i] The accounting quantity is the total quantity of units to be added to or subtracted from a Party's assigned amount for a particular activity in accordance with the provisions of Article 7, paragraph 4, of the Kyoto Protocol.

[j] In accordance with paragraph 4 of the annex to decision 16/CMP.1, debits resulting from harvesting during the first commitment period following afforestation and reforestation since 1990 shall not be greater than the credits accounted for on that unit of land.

[k] In accordance with paragraph 10 of the annex to decision 16/CMP.1, for the first commitment period a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3 paragraph 3, may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[l] In accordance with paragraph 11 of the annex to decision 16/CMP.1, for the first commitment period of the Kyoto Protocol only, additions to and subtractions from the assigned amount of a Party resulting from Forest management under Article 3, paragraph 4, after the application of paragraph 10 of the annex to decision 16/CMP.1 and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

Table4(b)
Reporting on progress[a, b, c]

Units of market based mechanisms			*Year*	
			2015	*2016*
Kyoto Protocol units[d]	*Kyoto Protocol units*	*(number of units)*		
		(kt CO_2 eq)		
	AAUs	*(number of units)*		
		(kt CO2 eq)		
	ERUs	*(number of units)*		
		(kt CO2 eq)		
	CERs	*(number of units)*		
		(kt CO2 eq)		
	tCERs	*(number of units)*		
		(kt CO2 eq)		
	lCERs	*(number of units)*		
		(kt CO2 eq)		
Other units [d,e]	*Units from market-based mechanisms under the Convention*	*(number of units)*		
		(kt CO_2 eq)		
	Units from other market-based mechanisms	*(number of units)*		
		(kt CO_2 eq)		
Total		*(number of units)*		
		(kt CO_2 eq)		

Abbreviations: AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, lCERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.

Note: 2011 is the latest reporting year.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For each reported year, information reported on progress made towards the emission reduction target shall include, in addition to the information noted in paragraphs 9(a-c) of the reporting guidelines, on the use of units from market-based mechanisms.

[c] Parties may include this information, as appropriate and if relevant to their target.

[d] Units surrendered by that Party for that year that have not been previously surrendered by that or any other Party.

[e] Additional rows for each market-based mechanism should be added, if applicable.

Table5

Summary of key variables and assumptions used in the projections analysis[a]

Key underlying assumptions		*Historical*[b]							Projected				
Assumption	*Unit*	*1990*	*1995*	2000	2005	2009	2010	2011	2015	2020	2025	2030	2035
Population	*thousands*						105,731.00		105,517.00	105,657.00	105,794.00	106,772.00	
Population growth	%								-0.20	0.13	0.13	0.92	
GDP growth rate	%						0.60		1.50	3.00	3.00	3.00	
International oil price	USD / boe						60.00		73.86	89.00	85.17	93.00	
International coal price	USD / boe						16.00		19.14	23.00	22.63	24.00	
International gas price	USD / boe						38.00		50.57	62.00	55.71	65.00	
EU ETS carbon price	EUR10/TCO2								7.00	10.00	14.00	35.00	
Gross value added (GVA) total industry	const€million (2010=t-10)						26,543.99		25,134.21	27,506.20	31,887.23	36,966.04	
Gross inland consumption: solid fuels	PJ						69.37		66.94	72.52	46.05	0.61	
Gross inland consumption: total petroleum products	PJ						518.00		441.06	348.32	318.79	325.83	
Gross inland consumption: gas	PJ						188.69		186.07	171.71	204.27	246.06	
Gross inland consumption:-Renewables	PJ						233.62		223.25	210.31	207.62	209.46	
Gross inland consumption:-Nuclear	PJ						0.00		0.00	0.00	0.00	0.00	
Gross inland consumption:-Other	PJ						0.00		0.00	0.00	0.00	0.00	
Gross inland consumption:-Total	PJ						1,009.68		917.31	802.86	776.73	781.96	
Gross electricity production:-Coal	TWh						7.10		14.29	7.44	4.70	0.00	
Gross electricity production:-Oil	TWh						3.05		0.00	0.00	0.00	0.06	
Gross electricity production:-Natural gas	TWh						14.90		4.08	7.95	11.55	18.63	
Gross electricity production:-Renewables	TWh						28.53		24.29	27.26	28.56	30.89	
Gross electricity production:-Nuclear	TWh						0.00		0.00	0.00	0.00	0.00	
Gross electricity production:-Other	TWh						0.00		0.00	0.00	0.00	0.00	
Gross electricity production:-Total	TWh						53.58		42.66	42.66	44.81	49.58	
Final energy consumption:-Industry	PJ						172.41		130.21	134.92	143.01	152.27	
Final energy consumption:-Transport	PJ						271.66		224.74	217.85	209.39	214.83	
Final energy consumption:-Residential	PJ						129.03		110.00	112.65	115.39	120.95	
Final energy consumption:-Agriculture/Forestry	PJ						19.36		18.33	19.18	20.67	22.26	
Final energy consumption:-Services	PJ						84.00		81.31	81.97	86.97	93.30	
Final energy consumption:-Other	PJ						0.00		0.00	0.00	0.00	0.00	
Final energy consumption:-Total	PJ						676.46		564.59	566.58	575.43	603.62	
Number of passenger-kilometres (all modes)	million pkm						96,425.06		87,708.76	99,297.69	109,390.39	121,813.49	
Freight transport tonnes-kilometres (all modes)	million tkm						27,242.76		26,597.29	30,038.96	31,778.06	34,201.47	
Final energy demand for road transport	PJ						271.66		224.74	217.85	209.39	214.83	

Livestock:-Dairy cattle	1000 heads						278.00		274.60	272.03	269.96	268.11	0.00
Livestock:-Non-dairy cattle	1000 heads						1,152.00		1,118.57	1,089.48	1,089.42	1,070.51	0.00
Livestock:-Sheep	1000 heads						1,900.41		1,832.90	1,771.91	1,783.39	1,744.78	0.00
Livestock:-Pig	1000 heads						1,913.00		1,796.04	1,723.21	1,670.43	1,566.38	0.00
Livestock:-Poultry	1000 heads						35,352.00		35,352.00	35,352.00	35,352.00	35,352.00	0.00
Nitrogen input from application of synthetic fertilizers	kt nitrogen						194.53		178.13	165.56	155.74	141.59	0.00
Nitrogen input from application of manure	kt nitrogen						103.83		102.00	100.72	100.23	98.93	0.00
Nitrogen fixed by N-fixing crops	kt nitrogen						4.91		4.77	4.64	4.68	4.60	0.00
Nitrogen in crop residues returned to soils	kt nitrogen						52.41		53.34	53.67	54.53	56.60	0.00
Municipal solid waste (MSW) generation	tonne MSW						5,467,000.00		4,787,375.00	4,803,000.00	4,562,700.00	4,322,400.00	
Municipal solid waste (MSW) going to landfills	*tonne MSW*						3,333,223.00		2,075,476.98	993,000.00	813,861.99	648,360.00	

[a] Parties should include key underlying assumptions as appropriate.

[b] Parties should include historical data used to develop the greenhouse gas projections reported.

Table6(a)

Information on updated greenhouse gas projections under a 'with measures' scenario[a]

	GHG emissions and removals[b]							GHG emission projections	
	(kt CO_2 eq)							(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2015	2020	2030
Sector[d,e]									
Energy	31,146.64	31,146.64	36,815.37	41,147.95	44,110.24	29,780.94	31,964.25	25,006.74	20,902.00
Transport	10,075.31	10,075.31	13,475.47	19,163.35	19,598.21	18,749.46	16,193.25	15,044.49	14,746.65
Industry/industrial processes	5,839.26	5,839.26	6,107.10	7,421.29	8,138.95	7,367.93	7,578.89	6,588.42	5,969.82
Agriculture	6,981.16	6,981.16	6,903.12	7,343.64	6,613.00	6,472.12	6,623.53	8,142.39	7,241.39
Forestry/LULUCF	1,841.56	1,841.56	-3,805.51	-5,086.77	1,519.85	-10,910.43	-8,465.34	-7,567.04	-8,316.48
Waste management/waste	5,360.77	5,360.77	6,534.68	7,214.61	7,674.08	6,921.27	6,380.89	8,266.53	6,987.25
Other (specify)									
Gas									
CO_2 emissions including net CO_2 from LULUCF	46,259.54	46,259.54	49,741.06	59,684.28	69,257.08	41,006.26	43,044.06	34,530.87	29,870.92
CO_2 emissions excluding net CO_2 from LULUCF	45,371.32	45,371.32	54,532.67	65,682.92	69,141.97	52,615.65	52,017.49	42,242.87	38,332.36
CH_4 emissions including CH_4 from LULUCF	10,565.25	10,565.25	11,740.47	12,510.10	13,134.16	11,641.78	10,953.22	530.68	447.88
CH_4 emissions excluding CH_4 from LULUCF	10,201.16	10,201.16	11,287.61	12,105.06	12,292.97	11,346.47	10,812.34	528.10	445.30
N_2O emissions including N_2O from LULUCF	4,419.91	4,419.91	4,499.35	4,710.74	4,326.03	3,780.52	3,558.88	15.75	15.84
N_2O emissions excluding N_2O from LULUCF	3,830.66	3,830.66	3,966.10	4,203.90	3,762.48	3,376.88	3,191.67	15.48	15.57
HFCs			35.42	281.22	907.13	1,910.10	2,679.24	2,875.82	1,514.98
PFCs				1.13	3.30	7.93	13.89		
SF_6			13.93	16.61	26.63	34.69	26.19	114.05	227.26
NF_3									
Other (specify)									
Total with LULUCF[f]	61,244.70	61,244.70	66,030.23	77,204.08	87,654.33	58,381.30	60,275.48	55,481.24	47,530.64
Total without LULUCF	59,403.14	59,403.14	69,835.73	82,290.84	86,134.48	69,291.72	68,740.82	63,048.28	55,847.12

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance 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", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 20XX is the reporting due-date year (i.e. 2014 for the first biennial report).

[d] In accordance with paragraph 34 of 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", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

Table6(c)

Information on updated greenhouse gas projections under a 'with additional measures' scenario[a]

	GHG emissions and removals[b]							GHG emission projections	
	(kt CO_2 eq)							(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2015	2020	2030
Sector[d,e]									
Energy	31,146.64	31,146.64	36,815.37	41,147.95	44,110.24	29,780.94	31,964.25	25,006.67	18,271.49
Transport	10,075.31	10,075.31	13,475.47	19,163.35	19,598.21	18,749.46	16,193.25	15,044.49	14,736.93
Industry/industrial processes	5,839.26	5,839.26	6,107.10	7,421.29	8,138.95	7,367.93	7,578.89	6,550.03	5,085.96
Agriculture	6,981.16	6,981.16	6,903.12	7,343.64	6,613.00	6,472.12	6,623.53	8,142.39	7,241.39
Forestry/LULUCF	1,841.56	1,841.56	-3,805.51	-5,086.77	1,519.85	-10,910.43	-8,465.34	-7,567.04	-8,316.48
Waste management/waste	5,360.77	5,360.77	6,534.68	7,214.61	7,674.08	6,921.27	6,380.89	8,267.47	6,827.43
Other (specify)									
Gas									
CO_2 emissions including net CO_2 from LULUCF	46,259.54	46,259.54	49,741.06	59,684.28	69,257.08	41,006.26	43,044.06	34,530.87	27,339.60
CO_2 emissions excluding net CO_2 from LULUCF	45,371.32	45,371.32	54,532.67	65,682.92	69,141.97	52,615.65	52,017.49	42,242.87	35,801.04
CH_4 emissions including CH_4 from LULUCF	10,565.25	10,565.25	11,740.47	12,510.10	13,134.16	11,641.78	10,953.22	530.68	439.42
CH_4 emissions excluding CH_4 from LULUCF	10,201.16	10,201.16	11,287.61	12,105.06	12,292.97	11,346.47	10,812.34	528.10	436.84
N_2O emissions including N_2O from LULUCF	4,419.91	4,419.91	4,499.35	4,710.74	4,326.03	3,780.52	3,558.88	15.75	15.65
N_2O emissions excluding N_2O from LULUCF	3,830.66	3,830.66	3,966.10	4,203.90	3,762.48	3,376.88	3,191.67	15.48	15.38
HFCs			35.42	281.22	907.13	1,910.10	2,679.24	2,837.43	631.12
PFCs				1.13	3.30	7.93	13.89		
SF_6			13.93	16.61	26.63	34.69	26.19	114.05	227.26
NF_3									
Other (specify)									
Total with LULUCF[f]	61,244.70	61,244.70	66,030.23	77,204.08	87,654.33	58,381.28	60,275.48	55,444.01	43,846.72
Total without LULUCF	59,403.14	59,403.14	69,835.73	82,290.84	86,134.48	69,291.72	68,740.82	63,011.05	52,163.20

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance 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", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 20XX is the reporting due-date year (i.e. 2014 for the first biennial report).

[d] In accordance with paragraph 34 of 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", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

Table7

Provision of public financial support: summary information in 2015[a]

Allocation channels	*Year*									
	European euro - EUR					*USD[b]*				
	Core/ general[c, 1]	*Climate-specific[d, 2]*				*Core/ general[c, 1]*	*Climate-specific[d, 2]*			
		Mitigation	*Adaptation*	*Cross-cutting[e]*	*Other[f]*		*Mitigation*	*Adaptation*	*Cross-cutting[e]*	*Other[f]*
Total contributions through multilateral channels:	3,874,156.00			2,000,000.00						
Multilateral climate change funds[g]				2,000,000.00						
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks	3,874,156.00									
Specialized United Nations bodies										
Total contributions through bilateral, regional and other channels		3,411,860.00	312,353.00	500,000.00						
Total	3,874,156.00	3,411,860.00	312,353.00	2,500,000.00						

Note: Explanation of numerical footnotes is provided in the documentation box after tables 7, 7(a) and 7(b).

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should provide an explanation of the methodology used for currency exchange for the information provided in tables 7, 7(a) and 7(b) in the documentation box.

[c] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[d] Parties should explain in their biennial reports how they define funds as being climate-specific.

[e] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

Table7

Provision of public financial support: summary information in 2016[a]

	European euro - EUR					USD[b]				
	Core/ general[c, 1]	Climate-specific[d, 2]				Core/ general[c, 1]	Climate-specific[d, 2]			
		Mitigation	Adaptation	Cross-cutting[e]	Other[f]		Mitigation	Adaptation	Cross-cutting[e]	Other[f]
Total contributions through multilateral channels:	12,881,432.00									
Multilateral climate change funds[g]										
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks	12,812,381.00									
Specialized United Nations bodies	69,051.00									
Total contributions through bilateral, regional and other channels		1,310,398.00	421,722.00	263,506.00						
Total		1,310,398.00	421,722.00	263,506.00						

Note: Explanation of numerical footnotes is provided in the documentation box after tables 7, 7(a) and 7(b).

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should provide an explanation of the methodology used for currency exchange for the information provided in tables 7, 7(a) and 7(b) in the documentation box.

[c] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[d] Parties should explain in their biennial reports how they define funds as being climate-specific.

[e] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

Table7(a)

Provision of public financial support: contribution through multilateral channels in 2015[a]

Donor funding	*Total amount*				*Status*[b, 3]	*Funding source*[f, 4]	*Financial instrument*[f, 5]	*Type of support*[f, g, 6]	*Sector*[c, f, 7]
	Core/general[d, 1]		*Climate-specific*[e, 2]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels	3,874,156.00		2,000,000.00						
Multilateral climate change funds			2,000,000.00						
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund			2,000,000.00		Disbursed	ODA	Grant	Cross-cutting	Not applicable
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks	3,874,156.00								
1. World Bank	1,610,000.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
2. International Finance Corporation									
3. African Development Bank	1,988,341.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
4. Asian Development Bank	112,688.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank	163,127.00				Disbursed	Other	Grant	Other (not applicable)	Not applicable
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows, USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as disbursed and committed. Parties will provide the information for as many status categories as appropriate in the following order of priority: disbursed and committed.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Table7(a)

Provision of public financial support: contribution through multilateral channels in 2016[a]

Donor funding	Total amount				Status[b, 3]	Funding source[f, 4]	Financial instrument[f, 5]	Type of support[f, g, 6]	Sector[c, f, 7]
	Core/general[d, 1]		Climate-specific[e, 2]						
	European euro - EUR	USD	European euro - EUR	USD					
Total contributions through multilateral channels	12,812,381.00								
Multilateral climate change funds									
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks	12,812,381.00								
1. World Bank	1,730,000.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
2. International Finance Corporation									
3. African Development Bank	10,050,471.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
4. Asian Development Bank	188,094.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
5. European Bank for Reconstruction and Development									
6. Inter-American Development Bank	843,816.00				Disbursed	ODA	Grant	Other (not applicable)	Not applicable
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows, USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as disbursed and committed. Parties will provide the information for as many status categories as appropriate in the following order of priority: disbursed and committed.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Table7(b)

Provision of public financial support: contribution through bilateral, regional and other channels in 2015[a]

Recipient country/ region/project/programme[b]	*Total amount*		*Status[c, 3]*	*Funding source[g, 4]*	*Financial instrument[g, 5]*	*Type of support[g, h, 6]*	*Sector[d, g, 7]*	*Additional information[e]*
	Climate-specific[f, 2]							
	European euro - EUR	*USD*						
Total contributions through bilateral, regional and other channels	4,224,213.00							
Cape Verde/ Capacity Building for Developing Strategies on Low Carbon Resilient in Cabo Verde	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Cape Verde, Mozambique/ Capacity Building for Developing Strategies on Low Carbon Resilient in Mozambique	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Sao Tome and Principe/ Capacity Building for Developing Strategies on Low Carbon Resilient in São Tome and Principe	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Other (CPLP - Community of Portuguese Language Countries) / Contribution to the Special Fund of the CPLP to cooperation activities in the field of climate change	500,000.00		Disbursed	ODA	Grant	Cross-cutting	Other (General Environmental Protection)	
Cape Verde/ Roadmap of Waste (Cabo Verde)	262,500.00		Disbursed	ODA	Grant	Mitigation	Water and sanitation	
Sao Tome and Principe/ Bioenergy exploitation at Sao Tome and Principe (São Tomé e Principe)	296,445.00		Disbursed	ODA	Grant	Mitigation	Other (Energy Generation, Renewable Sources)	
Mozambique/ Installation of photovoltaic systems in 50 villages (Mozambique)	173,248.00		Disbursed	ODA	Grant	Mitigation	Other (Energy Generation, Renewable Sources)	
Cape Verde/ Line of Credit of 100 Million Euro for imports (renewable energies, environment and water) - Cabo Verde	2,423,631.00		Disbursed	ODA	Concessional Loan	Mitigation	Other (Energy Generation, Renewable Sources)	
ODA Loan of 4.5M€ for imports (renewable energies, environment and water)	39,580.00		Disbursed	ODA	Concessional Loan	Mitigation	Other (Energy Generation, Renewable Sources)	
Cape Verde/ Mainstreaming Adaptation to Climate Change in Development in Cabo Verde (IAMCD)	47,570.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Mozambique / Mainstreaming Adaptation to Climate Change in Development in Mozambique (IAMCD)	47,570.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Sao Tome and Principe/ Mainstreaming Adaptation to Climate Change in Development in São Tomé and Principe (IAMCD)	47,570.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Guinea-Bissau/ Cooperation between Águas de Portugal and Guinea-Bissau in the water and sanitation sector.	19,500.00		Disbursed	ODA	Grant	Adaptation	Water and sanitation	
Cape Verde/ NGO ADPM - A Sustainable Development for Chã de Norte in Cabo Verde	13,750.00		Disbursed	ODA	Grant	Adaptation	Other (Other Multisector)	
Mozambique/ NGO OIKOS - Improved Resistance to Natural Disasters in Mozambique	35,831.00		Disbursed	ODA	Grant	Adaptation	Other (Disaster Prevention and Preparedness)	
Timor-Leste/ The Global Alliance Support Program for Climate Change in East Timor (PAAC) in Timor Leste	100,562.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as disbursed and committed. Parties will provide the information for as many status categories as appropriate in the following order of priority: disbursed and committed.

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Table7(b)

Provision of public financial support: contribution through bilateral, regional and other channels in 2016[a]

Recipient country/ region/project/programme[b]	Total amount		Status[c, 3]	Funding source[g, 4]	Financial instrument[g, 5]	Type of support[g, h, 6]	Sector[d, 9, 7]	Additional information[e]
	Climate-specific[f, 2]							
	European euro - EUR	USD						
Total contributions through bilateral, regional and other channels	1,995,626.00							
Cape Verde/ A Sustainable Development for Chã de Norte (NGO ADPM) – Cabo Verde	4,901.00		Disbursed	ODA	Grant	Adaptation	Other (Other Multisector)	
Cape Verde/ Mainstreaming Adaptation to Climate Change in Development (IAMCD) - Cabo Verde	18,974.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Sao Tome and Principe/ Mainstreaming Adaptation to Climate Change in Development (IAMCD) - São Tomé and Príncipe	18,974.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Mozambique/ Mainstreaming Adaptation to Climate Change in Development (IAMCD) - Moçambique	18,974.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Mozambique / Improved Resistance to Natural Disasters (NGO OIKOS) – Moçambique	7,877.00		Disbursed	ODA	Grant	Adaptation	Other (Disaster Prevention and Preparedness)	
Mozambique/ Implementation of pilot-projects for local actions of adaptation programs - Mozambique	227,542.00		Disbursed	ODA	Grant	Adaptation	Other (Other Multisector)	
Guinea-Bissau/ Rice Resilience Reinforcement Program in the Bafatá and Contuboel sectors - Guiné Bissau	111,808.00		Disbursed	ODA	Grant	Adaptation	Agriculture	
Cuba/ Strengthening preparedness, response and resilience to drought in the provinces of eastern Cuba.	12,672.00		Disbursed	ODA	Grant	Adaptation	Other (General Environmental Protection)	
Cape Verde/ Capacity Building for Developing Strategies on Low Carbon Resilient - Cabo Verde	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Sao Tome and Principe/ Capacity Building for Developing Strategies on Low Carbon Resilient - São Tomé and Príncipe	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Mozambique/ Capacity Building for Developing Strategies on Low Carbon Resilient - Mozambique	72,152.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Cuba/ Agro-Energy in Cuba	13,980.00		Disbursed	ODA	Grant	Mitigation	Other (Energy Generation, Renewable Sources)	
Cape Verde/ North Plateau – Water and Energy as Bases for the Sustainable Development of Communities in Santo Antão Island - Cabo Verde	53,920.00		Disbursed	ODA	Grant	Mitigation	Other (Heating, Cooling and Energy Distribution)	
Cuba/ Bioenergy – Local energy production from biomass in Cuba	90,000.00		Disbursed	ODA	Grant	Mitigation	Other (Energy Generation, Renewable Sources)	
Mozambique/ Access to Sustainable Energy in Titimane. Integrated Rural Development Component in Mozambique.	67,989.00		Disbursed	ODA	Grant	Mitigation	Other (Energy Generation, Renewable Sources)	
Contribution to the Trust Fund for the Vienna Convention for the Protection of the Ozone Layer	5,553.00		Disbursed	ODA	Grant	Mitigation	Other (General Environmental Protection)	
Cape Verde/ Roadmap of Waste – Cabo Verde	862,500.00		Disbursed	ODA	Grant	Mitigation	Water and sanitation	
Sao Tome and Principe/ Bioenergy exploitation at São Tomé e Principe (São Tomé and Príncipe)	263,506.00		Disbursed	ODA	Grant	Cross-cutting	Other (Energy Generation, Renewable Sources)	

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2015 and 2016, where 2018 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as disbursed and committed. Parties will provide the information for as many status categories as appropriate in the following order of priority: disbursed and committed.

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] This refers to funding for activities that are cross-cutting across mitigation and adaptation.

Table8

Provision of technology development and transfer support[a,b]

Recipient country and/or region	*Targeted area*	*Measures and activities related to technology transfer*	*Sector[c]*	*Source of the funding for technology transfer*	*Activities undertaken by*	*Status*	*Additional information[d]*
Cape Verde	Adaptation		Other Multisector	Public	Public	Implemented	Programme "A Sustainable Development for Chã de Norte (NGO ADPM)": The major goal of this project is to establish a sustainable development of the Chã de Norte council throught a rational management of their natural resources and the use of low carbon technologies. As a result, this council will increase their climate change resilience and generate sustainable mechanisms of self-employment in order to decrease poverty and increase the community life conditions. Implementing Agency: Ministry for Rural Development of Cabo Verde, National Institute for the Water Resourses Management of Cabo Verde, Council of Porto Novo (Cabo Verde), Association Beira Mar - Chã de Norte.
Mozambique	Adaptation		Disaster prevention and preparedness	Public	Public	Implemented	Programme "Improved Resistance to Natural Disasters (NGO OIKOS)": Contribute to the increase of the Nampula and Zambezia region's resiliance to several disaster's levels (environmental, human, economic). Implementing Agency: OIKOS - Cooperação e Desenvolvimento (Portugal).
Guinea-Bissau	Adaptation		Agriculture	Public	Public	Implemented	Programme "Rice Resilience Reinforcement Program in the Bafatá and Contuboel sectors":
Mozambique	Adaptation		Other Multisector	Public	Public	Implemented	Programme "Implementation of pilot-projects for local actions of adaptation programs":
Cape Verde	Mitigation		Heating, cooling and energy distribution	Public	Public	Implemented	Programme "North Plateau – Water and Energy as Bases for the Sustainable Development of Communities in Santo Antão Island":
Cuba	Mitigation		Energy generation, renewable sources	Public	Public	Implemented	Programme "Bioenergy – Local energy production from biomass in Cuba":
Mozambique	Mitigation		Energy generation, renewable sources	Public	Public	Implemented	Programme "Access to Sustainable Energy in Titimane. Integrated Rural Development Component in Mozambique":
Cape Verde	Mitigation		Water and sanitation	Public	Public	Implemented	Programme "Roadmap of Waste": The goal of this project is to map the places, the technologies, the collection methods, the characterising data as well as define the capacity building actions and the legislative framework for Waste Mamagement in Cape Verde. Additionally, the project would undertake the demonstration of a specific technology for waste amangement that is most appropriate for the national/local circunstances that is also in line with the objectives of the UNFCCC for the waste sector. Implementing Agency: Government of Cabo Verde.
Sao Tome and Principe	Mitigation		Energy generation, renewable sources	Public	Public	Implemented	Programme "Bioenergy exploitation at São Tomé e Principe": The project aims to promote the use of renewable energy in Sao Tome. Its goal is to increase the capacities of the targeted population as well as the technical staff responsible for climate change adaptation and mitigation as well as operationalise the use of biogas in the context of a sustainable access to renewable energy in rural communities of Sao Tome and Principe. Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde.

[a] To be reported to the extent possible.

[b] The tables should include measures and activities since the last national communication or biennial report.

[c] Parties may report sectoral disaggregation, as appropriate.

[d] Additional information may include, for example, funding for technology development and transfer provided, a short description of the measure or activity and co-financing arrangements.

Table9

Provision of capacity-building support[a]

Recipient country/region	*Targeted area*	*Programme or project title*	*Description of programme or project* [b,c]
Cape Verde	Adaptation	Mainstreaming Adaptation to Climate Change in Development (IAMCD)	Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde
Sao Tome and Principe	Adaptation	Mainstreaming Adaptation to Climate Change in Development (IAMCD)	Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde
Mozambique	Adaptation	Mainstreaming Adaptation to Climate Change in Development (IAMCD)	Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde
Mozambique	Adaptation	Improved Resistance to Natural Disasters (NGO OIKOS)	Contribute to the increase of the Nampula and Zambezia region's resiliance to several disaster's levels (environmental, human, economic). Implementing Agency: OIKOS - Cooperação e Desenvolvimento (Portugal).
Cuba	Adaptation	Strengthening preparedness, response and resilience to drought in the provinces of eastern Cuba.	
Cape Verde	Mitigation	Capacity Building for Developing Strategies on Low Carbon Resilient	Develop the necessary skills to elaborate, implement and measure, report and verify (MRV) low emissions development strategies (LEDS) resilient to a changing climate and coherent with the National Development Plans and, broadly, the Mllenium Development Goals. Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde and the Government of Cabo Verde.
Sao Tome and Principe	Mitigation	Capacity Building for Developing Strategies on Low Carbon Resilient	Develop the necessary skills to elaborate, implement and measure, report and verify (MRV) low emissions development strategies (LEDS) resilient to a changing climate and coherent with the National Development Plans and, broadly, the Mllenium Development Goals. Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde and the Government of Sao Tome and Principe.
Mozambique	Mitigation	Capacity Building for Developing Strategies on Low Carbon Resilient	Develop the necessary skills to elaborate, implement and measure, report and verify (MRV) low emissions development strategies (LEDS) resilient to a changing climate and coherent with the National Development Plans and, broadly, the Mllenium Development Goals. Implementing Agency: Instituto Nacional de Meteorologia de Cabo Verde and the Government of Mozambique.
Cuba	Mitigation	Agro-Energy in Cuba	
Cape Verde	Mitigation	North Plateau – Water and Energy as Bases for the Sustainable Development of Communities in Santo Antão Island	
Mozambique	Mitigation	Access to Sustainable Energy in Titimane. Integrated Rural Development Component in Mozambique.	
	Mitigation	Contribution to the Trust Fund for the Vienna Convention for the Protection of the Ozone Layer	
Cape Verde	Mitigation	Roadmap of Waste	The goal of this project is to map the places, the technologies, the collection methods, the characterising data as well as define the capacity building actions and the legislative framework for Waste Mamagement in Cape Verde. Additionally, the project would undertake the demonstration of a specific technology for waste amangement that is most appropriate for the national/local circunstances that is also in line with the objectives of the UNFCCC for the waste sector. Implementing Agency: Government of Cabo Verde.

[a] To be reported to the extent possible.

[b] Each Party included in Annex II to the Convention shall provide information, to the extent possible, on how it has provided capacity-building support that responds to the existing and emerging capacity-building needs identified by Parties not included in Annex I to the Convention in the areas of mitigation, adaptation and technology development and transfer.

[c] Additional information may be provided on, for example, the measure or activity and co-financing arrangements.