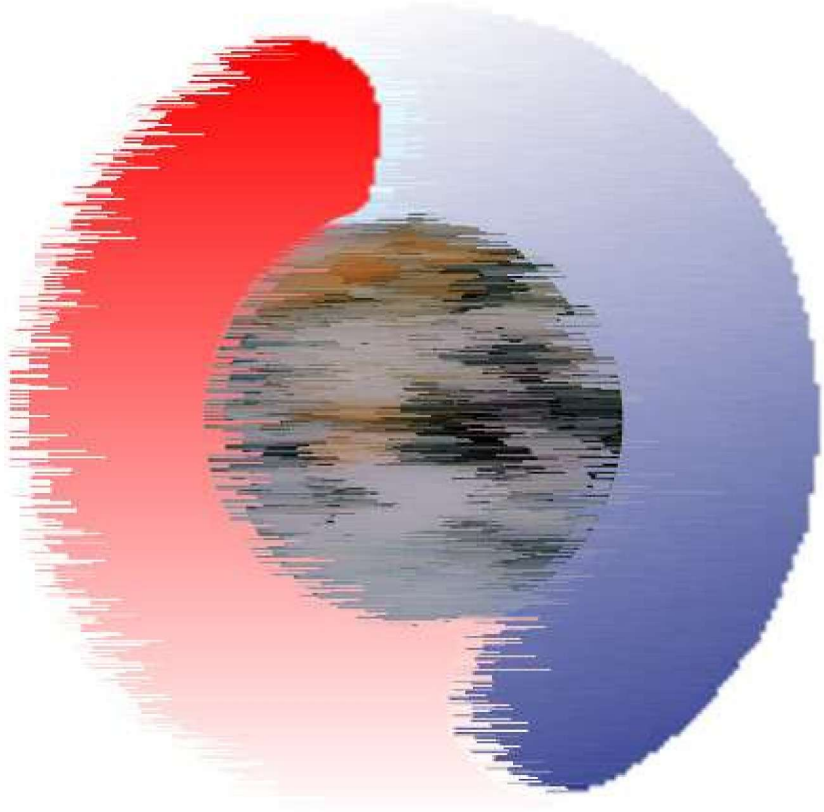


MINISTRY OF THE ENVIRONMENT
PORTUGAL
1997

PORTUGAL'S SECOND REPORT

TO BE SUBMITTED TO THE CONFERENCE OF THE PARTIES TO THE FRAMEWORK CONVENTION ON CLIMATE CHANGE

CONTENTS

PREFACE

Portugal, in conformity with Article 12, prepared the first Report as a Party to the Framework Convention on Climate Change in 1995. A major effort was made, in the said Report, to compile and collate the available information, both as regards the inventory of emissions and the projections for the year 2000, as well as in respect of the measures and policy actions designed to limit the growth of emissions of greenhouse gases.

Several things have happened since the time in question, both in the domestic sphere and in respect of the international environment affecting the Portuguese economy. There has been an upturn in economic growth in Portugal over the last few years, after a period of recession in which the performance of several sectors was below par. In the European sphere, the processes for the formation of Economic and Monetary Union have been consolidated and Portugal is in a position to be classified in the group of countries adhering to the single currency, starting in 1998. The improvement in economic growth will have an effect on energy consumption, particularly in those sectors such as transport and the domestic and services sectors in which our lack of development, in comparison to our Community partners, is more noticeable.

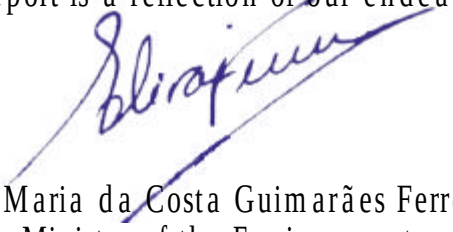
It is indispensable for Portugal, during this stage of its development and in line with the events which have occurred in the more industrialised countries, to separate economic growth from energy consumption. The process has, nowadays, been made much easier by access to new technologies which are more efficient from an energy and environmental viewpoint and which also corresponds to criteria of cost-effectiveness. It is in this sphere that most of the national endeavours have been concentrated.

By becoming a party to this Convention, Portugal has undertaken commitments has attempted to fulfill, not only in the policy sphere but also in financial terms. Several of these obligations are the result of the European area to which it is a party, while others, involve a framework of multilateral and bilateral cooperation.

It is particularly in the sphere of bilateral relations and the Commonwealth of Portuguese Speaking Countries that Portugal can, and will, continue to make a contribution to the extent of its financial, human, technical and scientific possibilities. Bilateral cooperation programmes have been entered into with Portuguese Speaking African Countries in the energy, forest and hydro resources sectors and which have a direct or indirect effect on climate change.It is Portugal's intention to continue to intensify its efforts to cooperate in this domain, and it will be concentrating on areas in which its intervention capacities may be more productive, principally in the fields of education, training research and technical assistance.

We are convinced that global issues cannot be effectively resolved without the participation of all countries and that this participation can only be guaranteed within a framework of improved cooperation in which the sharing of costs takes into account not only criteria of efficiency but also of equity. Portugal is, in this context, willing to go as far as its economic and social posibilities permit.

This Report is a reflection of our endeavour



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Minister of the Environment

EXECUTIVE SUMMARY

INTRODUCTION

In the sphere of information necessary for the preparation of this Report, it has, over the last two years, been possible to make a start on improving the data collection on the inventory of emissions, using definitive figures for 1994. The time span for the projection of energy consumption is now the year 2010, and the effects of several energy policy measures and actions - i.e. the introduction of natural gas which is currently in progress, on the future evolution of CO2 emissions, have become clearer. The improvements to information and, particularly, the collection date thereof, still fail to shows the quantitative changes which have occurred over the last few years and only future reports will consequently be in a position to confirm the trends which are now being identified.

In the sphere of international commitments and, as a member of the European Union, Portugal has, for the first time, accepted clear commitments with a view to limiting the growth of its emissions of greenhouse gases by the year 2010, using 1990 as the reference year. Although the referred to numbers (+40% in 2010, in comparison to 1990) may appear to be somewhat high, the endeavours which Portugal will be making to limit its emissions during the convergence stage of the more advanced European economies will be very important and will, inter alia, involve the need to take the following measures:

- A marked penetration of natural gas, not only in the electricity production sector, but also in industry and the domestic and services sectors;
- A continuous improvement to the energy intensity of GDP, inverting the trend of the last few years and converging with the average;
- The application of actions and measures tending to rationalise the use of energy together with a greater degree of exploitation of renewable energies

In this Report, which is based on 1994 data, it has still not proved possible to detect signs of the endeavours which are currently being made and which represent a policy committed to limiting the emission of greenhouse gases. More up-to-date data is needed in order to evaluate the incidence of the current measures

The Portuguese position, however, which was stated within the framework of the European Union as well as the Convention, is to continue to be the European country with the lowest per capita emissions, and to continue to developthe most suitable policies.

1. National circumstances

Portugal is located on the south eastern tip of Europe with a coastline of around 800 km. It has a series of topographical transitions from North to South and a total Mainland surface area of 9 189 892 ha. The territory is also comprised of the two archipelagoes of Madeira and the Azores, located in the Atlantic Ocean.

Portugal enjoys a temperate climate with average annual temperatures of between 7ºC -18ºC. Average annual precipitation values vary from between 3100 mm in the mountainous northern inland regions and 450 mm along the southern coast.

The Portuguese population stabilised during the 1981-1991 period, having been estimated at around 9 887 560 inhabitants in December 1993. This reflects the 0.23% growth occurring in 1993 (of which 0.08% was natural growth and 0.15% the result of immigration). Portugal has ceased to be a country of emigration and is now

a country of immigration in which immigrants are on the lowest rung of the job ladder.

Portugal is no longer one of the European countries with the youngest age structures and has been affected by a marked fall in the birth rate and an increase in life expectancy. This has increased the demographic ageing process over the last few years.

The resident population in Portugal is expected to be in the region of 9 987 450 persons in the year 2010. These figures will bring Portugal into line with the demographic patterns existing in other industrialised societies, particularly in Europe.

The territory is occupied by various small centres and there is a significant spread of small communities, together with the two metropolises of Lisbon and Oporto which, as a whole, account for more than 32% of the citizens living on the Mainland. 20% of citizens, on the other hand, live in communities of less than 200 inhabitants and around 80% of employment, in terms of industry and services, is located along the coastal area between the cities of Setúbal and Braga. The major urban centres of Lisbon and Oporto are responsible for around 50% of GDP (Gross Domestic Product).

Around 54% of the territory on the Mainland and the Autonomous Regions of the Azores and Madeira is used for agricultural purposes and of which 77% is comprised of what is termed as being the “Used Agricultural Area". There has been an increase in the areas used for permanent pastures in detriment to arable soil. Forests and other arboreal plantations cover around 64% of the territory which is mainly populated by wild pine and eucalyptus trees.

Livestock is respectively split up among fouls, sheep/goats, pigs and cattle.

Final Total Production in the agricultural economy has been falling significantly, although there was a slight degree of recovery in 1994. The explanation found for this occurrence is the diminution of Vegetal Production as a consequence of the particularly poor climate conditions recorded during the years in question.

The global performance of the Portuguese economy within a European context conducive to growth, was positive, having duly expanded over the 1985-1991 period. The average annual growth rate was 4.4%, although there was a downturn in demand starting in 1991. The rapid growth in GDP has been associated with intensification in opening up the Portuguese economy to outside forces.

There were increased exports in the light industrial sector, particularly in the case of automobiles and there has been a rapid increase in the level of services, which has been clearly visible in the increase in the share of production support services (banks, insurance and the provision of services to companies) as well as an expansion in the hotel sector.

Commerce represents 28% of GDP and 74% of imports are for semi-finished products and investment goods and 11% for energy related products. Most exports are still concentrated in the traditional products sector.

The Portuguese economic structure is characterised by a large industrial sector employing around 35% of the working population and in which agriculture represents only 20% and of which only 6%, in turn, has an effect on GDP. Tourism, with an annual growth rate of 7%, represents around 9% of GDP.

Of recent socio-economic trends, special reference should be made to the rapid 74% increase in unemployment over the 1992-1994 period. This was more marked in the metropolitan areas of Lisbon and Oporto.

Transport infrastructures have been one of the areas in which greater progress has been achieved and there have been significant improvements in accessibility and a major reduction of travelling time, particularly in the case of journeys by road.

There has been a rapid increase in the car ownership rate. The population/total number of vehicles ratio increased by 57% i.e. from 233 to 366 vehicles per 1000 inhabitants over the 1990-1995 period. There was also a slight improvement in the inhabitants/light passenger vehicle ratio from 5 to 3.

The above circumstance, together with the improvement in road infrastructures, has increased urban mobility, per person, by 3 900 Km, with an annual growth trend of 10%.

As regards the renewal of the number of vehicles on the road, the current average age of light passenger vehicles is 6.1 years, and represents a decrease of 50% since 1986. For other vehicles, the average age is: 5.6 years for light goods vehicles, 9.6 years for heavy goods vehicles and 4.1 years for motorbikes.

In supply terms, the energy sector in Portugal is highly dependent on overseas sources of which imported crude represented 71% of the total consumption of primary energy in 1995. During the same year, demand for final energy was particularly marked in the industrial and transport sectors which respectively accounted for 39% and 34%. The per capita consumption of energy in Portugal is still less than 50% of the Community average. The use of natural gas, starting in 1997, will make it possible to diversify supply and reduce dependence on crude imported from overseas.

2. Inventories

2.1 Anthropogenic Emissions

A national inventory of carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), nitrogen oxides (NOx) non methanol volatile organic compounds (NMVOC), carbon monoxide (CO) emissions for the 1990-1994 period was carried out. The inventory did not contain any calculations on the emissions of HFCs, PFCs and SF6, owing to the fact that they are not produced in Portugal and that it was impossible to quantify their imports.

The results, in accordance with IPCC recommendations, have been set out in Tables 2.1 to 2.5 and show that combustion processes in Portugal are the principal emission source of most greenhouse gases, and, consequently, the major contributing factors to Global Warming Potential (65 to 68% of the emissions expressed using this parameter).

Special reference should be made to the contribution (more than 90%) of combustion in national emissions of NOx, CO and CO2, and the significance of the transport and energy production sectors.

The principal emisison source of CH4, with a total emission of 808 Gg in 1990 and 827 Gg in 1994 was the deposition of solid and liquid wastes which are responsible for around 71% - 74% of total national emissions of this pollutant.

Estimates of N2O emissions show that combustion processes and agriculture are the major responsibles of the 14 Gg in 1990 and 14.1 Gg in 1994.

As regards compound pollutants which are globally referred to as NMVOC, whose total emissions varied during the 1990-1994 period from 258 to 294 Gg respectively, reference should be made to combustion processes with values of around 39% to 42% of the total emissions of this pollutant, followed by the use of solvents with around 29% to 33%.

These results do not include emissions from the consumption of fuel by aviation and international maritime transport, which, albeit having been calculated (See Annex A) have not been recorded in the national totals. The emissions resulting from the combustion of biomass are not included in the case of the pollutant CO2 and the net national total has been calculated by reducing net vegetal growth from the total national emissions.

2.2
Sink-holes

Owing to the state of its development, in comparison to the agriculture in the rest of the European Union (EU), Portuguese agriculture has low emission levels of pollutants and a highly favourable offset in its CO2 storage content.

The values of total quantity of carbon stored in the soil have been under estimated at 47 t of carbon per ha. The average annual level of storage content of carbon dioxide in Portuguese forests is 1.14 Tg of CO2.

3.
Policies and measures

3.1
Agrarian Sector

The objective of the EU's Common Agricultural Policy (CAP) is to diminish incentives to agricultural production, for which reason several of the support measures put into effect, and particularly those designed to protect the environment, encourage increases in vegetal production and animal husbandry with a consequent reduction of the use of fertilisers and heads of cattle, which makes it possible to reduce emissions of N2O and CH4.

Forestry measures, on the other hand, by encouraging the maintenance, expansion and protection of forests, will help to reduce or stabilise the rates of CO2 in the atmosphere, owing to the importance of forests as sink-holes.

3.2
Energy Sector

The guidelines established for national energy policy have been to meet the global objective of guaranteeing the country's supply and availability of energy for the amounts required, pursuant to price considerations satisfying the competitiveness of the national economy and respect for environmental conservation.

The various policies leading to the fulfillment of this objective are set out below:

- Energy Resources Policy, introduction of natural gas and increased use of national renewable sources of energy;
- Rational Use of Energy Policy;
- Technological Development Policy;
- Emissions Limitation Policy.

The principal guidelines for achieving the listed policies include:

- Diversification of the supply of primary energy through the use of natural gas for electricity production and final consumption, starting in 1997;
- Increased use of renewable energy sources for electricity production;
- Combined production of heat and electricity, in various industrial sub-sectors;
- Improved efficiency of thermal power stations and transport of electricity;
- A more rational use of energy in all sectors of final consumption;
- The application of new, more highly developed, albeit not necessarily innovative, technologies, and the upgrading of current equipment and installations;
- The introduction of several regulatory alterations with the objective of progressively reducing the sulphur content of fuels.

3.3
Industrial Sector

During the first five years of its membership of the EU, Portuguese industry succeeded in accompanying the rate of growth of Gross Domestic Product (GDP) notwithstanding the

continued existence of major regional asymmetries - a higher concentration of production and employment in the Northern, Central and Lisbon and Tagus Valley Regions, together with an increased degree of vulnerability to outside forces, owing to the predominance of traditional labour intensive and high energy intensity sectors in the productive structure.

Reference should be made to the fact that there are already signs of a broadening of the industrial specialisation base, taking into account the dynamism of metal and electrical materials industries, as well as several production sectors such as wood and cork, household stonework and vehicles.

Today's industrial development model includes living and environmental standards and is endeavouring to accompany the current industrial development model worldwide, in the form of an adequate industrial policy strategy i.e. its interface with the environment.

Industrial Policy has therefore generally, and, except for very specific instances, taken the form of a horizontal policy, targeted at companies, in which the Environment is considered as being one of the horizontal priorities of the same policy, with the objective of maintaining an adequate degree of convergence with "best industrial practices", on a European Union level. This signifies the existence of an industrial development strategy which is principally targeted at companies as opposed to an industrial sector based approach.

4.
Projections of CO2 emissions

Two projections for emissions of carbon dioxide were carried out. The first is the result of studies by the Directorate General for Energy, in 1995, encompassing measures considered as being acceptable for an endeavour to limit emissions, without prejudice to adversely affecting the country's economic development. The second, more restrictive, projection represents the national commitment in respect of the projected emission increases between 2000 and 2010.

5.
Climate vulnerability and the potential effects of climate change

Portugal is a country of contrasts, not only on a topographical and climate level but also on a level of ecosystems.

The geographical situation of Mainland Portuguese territory lends itself to the occurrence of episodes of drought, flooding and inundation as well as heat waves.

Special reference should be made to the phenomenon of desertification in the Alentejo and Algarve and in the eastern Trás-os-Montes and Beiras regions.

Reference should also be made to the increased rate of coastal recession. Erosion is already causing a recession of the coast-line and can represent as much as 1m per year in some regions. The foreseeable rise in average sea level could be the potential cause of storms along the coastline.

The alterations to the precipitation patterns on Mainland Portugal, particularly the reductions of the amount of precipitation in Spring, and especially in March, have an effect on both water resources and agriculture.

6.
Adaptation measures

The Flood Monitoring and Alert System was created for the close supervision of extreme phenomena such as flooding. The combination

of hydrological and hydraulic modelling in this system ensures a more rational operation of hydrographic basin sub-systems and provides it with a degree of forecasting flooding conditions downstream with more advance notice and the possibility of greater coordination of intervention by the competent authorities.

One of the Forestry Policy vectors is the promotion of the sustainable development of the sector and an agro-forestry base which is well adapted to ecological conditions. A Sustainable Development Plan for the Portuguese Forestry Sector is being drawn up, taking into account that forestry activity should be included as part of a holistic approach to the control of desertification. Portugal, also taking this phenomenon into account, has developed policies and measures designed to protect its subterranean and surface waters.

A study is being carried out on the problem of coastal erosion in connection with the increase in average sea level, and regulations have been adopted which will make it mandatory to consider the problem of the rise in average sea levels in all construction projects along the coast and, in particular, all coastal engineering and port works.

7. Financial assistance and technology transfers

The environmental issue, in itself, is still not considered to be a central priority of cooperation policy and is, to a certain extent, included in other sectors of intervention such as, inter alia, agriculture, fisheries, industry and tourism.

The total amount of Public Development Aid (PDA) in 1995 was 270 million US dollars, which represents 0.26%, of GDP at market prices.

Several bilateral actions were taken, particularly in the fields of education and training and support for the preparation of legislation on the environment.

Cooperation actions involved exclusively with environmental issues in 1995 came to around 0.5 million US dollars and took place mainly in Guinea-Bissau, Mozambique, Cape Verde and São Tomé and Príncipe.

8. Research and systemathic observation

Research activities are fundamentally supported by the Junta Nacional de Investigação Científica e Tecnológica (JNICT) and participation in Community Programmes such as PRAXIS XXI, which is co-financed by the European Commission as part of Structural Funds.

Within the sphere of Global Changes, and owing to the influence of the PRAXIS Programme, a series of new aspects such as the setting up of the National Committee for the International Geosphere-Biosphere Programme (IGBP) and the promotion of national and international cooperation are being introduced. Portugal, as a member of EUMETSAT (European Organisation for the Exploration of Meteorological Satellites) is participating in the planned creation of an SAF (Satellite Application Facility) Climate and is preparing the creation of an SAF Land.

Portugal is concerned over the need to formulate national strategies for fulfilling the principles and obligations of the United Nations Framework Convention on Climate Change. The regional, limited area models, integrated as part of General Circulation Models, will therefore play an important role in the evaluation of the effects forecast by climate scenarios in the different domains, as well as in the definition of adaptation measures.

9.

Education, training and public awareness

The structures of the Ministry of Education (ME) and Ministry of the Environment (MA), have concentrated on the need to support environmental education projects in basic and secondary education as well as kindergartens. These projects have been designed with a view to the horizontal integration of environmental issues as part of school programmes.

Reference should also be made to the nation-wide cooperation between the Ministry of Education and the Ministry of Agriculture, which has essentially taken the form of active participation in activities designed to increase the awareness of the population in general and students in particular, of the importance of the forest in planetary equilibrium, and particularly so as regards Protection of Forests from Outbreaks of Fire, and in the socio-economic and cultural domains of Mankind.

The issue of Climate Change has not been specifically dealt with on a basic and secondary educational level although it is subjacent to environmental issues in general and issues related with the atmosphere in particular. The subject matter is, however, dealt with directly on a level of the contents of several disciplines or from a transversal perspective in programmes.

10.

Territorial planning

Climate change has not been specifically considered within the scope of territorial planning policy although the latter does not ignore the fact that the rational use of natural resources and the protection of environmental quality are aspects which are covered by the policy in question and have been considered in the objectives of the different Territorial Plans.

1.
NATIONAL CIRCUMSTANCES

1.1
Geographical profile

Portugal, which is located on the south eastern tip of Europe with a coastline of around 800 km, has a series of topographical transitions from north to south and a total Mainland surface area of 9 189 892 ha.

The land north of the River Tagus is mountainous, rising to more than 400 m with a maximum height of 1991 m, excluding the plains of the basins of the Rivers Tagus and Vouga. Soils are predominantly acid, and range from extremely to moderately acid, with the latter soils being located in the Central Region. South of the River Tagus in the region of the Alentejo, the land is mainly at a height of between 50-400 m above sea level, with acid, neutral oil, albeit the former predominates and with a basic pH content of between 5.6-6.5. The Algarve, in the far south, has a continuously level coastline at a height of between 0-50 m above sea level, with soils ranging from acid in the plateau land, turning into neutral and predominantly alkaline soils on its plains.

Figure 1.1 - Köpen climate classification

The Archipelago of Madeira is located at a distance of around 1000 km Southeast of Mainland Portugal whereas the Archipelago of the Azores is located more than 1200 km to the West. The former has a total surface area of 77 892 ha, which is 232 967 ha in the case of the latter.

Portugal shares a common border of 1200 km with Spain. The border is intersected by the largest rivers (Douro, Tagus, Guadiana and Minho). The national rivers (Vouga, Mondego and Sado) tend to be shorter and more irregular.

According to 1993 data supplied by the National Statistics Institute, land use, by geographical distribution, is as follows: 40% of the territory is used for agriculture, 34% for forestry, 10% of the territory is occupied by constructions, pending applications and others and 16% is used for other purposes.

In the case of the Archipelagoes of the Azores and Madeira, the occupancy figures for the Azores are 46% for agriculture, 25% for forestry, 15% for constructions, pending applications and others and 14% for other uses whereas in the case of Madeira, the land occupancy is 9% for agriculture, 30% for forestry, 23% for construction, pending applications and others and 38% for other purposes.

1.2 Population profile

Population in Portugal, during the 1981-1991 period stabilised as a result of low natural growth rates and the return to negative emigration rates during which there was an approximate increase in population of 5%.

The resident population in Portugal in December 1993 was estimated to be 9 887 560 individuals, following the 0.23% growth in 1993. This figure for the effective growth rate was the result of a very low rate of natural growth of 0.08% during the year and a 0.15% increase in the rate of immigration. According to data supplied by the National Statistics Institute, the resident population in 1994 was estimated to be 9 912 160 individuals.

Portugal is no longer one of the countries in Europe with a younger age structure and has begun to experience problems caused by the progressive ageing of its population and the inability to fully replace its generations. There is a small annual deficit which has been increasing and in danger of becoming permanent and consolidated. Portugal has ceased to be a country of emigration and is now to turning into a country of immigration increasingly in demand.

Portugal is currently and simultaneously a country of highly selective departures and arrivals who occupy the lowest rungs on the professional ladder. Having recently suffered the maleficence of emigration on a major scale, the country is now experiencing the problems created by the arrivals of immigrants in search of better living conditions, the numbers of which are no longer inconsiderable.

According to Eurostat data, the recent effective growth in Portugal is one of the lowest to occur in European Union countries, as a consequence of low natural growth and an increase in immigration during most of the 80's, which did not prevent the already referred to increasing signs of foreign immigration. Reference should, however, be made to the fact that the immigration which has already occurred and currently in progress is almost exclusively based on economic considerations.

The marked fall in the birth rate and increased life expectancy, including improvements to the level of infant mortality, have accelerated the demographic ageing process over the last few years.

On the basis of current demographic knowledge, the most plausible profile for the evolution of the resident population in Portugal for the year 2010, is 9 987 450 individuals.

Portugal is therefore coming more into line with the demographic profiles of industrialised societies, particularly in Europe.

The pattern of territorial occupancy can be characterised as being an urban network of mainly medium sized centres with a large number of small communities. This signifies major dispersion in the occupancy of a large part of the territory.

Regional asymmetries in Portugal are very marked and the number of inhabitants living in coastal regions, in which two thirds of the population on Portuguese territory are concentrated, continues to increase. The major agglomerations of Lisbon and Oporto have more than 32% of the population although the rates of growth in these areas are showing signs of diminishing.

The population density is 324 inhabitants per square km along the coast between Setúbal and Braga, in contrast to inland areas with only 34 inhabitants per square km.

These asymmetries are further exacerbated by the phenomenon of ageing which is particularly noticeable in the inland part of the country and which has been the cause of a desertification process in several of the areas in question.

Figure 1.2 - Mean annual air temperature and precipitation values, (1961-1990)

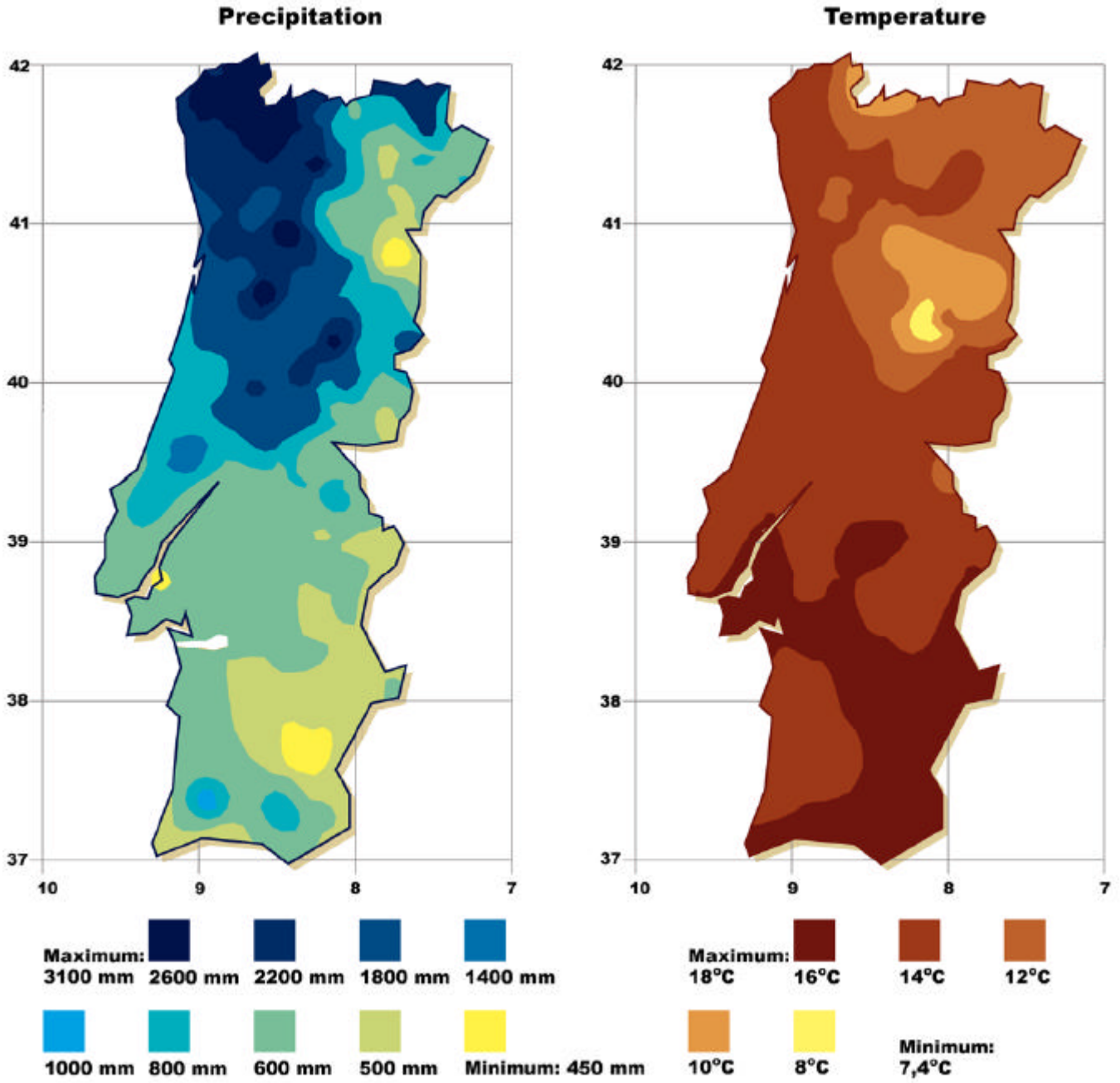


Figure 1.3 - Mean air temperature values for 1961 1990 period

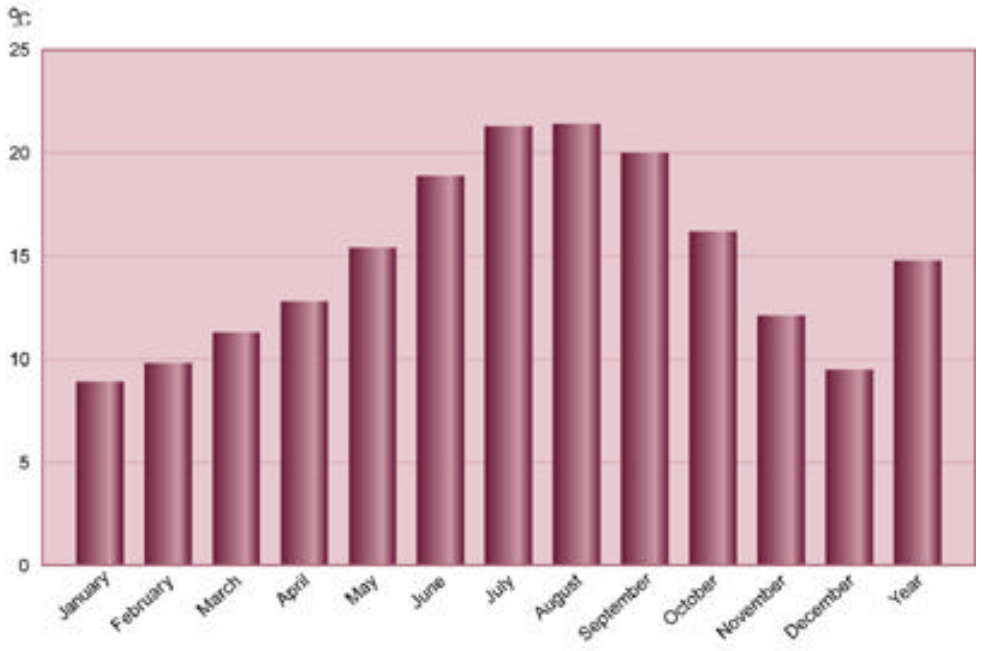
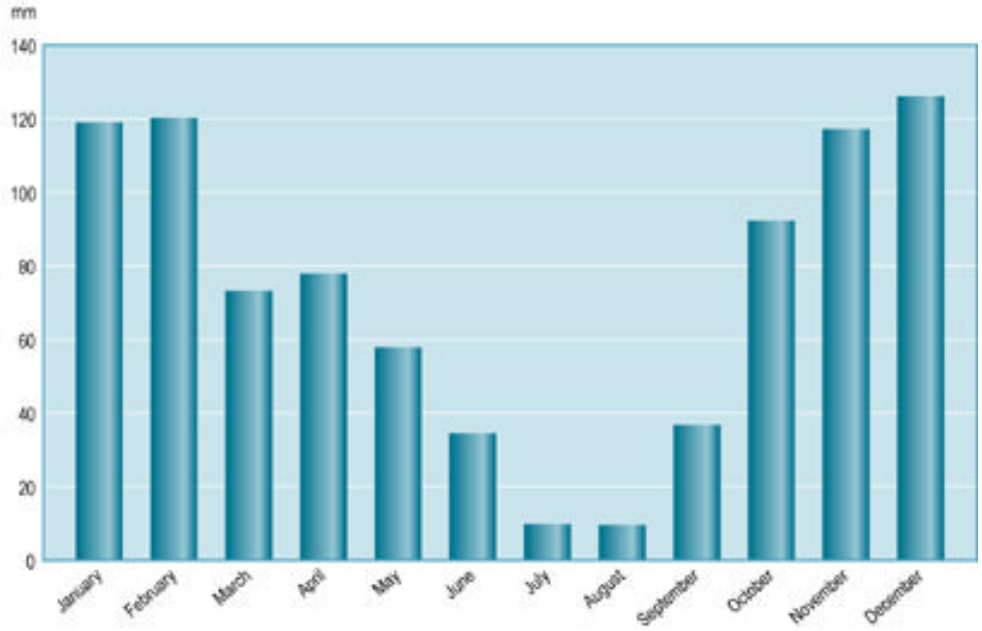


Figure 1.4 - Mean precipitation values for 1961-1990 period



Reference should also be made to the fact that around 80% of employment, in terms of industry and services, is located along the coast between Setúbal and Braga, which only represents approximately a quarter of national territory.

Therefore, by way of conclusion and after an examination of both demographic structures and development prospects, reference should be made to the following aspects: population ageing, regional asymmetries as regards communities and the recent emergence of immigration trends

1.3

Climate profile

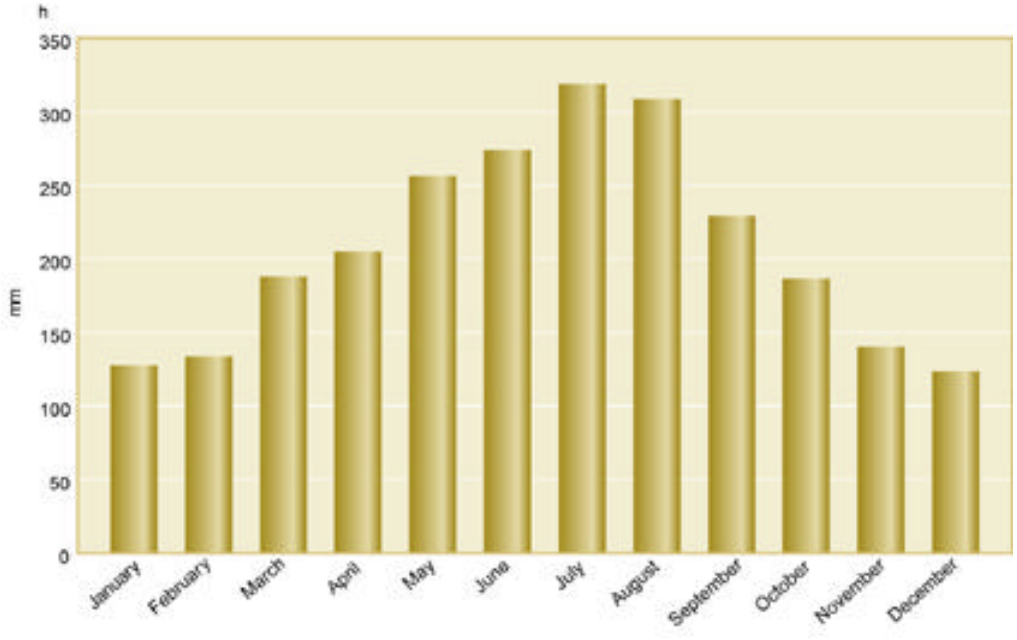
Characterisation

Mainland Portugal

Mainland Portugal, between latitudes 37° and 42°N, is located in the transitional region between the sub-tropical anticyclone and the sub-polar depression zones. The most conditioning climate factors on Mainland Portugal are, in addition to latitude, its orography, the effect of the Atlantic Ocean and its continentality. Mainland Portugal effectively has a latitudinal extension of only 5°. As regards altitude, the highest values are between 1000 m and 1500 m, with the exception of the Serra da Estrela, with around 2000 m. As regards continentality, the regions furthest from the Atlantic Ocean are around 220 km away.

Although the already referred to variation in climate factors is small, it is still sufficient to justify significant variations in the elements which are most characteristic of the climate i.e. air temperature, amount of precipitation and sunshine.

Figure 1.5 - Mean sunshine values for 1961 - 1990 period



According to the Köppen classification, whichis based on the average air temperature and amounts of precipitation and the correlated distribution of these two elements over the months of the year, the climate on Mainland Portugal is classified as Csa, i.e., a temperate climate (meso-thermal) with rainy winters and dry (Mediterranean) hot summers (mean air temperature in the hottest month of more than 22 °C), in the southern and northeast Transmontano (Hot Land) region, and Csb, idem with a warm summer (mean air temperature in the hottest month of between 10°C - 22 °C), in the northern, central and western coastal areas south of Cape Raso (Figure 1.1).

Air Temperature

The spatial distribution of the mean annual air temperature, based on observations made during the 1961-1990 period, is set out in Figure 1.2.

The mean annual air temperature values vary between 7°C in the inner highlands of central Portugal to 18°C in the southern coastal area. The mean monthly air temperature values vary regularly during the year, reaching their maximum in August and minimum in January (Figure 1.3).

The number of days of the year with a minimum temperature of less than 0°C reaches a peak in the highlands of the northern and central interior and is nil in the western coastal and southern zones. The heating degree-days (period between 1st October and 31st May), for a base temperature of 18°C, varies between 3000 in the central highlands and less than 1000 on the southern coast. The cooling degree-days (period between 1st June and 30th September) for a base temperature of 20°C varies between 50 in the highlands and 600 in the southeast part of the territory.

Precipitation

Mean annual precipitation on Mainland Portugal is around 900 mm, with a major degree of spatial variation and in which the highest values of around 3000 mm are to be found in the highlands of the northeast region (Minho) and the lowest on the southern coast and the eastern part of the territory with around 500 mm (Figure 1.2).

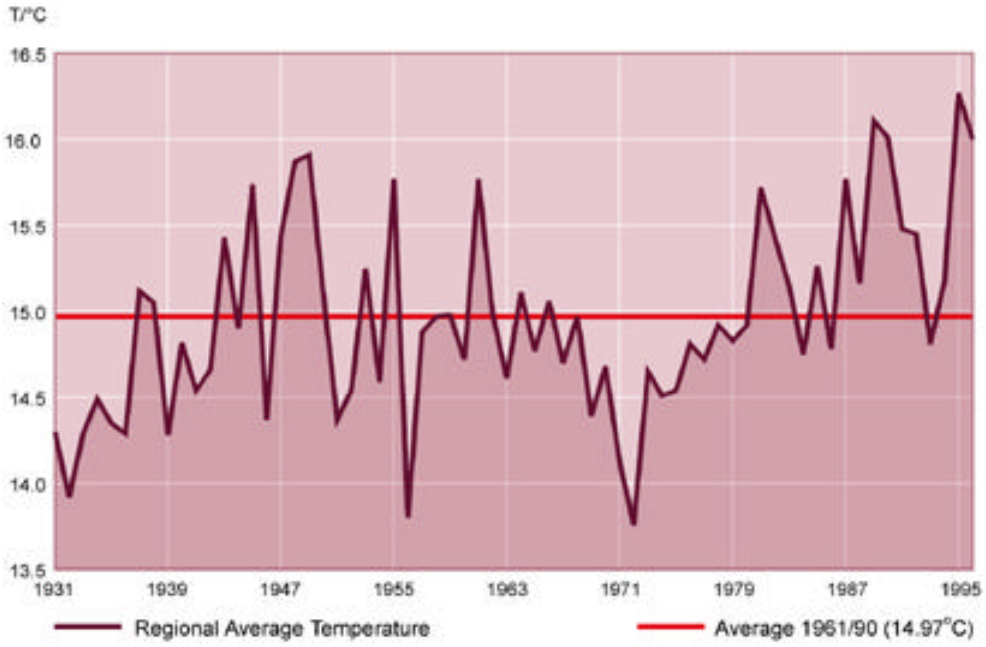
The wettest months are in winter and the driest months are July and August (Figure 1.4).

The average number of days in the year with precipitation of 10 mm or more varies between 15 and 25 days in the central coastal and southern regions of Portugal and the interior lowlands, between 25 and 50 in the northeast region and between 50 and 65 in the highlands.

Sunshine

There is, in general, a reduction of the annual average amount of sunshine from south to north, which varies depending on altitude, and from east to west. The lowest sunshine readings occur in the northeast of the territory (in the highlands of the Upper Minho region) with amounts of between 1600 h and 2200 h whereas the highest values occur on the southern coast, the eastern Alentejo and the Lisbon region with amounts of between 2600 h and 3300 h.

Figure 1.6 - Variability of regional average of the mean annual temperature - Mainland Portugal



Wind

The winds mainly blow in from a north to northeasterly direction on the western coast, except for the southern coast in which the winds are mainly southeasterly.

The occurrence of strong winds (wind speeds of 36 km per hour) and very strong winds (wind speeds of 55 km per hour) varies from location to location, although wind speeds are higher in the western coastal and highland regions. The number of days during the year with a wind speed of more than 36 km per hour varies between 30 and 50 days in the coastal region and around 70 days in the highlands.

North Atlantic Islands of the Azores and Madeira

Azores

The Azores has a temperate climate with the occurrence of all year round precipitation.

The annual average air temperature readings in the Azores are higher than those to be found on Mainland Portugal and those with an annual variation amplitude are even lower than those to be found on the Mainland coastal area.

The mean air temperature values reach a peak in August and a minimum in February. The number of days during the year with a minimum temperature of less than 0ºC is nil in the lower regions.

The heating degree days for a base temperature of 18ºC varies between 583 in Pico (with an altitude of 44 m) and 794 in Angra do Heroísmo (with an altitude of 74 m). The cooling degree days for a base temperature of 20ºC varies between 130 and 200.

The mean annual precipitation occurring during the year varies between 800 mm and 2200 mm. The mean annual sunshine values vary between 1500 h and 1900 h.

In the western and central islands, the winds blow mainly from the west and in the case of the eastern islands mainly from the northeast.

Madeira

Madeira has a temperate climate and is moderately rainy with rain to precipitation during the Winter.

The annual average air temperature readings in Madeira are higher than those to be found on Mainland Portugal (between 9°C -19°C). The mean monthly values reach a peak in August and a minimum in February. The number of days with a minimum temperature of less than 0°C during the year is around 13 in the mountainous regions and nil in the regions of lowest altitude.

The heating degree days for a base temperature of 15oC varies between 40 and 50 and for a base temperature of 18°C between 340 and 400. The cooling degree days for a base temperature of 24°C varies between 7 and 14 and for a base temperature of 20°C is around 200 (excluding the mountainous region).

Mean annual precipitation varies between 350 mm and 2000 mm in the highlands. Mean annual sunshine values vary between 1600 h and 2200 h.

Climate Evolution on Mainland Portugal

Mean Air Temperature

A statistical analysis of long climatological series of air temperatures on Mainland Portugal over the period between 1931 and 1996 shows that, starting in 1972, which was the coldest year during the period, there is a general trend towards an increase in the mean, annual surface temperature readings in which 1995 was the hottest of the last 66 years (Figure 1.6).

The variation occurring in the mean air temperature during the year for the 1961/90 period, in comparison to the 1931/60 period does not show any significant differences. There has specifically been an increase in the mean air temperature values during the Autumn and Winter and a decrease of temperature during the Spring (Figure 1.7).

Precipitation

An analysis of Figure 1.7 shows a significant reduction of the amounts of precipitation inthe Spring during the last 30 years, and particularly so during the month of March.

There is a trend for the rainy season to be shorter and for the wettest seasons to occur in Autumn and Winter.

An analysis of the variability of the amount of precipitation in Spring, on Mainland Portugal, for the period between 1931 and 1996 (Figure

1.8), also shows that there has been a significant fall in the amounts of precipitation, starting in 1964, in the country as a whole, (even if this has been more significant in the Beira Interior and Alentejo Regions, in which the reduction occurring during the 1961-1990 period in comparison to 1931-1960 was 27% and 23%, respectively).

Figure 1.9 shows the variability of the average regional amount of annual precipitation.

Figure 1.7 Variation of average monthly values for the 1961-1990 period in comparison to the 1931-1960 period

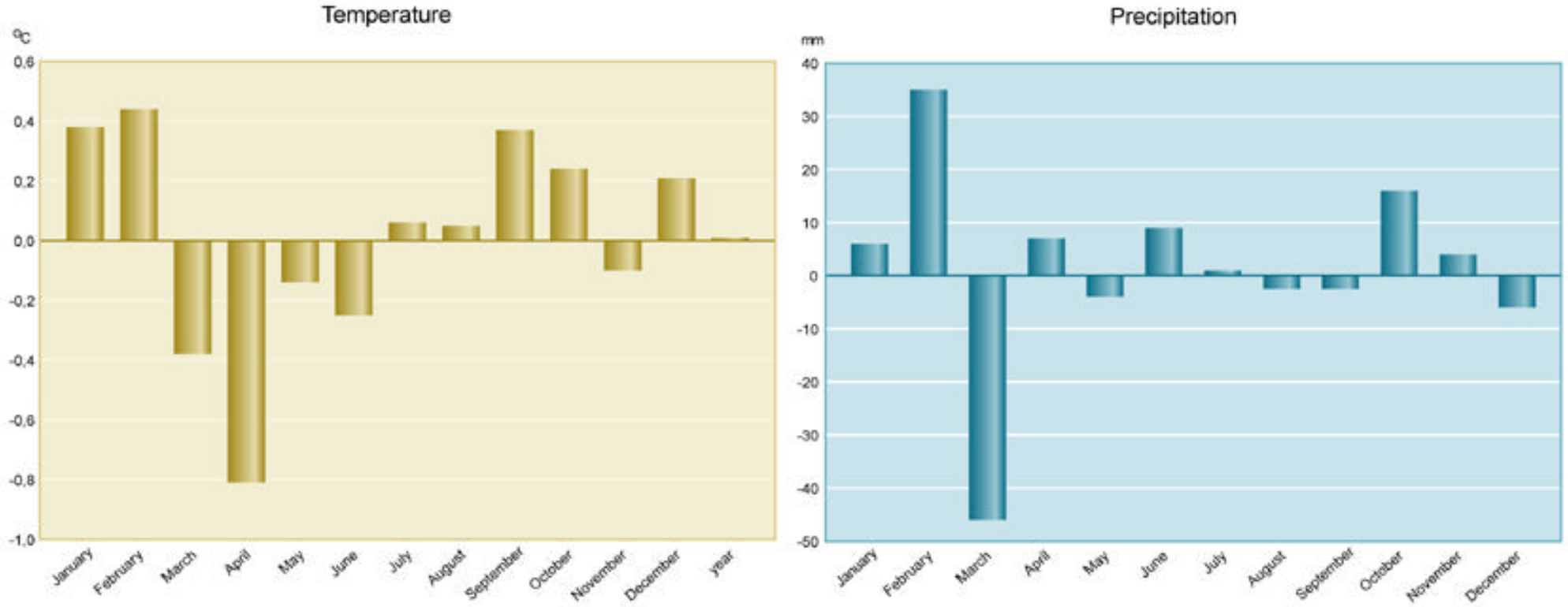


Figure 1.8 - Variability of Average Regional Amount of Precipitation in Spring - Mainland Portugal

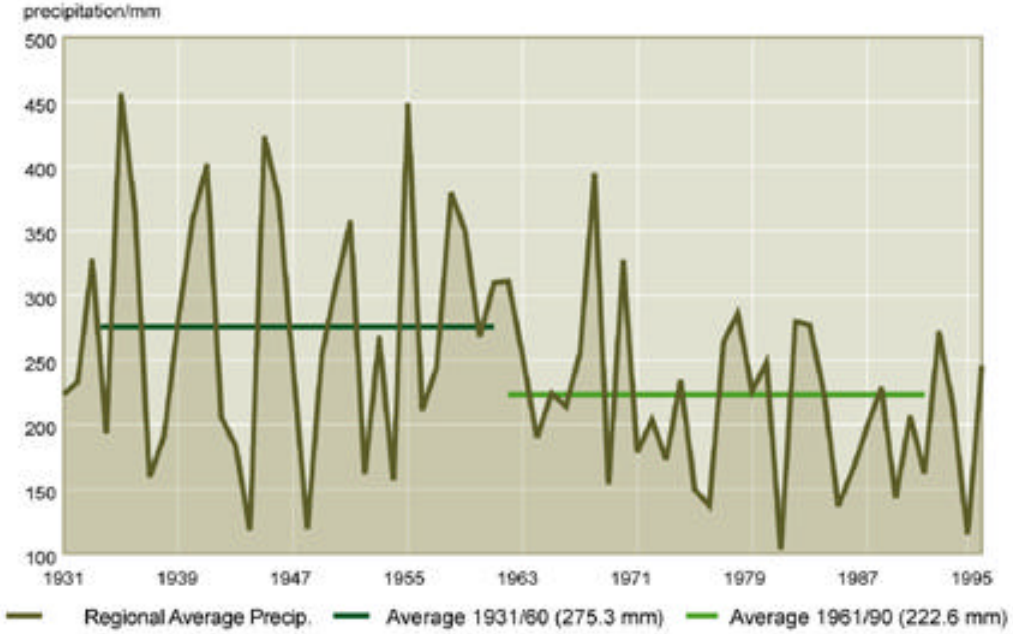
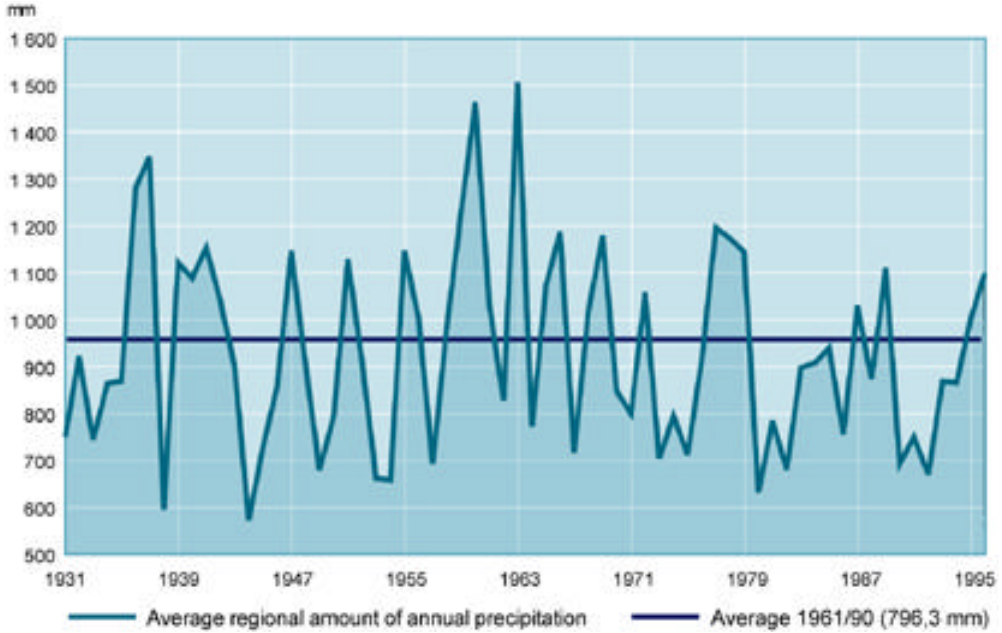


Figure 1.9 - Variability of Average Regional Amount of Annual Precipitation on Mainland Portugal



1.4 Agrarian profile

Several aspects of the agricultural economy

Table 1.1 sets out several aspects of the agricultural economy taken from the Agricultural Economic Accounts (CEA) published by the National Statistics Institute, at 1980 constant prices or current prices (in the case of the "Gross Income from Agricultural Activity" and "Gross Fixed Capital Formation" headings, for which figures at constant prices are not available), on the Mainland, for the annual series between 1990 and 1995.

An examination of the data available for the years being analysed shows that Final Total Production fell significantly, albeit evidencing a slight degree of recovery starting in 1994. The evolution is mainly the result of the behaviour of the Vegetal Production figures which can be explained by the poor harvests obtained as a consequence of the very poor climate conditions occurring during the years in question, owing to the fact that Animal Husbandry, with several slight ups and downs, has remained stable. Both Gross Value Added and Gross Income from Agricultural Activity reflect the evolution of Final Total Production.

Table 1.1 - Several aspects of the agricultural economy (Unit: PTE 106)

HEADINGS	YEARS 1990 (a)	1991 (a)	1992 (a)	1993 (a)	1994 (a)	1995 (b)
Final Vegetal Production	90 810	84 452	73 687	61 149	70 451	70 521
Final Animal Production	97 596	95 797	99 100	102 988	99 745	100 543
Final Total Production (1)	191 342	183 664	176 138	167 011	172 748	173 413
Intermediate Comsumption	71 680	71 409	65 791	65 450	65 365	65 365
Gross Value Added at Market Prices (2)	119 662	112 255	110 347	101 561	107 383	108 048
Gross Income from Agricultural Activity (3)	269 107	265 333	216 824	180 300	269 102	302 346
Gross Fixed Capital Formation	80 061	80 061	79 099	75 935	74 769	n.d

Source: INE, Agricultural Statistics - 1994 and Agricultural Statistics - 1995
(a) Provisional data (Base 1977).
(b) Agricultural Income Index: forecasts (Base 1977) calculated on data available in January 1996.
(1) = Final vegetal production + Final animal production + Project works.
(2) = Final production - Intermediate consumption.
(3) = Gross operating surplus [= Gross value added at factor costs (= Gross value added at market prices + Subsidies - Taxes associated with production excluding VAT) - Wages of workers] - Rents and other pecuniary payments and payments in kind - Interest

Figure 1.10 - Several aspects of the agricultural economy (I)

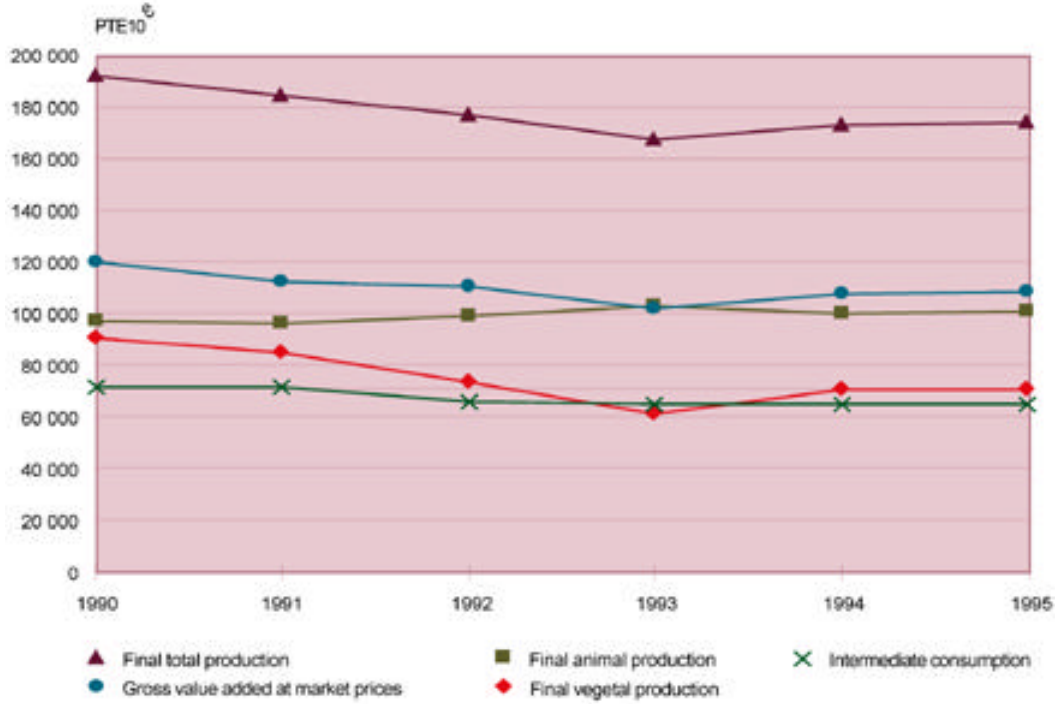
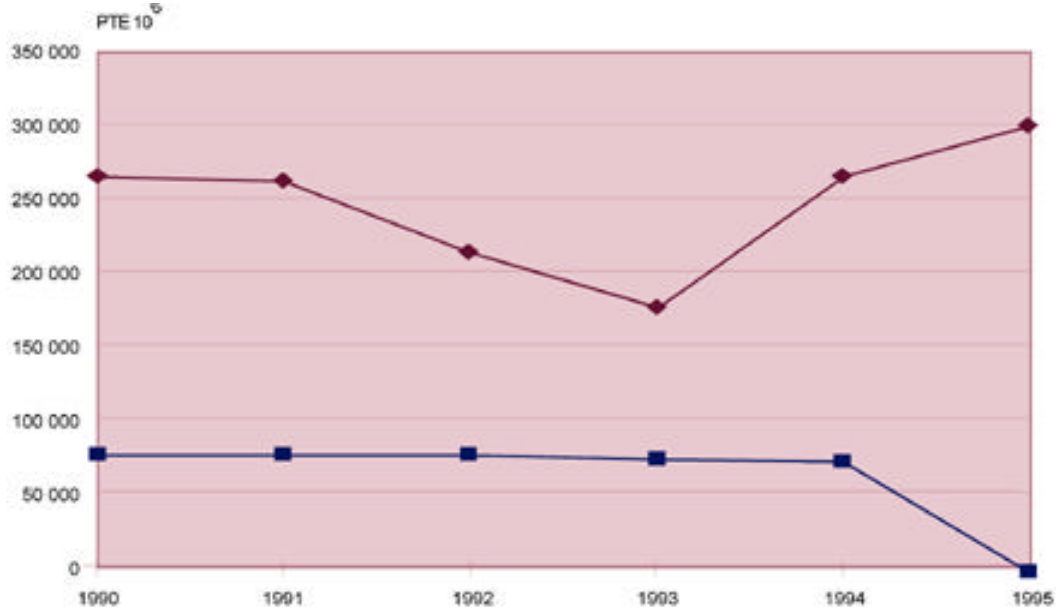


Figure 1.11 - Several aspects of the agricultural economy (II)



Used Agricultural Surface (SAU) and composition thereof

Of the area of approximately 9.2 million hectares of national territory (Mainland and Autonomous Regions of the Azores and Madeira), around 5 million (54%) constitutes the Total Agricultural Surface * (sum of the agricultural surface in use, forestry surface, agricultural surface not in use and other surfaces). Of the latter, around 3.9 million hectares (77%) constitute what is referred to as the Used Agricultural Surface (SAU). The Used Agricultural Surface (SAU) is comprised of arable land (cleared and covered by woods and forests), permanent crops, permanent pasture land and family type vegetable plots. The respective areas for the different regions (NUTS I Region, NUTS II Region and Agrarian Region) and percentages are set out in Table 1.2.

The composition of the SAU, which is similarly divided up, is set out in Table 1.3. The data has been supplied by the Surveys Division (formerly ex-IEADR) and now the Office of Planning and Agro-Food Policy (GPPAA) of the Ministry of Agriculture, Rural Development and Fisheries (MADRP).

Table 1.2 - Used Agricultural Surface (ha) - 1995

NUTS I NUTS II AGRARIAN REGION	TOTAL AGRICULTURAL SURFACE (ha)	S.A.U.	
		AREA (ha)	%
PORTUGAL	5 084 776	3 924 623	77.18
MAINLAND	4 929 403	3 800 381	77.10
NORTH	1 043 008	735 428	70.51
Entre-Douro and Minho	391 390	239 463	61.18
Trás-os-Montes	651 618	495 965	76.11
CENTRAL	1 032 760	646 842	62.63
Beira Litoral	376 507	205 704	54.63
Beira Interior	656 253	441 138	67.22
LISBON AND TAGUS VALLEY	712 353	483 832	67.92
ALENTEJO	1 913 756	1 800 536	94.08
ALGARVE	227 526	133 743	58.78
AZORES	143 142	116 881	81.65
MADEIRA	12 231	7 361	60.18

Source: INE/GPPAA and Regional Agricultural Directorates (DRA's), 1995 Survey on the Struture of Agricultural Operations

Figure 1.12 - Used Agricultural Surface (%) - 1995

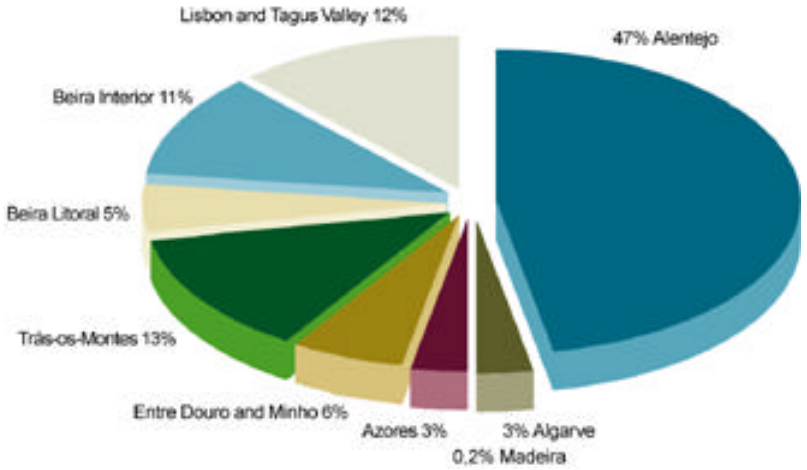


Figure 1.13 - Composition of Used Agricultural Surface

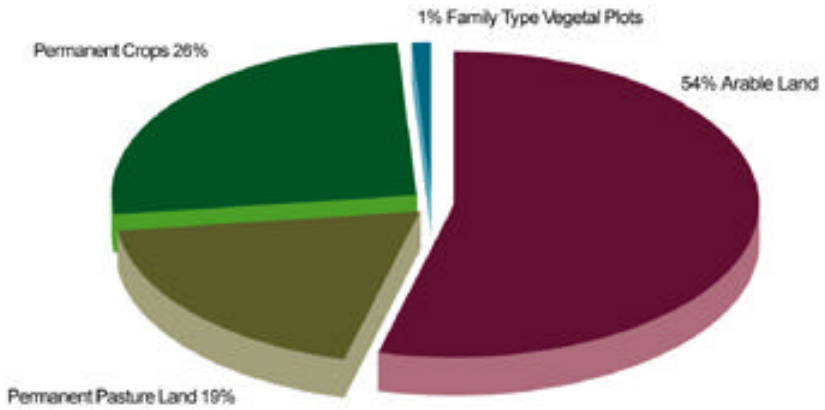


Table 1.3 - Composition of Used Agricultural Surface (ha) - 1995

NUTS I NUTS II AGRARIAN REGION	ARABLE LAND	PERMANENT CROPS	PERMANENT PASTURE LAND (1)	FAMILY TYPE VEGETABLES PLOTS (2)
PORTUGAL	2 153 274	746 976	1 052 798	30 127
MAINLAND	2 138 758	739 156	950 882	29 468
NORTH	367 040	227 800	141 272	10 412
Entre-Douro and Minho	147 489	40 455	51 820	3 336
Trás-os-Montes	219 551	187 345	89 452	7 076
CENTRAL	355 987	147 323	146 599	11 427
Beira Litoral	137 095	52 963	17 212	6 542
Beira Interior	218 892	94 360	129 387	4 885
LISBON AND TAGUS VALLEY	240 664	147 801	99 596	4 075
ALENTEJO	1 104 406	162 019	552 947	2 439
ALGARVE	70 661	54 213	10 468	1 115
AZORES	11 309	3 920	101 653	536
MADEIRA	3 207	3 900	263	123

(1) Sum of area of Permanent Pasture Land on Cleared Land, Wooded and Forestry Areas with Crops under Cover of Permanent Pasture Land and Permanent Crops area with Permanent Pasture Land. Please note that the total area of 28 421 hectares of Permanent Crops with Permanent Pasture Land has been recorded in the total area of Permanent Crops.
(2) Sum of the area of Family Type Vegetable Plots on Cleared Arable Land, Wooded and Forestry Areas with Crops under Cover of Family Vegetable Plots and Permanent Crops Area with Family Type Vegetable Plots. Similarly, the total area of 2 302 hectares of Permanent Crops with Permanent Family Type Vegetable Plots have already been recorded in the total area of Permanent Crops.

Livestock

Table 1.4 lists livestock by categories in 1995. Data supplied by the Livestock Survey as at 1st December 1995 (Provisional) for cattle, sheep, goats and pigs, and the 1995 Survey on the Structure of Agricultural Operations for poultry and horses have been used for the preparation of this table

Table 1.4 - Livestock - 1995

CATEGORIES	No. of ANIMALS (1 000)
Cattle (beef production)	960.0
Cattle (milk production)	364.0
Goats	799.0
Sheep	3 428.0
Pigs	2 402.0
Horses	34.7
Mules and asses	74.1
Gallinaceans	29 974.0
TOTAL	38 035.8

Source: GPPAA and DRA's/INE, 1995 Survey on Livestock (Provisional) and 1995 Survey on Structure of Agricultural Operation

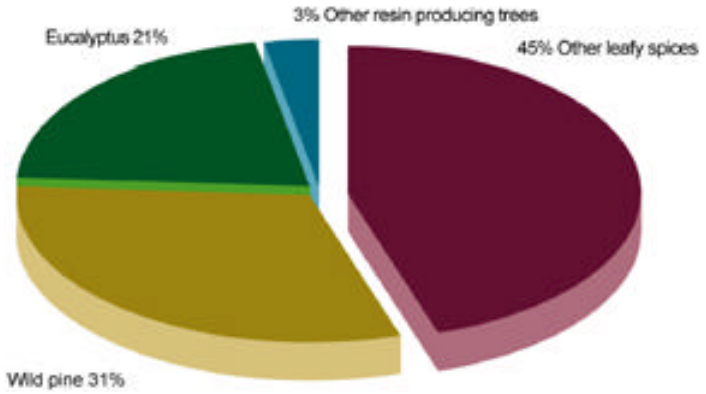
Rice Cultivation

Table 1.5 shows the rice cultivation area in 1995.

RICE CULTIVATION AREA (1000 HA)	21.646

Source: GPPAA and DRA's

Figure 1.14 - Distribution of Forestry Areas by Species (%) - 1995



Consumption of nitrogen based fertilisers

Table 1.6 shows the total consumption of nitrogen based fertilisers in 1995. It was decided to maintain the former figure (1993) in respect of maximum consumption owing to the non existence of available statistics to allow the real consumption to be quantified, not only owing to the fact that there is no longer any border control on intra-Community goods operations because of the Internal Market, but also on account of the fact that the consumption is highly irregular and very heterogeneous, both on a territorial and crop level.

Table 1.6 - Consumption of nitrogen based fertilisers -1995

CONSUMPTION OF FERTILISERS (1 000 t)	130

Source: Directorate-General for Industry (DGI), IEADR

Forestry Area

Portugal has a forestry area of around 3.3 million hectares, in which the distribution by principal species is set out in Table 1.7. There is a predominance of wild pine (Pinus pinaster) and eucalyptus (Eucalyptus globulus).

Table 1.7 - Distribution of forestry areas by species (ha) - 1995

SPECIES	AREA (103 ha)	%
Wild pine	1 034	31
Eucalyptus	700	21
Oth. resin prod. trees	108	3
Oth. leafy species	1 465	45
TOTAL	3 307	100

Source: Directorate General for Forests (DGF), National Forest Inventory

1.5 Economic profile

The evolution of the economic situation in Portugal, over the last decade, has been marked by its membership of the European Community and the implementation of a vast range of structural reforms.

The global performance of the Portuguese economy during this period was positive, having benefited from a good economic environment in Europe and having gone through a period of expansion lasting from 1985 to 1991 (with an average annual growth rate of 4.4%), at which point in time the economy started to slow down.

The rapid growth in GDP was associated with an intensification of the degree of the opening up of the Portuguese economy to outside forces. A major role was also played by public investment which was particularly targeted at the construction of infrastructures and private projects benefiting directly from Community Structural Funds.

The sources and effects of the transformations occurring in the Portuguese economy varied greatly from sector to sector, in which the following was observed:

- a significant reduction of the weight of the primary sector in total employment and GVA;

- a reduction also ocurringof the global weight of industry although there was an increase in light industry exports, particularly in the automobile sector;

- a major expansion of services, with special reference to the market shares of production support services (banks, insurance companies and the provision of services to companies) and the hotel sector, in GVA as a whole.

These transformations are associated with increased rural desertification and the continued trend towards the locating of economic activities in coastal areas. Around 80% of manufacturing industry is located between Cávado and the Setúbal Peninsula, in which there is a varied range of industrialised activities.

National specialisation continues to be associated with mature sectors (textiles and wood) and is still based on low labour costs, which characteristics, in a framework of the rapid liberalisation of international trade, leaves Portugal in an extremely delicate position in comparison to the competitive capacities of emerging economies.

The growth in Community demands, however, and the reduction of customs barriers, has caused a deterioration of the national balance of payments. Growth in GDP went back to the 2.2% mark in 1991 and was 1.4% in 1992. This slowdown was the result of lower exports, associated with the weakening of the world economy.

Trade (imports and exports) represents 28% of GDP. Semi-finished and capital products represent 74% of imports and energy products 11%. This increase in economic activity has been accompanied by a growth in imports. Notwithstanding the vitality and growth occurring in the mechanical and transport equipment sectors, access to other markets inside the EU has not, as yet, led to a major degree of diversification of exported products. There has, on the contrary, been greater concentration on traditional products such as textiles, clothing, wood, paper and cork.

The Portuguese economic structure is characterised by a large industrial sector share (namely textiles and metals) employing 35% of the working population, in contrast to the agricultural sector, which only represents 6% of GDP, and employs around 20% of the workforce. Tourism, which is growing at a rate of 7% per annum, represents around 9% of GDP.

1.6
Energy profile

The Portuguese energy sector can be characterised, in terms of supply, by a huge dependence on overseas sources owing to the country's low level of energy resources (hydropower, biomass and other renewable sources of energy).

Energy dependence on overseas sources was around 90%, in 1995, in which crude imports represented 71% of the total consumption of primary energy. As regards the demand for final energy in 1995, the proportional consumption of the principal sectors of economic activity were 39% by industry, 34% by transport, 12% by the domestic sector and 7% by services. This clearly evidences a major consumption by industry and transport.

Per capita energy consumption in Portugal is 50% less than the Community average. This is partly the result of a lower degree of comfort of the population in general and a low level of car ownership and mobility in comparison with the European Union average. There will therefore continue to be a trend towards increased energy consumption by the domestic/services and transport sectors.

The country is, on the other hand, adapting to the dynamics of energy markets, taking into account the European area to which it belongs and the globalisation of markets.

The adaptation of the energy system is being carried out in the form of privatisations of the major national energy producers and distributors which is are still in progress, together with a diversification of energy sources, particularly through the use of natural gas on an industrial and domestic level, which is soon to be followed by the production of electricity.

The Energy Programme has helped to reinforce energy infrastructures on a level of natural gas, in parallel with an increased use of endogenous energy resources, particularly renewable energy sources and the promotion of energy efficiency by means of incentives designed to stimulate the rational use of energy in all sectors of economic activity.

The first use of natural gas at the beginning of 1997, will diversify the energy supply structure and reduce dependence on crude from overseas sources.

The environmental effects derived from the use of natural gas will be highly relevant owing to the reduction of emissions of CO2, because of the partial replacement of petroleum and coal products by the fuel in question, not only on an industrial and domestic level but particularly owing to its use by power stations producing electricity. The first natural gas power station is shortly expected to come into operation.

1.7 Social profile

The growth in middle class employment is one of the most important reflexes of the recent evolution of the Portuguese economy. The endeavour to modernise and restructure production has, however, been accompanied by an increase in several inequalities in the distribution of income, made worse by the recent segmentation between stable and “precarious” employment as well as in the case of the “formal” and “informal” (i.e. parallel or black) economy.

Of recent socio-economic dynamic trends, special reference should also be made to the recent, albeit rapid, rise in unemployment which increased by 74% between 1992 and 1994. From a regional viewpoint, the problem is more serious in the metropolitan areas of Lisbon and Oporto.

The transport infrastructures areas has been one of the areas in which the highest rate of progress has been achieved over the last few years and in which significant improvements have been made to accessibility while also significantly reducing travelling times between different urban centres, particularly by road.

There has, at the same time, been a highly significant growth in the global demand for transport which increased by 125% between 1970 and 1980 and 67% between 1980 and 1991.

1.8 Mobility

There was a 112% increase in the total number of cars in circulation in Portugal between 1986 (year of EU membership) and 1995. There are currently 3,425,852 vehicles in circulation.

The ratio between population and the total number of cars increased by 233 vehicles per 1000 inhabitants in 1990, to 366 in 1995, i.e. 57% over the period of time in question.

The inhabitants per light passenger vehicle ratio, in turn, improved from 5 to 3.

These factors, together with improvements to road infrastructures, have led to a greater degree of urban mobility per person of around 3,900 km with a 10% per annum growth trend.

New car purchases have diminished and the average age of light passenger vehicles is 6.1 years which is a reduction of 50% over 1986. The average age of other automobiles is 5.6 years in the case of light goods vehicles, 9.6 years for heavy goods vehicles, 11.6 years for heavy passenger vehicles and 4.1 years for motorbikes.

Based on fuel consumption, the total national number of automobiles has expanded at a rate of between 5% to 6% per annum. Reference should be made to the prohibiting of the sale of low octane petrol since 1993, the maintenance of sales of high octane petrol of 1.2 million tonnes and the increased sales of unleaded petrol of around 20% per annum owing to the enforcement of the use of this type of fuel on petrol driven vehicles and the fitting of catalysers or equivalent systems.

The diversification of the total number of automobiles in Portugal has been very slow as regards other less polluting types of fuel, particularly LPG (liquefied petroleum gas) which is currently used by a total number of 18 thousand vehicles, namely light passenger vehicles together with several experiments which are being carried out with heavy passenger vehicles used on urban and suburban transport routes.

The number of electric vehicles in urban circulation is insignificant owing to their high cost, particularly when compared to vehicles of a similar category. They do, however, represent a solution which helps to promote improvements to air quality.

2. INVENTORIES

2.1 Methodology

The inventories prepared as part of this communication have provided estimates of the emissions of the following pollutants: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), nitrogen oxides (NOx), non methane volatile organic compounds (NMVOC), and carbon monoxide (CO).

No reference is made to emissions of the pollutants HFCs, PFCs and SF6, owing to the fact that Portugal does not produce them and it was not possible to record imports up until the date of the preparation of this report.

The national inventory of atmospheric emissions was not only prepared to cater for the demands of the United Nations Framework Convention on Climate Change but, also, for other international commitments of which special reference should be made to the CORINAIR 94 Programme and EMEP.

Contrary, however, to the other inventories, the estimates set out in this report refer only to anthropogenic emissions and do not include forestry emissions which are the particular cause of volatile organic compounds. In addition, as regards the contribution to emissions of the pollutant N2O made by agriculture, an estimate has only been provided of the increase in emissions caused by the use of fertilisers and no account has been taken of the total emissions derived from biological processes on a soil level. This explains why the figures set out in this report are occasionally lower than the estimates published in other inventories such as CORINAIR.

Emissions of CO2 have been obtained through the conversion of CO, CH4 and NMVOC resulting from fossil fuels (combustion, fugitive emissions and the use of solvents) using the IPCC methodology.

Owing to the fact that emission values for gaseous pollutants for the years under analysis, measured at source, are not available, they have been calculated from the balances of mass and emission factors. These factors have, as far as possible, been compiled in such a way as to characterise the emissions from the diverse sectors in Portugal and, consequently, the sources of pollution.

The data collection for calculating atmospheric emissions in Portugal is normally carried out as a separate exercise in respect of area and specifically defined sources.

Accordingly, the data used for the preparation of the annual national inventories of atmospheric emissions existing in Portugal, between 1990 and 1994, as regards area sources, have been obtained from the national statistics on fuel consumption, the use of solvents, number of cattle, agricultural and forestry areas.

Emissions resulting from large point sources (thermal power stations, oil refineries, steelworks and pulp and paper manufacturing plants) have been estimated on the basis of more detailed information which has been supplied by the actual manufacturing plants producing the emissions.

The emission factors estimate the emission on the basis of a magnitude or set of magnitudes characterising the polluting activity. They can be interpreted in their more strict sense, in which only an activity level factor is applied, or in a more elaborate manner, through the use of calculation algorithms. The choice was made after carrying out an exhaustive data collection exercise based on various international sources. Of the principal sources, special reference should be made to CORINAIR/EMEP, IPCC, the Environmental Protection Agency of the United States of America and the Dutch Ministry of Planning.

The estimate of road transport emissions has been based on COPERT methodology and emission factors.

The mass balances were only applied to pollutants used in the composition of fuels, the total amount of which is emitted during the burning process. This is the case of CO2 which is calculated on the basis of the carbon content of the fuels.

Global Warming Potential has only been calculated on the basis of carbon dioxide, methane and nitrogen oxide pollutants.

The factors used for converting CH4 and N2O to GWP were 21 and 321 respectively.

2.1.1 Categories of Pollution Sources

The principal categories of pollution sources considered in the IPCC are set out below:

1A Fuel Combustion Activities - Energy related activities, including combustion and fugitive emissions resulting from the use of fuel. This includes the following sub-categories:

1A1 Energy and Transformation Industries - Emissions caused by the burning of fuel in energy production activities and the conversion of forms of primary into secondary energy.

1A1a Electricity and Heat Production - Emissions resulting from public and private electricity production activities, also including emissions from co-generating equipment;

1A1b Petroleum Refining - Includes the emissions from the use of fuel in oil refineries as well as other production emissions other than fugitive emissions;

1A1c Solid Fuel Transformation and other Energy Industries - Emissions occurring in the steel industry and associated with the production of secondary fuels (blast furnace gas and gas produced from coke);

1A2 Industry - Emissions from the final combustion of energy in industry, except combustion resulting from co-generating equipment;

1A3 Transport - Emissions from combustion and fuel evaporation from all transport activity;

1A3a Civil aviation. Emissions resulting from the burning of fuel by the domestic aviation fleet;

1A3ai International Aviation (international

bunkers) - Part of the emissions resulting from the sale of fuels to foreign airline companies. This category has not been included in the national total;

1A3aii National Aviation - Part of the emissions associated with national companies;

1A3b Road Transportation - Emissions resulting from the use of fuels by road vehicles;

1A3c Railways - Emissions resulting from the use of fuels by rail transport;

1A3d Navigation;

1A3di International Navigation (international bunkers) - Part of the emissions resulting from the sale of fuels to overseas companies. This category has not been included in the national total;

1A3dii National Navigation - Part of the emissions associated with national companies, excluding the coastal and deep sea fishing activities incorporated in 1A4c;

1A4Small Combustion - Includes the following component categories;

1A4a Commercial/Institutional - Emissions from combustion in commercial and institutional buildings;

1A4b Residential - Emissions from combustion in the domestic consumption sector;

1A4c Agriculture/Forestry/Fishing - Emissions from combustion in agricultural and forestry activities, including vehicles, pumps and other types of machinery. Also includes emissions resulting from combustion in coastal and deep sea fishing sector.

1A5 Other - Specifically includes the use of fuels in civil construction activity;

1B Fugitive Emissions from Fuels - Emissions of CH4, and fugitive NMVOC and CO2, (not combustion) emissions derived from the production, transmission, storage and distribution of fossil fuels. The emissions of CO2 are the sum of the total of emissions of methane and other volatile organic compounds;

1B1 Solid Fuels - Emissions resulting from coal mining activity;

1B2 Oil and Natural Gas - Fugitive emissions resulting from the exploration, transport, refining and distribution of crude oil, natural gas and products thereof. Includes the following categories:

1B2a Oil - Includes the following categories:

1B2ai Exploration;

1B2aii Production of crude oil;

1B2aiii Transport of crude oil - Emissions resulting from crude oil loading and unloading activities of tankers;

1B2aiv Refining/Storage - Fugitive emissions from refining processes and the storage of crude and refined products in tanks;

1B2b Natural Gas - Activity non existent during period under analysis;

1B2c Venting and flaring - The estimates for these emissions have been included in categories 1A1b and IB2iv;

2 Industrial Processes - Emissions of greenhouse gases from production processes, not including emissions related with associated combustion processes. Reference has been made to the principal sources of pollution;

3 Solvent and other Product Use - Emissions of NMVOC and CO2 resulting from the use of solvents and other products containing volatile organic compounds;

4 Agriculture - Includes all anthropogenic emissions from this sector excluding emissions from the use of fuels. Includes the following categories of polluting activities:

4A Enteric Fermentation - Emissions of methane as a sub-product of enteric fermentation from the digestive processes of domestic

livestock. Reference is made to the principal groups of domestic livestock (Cattle (for milk production), cattle (for beef production), sheep, goats, pigs, horses, mules and poultry);

4B Manure Management - Emissions of methane resulting from the anaerobic decomposing of animal waste (manure), when stabled or stored. Reference is again made to the emissions by the principal groups of domestic livestock;

4C Rice Cultivation - Emissions of methane resulting from anaerobic conditions in rice fields;

4D Agricultural Soils - Emissions of Nitrogen Oxides resulting from the increased release of nitrogen from human activity. Reference has been made to the contribution of fertilisers in other cases, which includes the application of manure, retention by vegetal crops and the decomposition of crop wastes in the soil. It also includes indirect emissions resulting from the deposition of ammonia, which, in turn, is the result of animal wastes and fertilisers, in the soil and the release of bleached nitrogen such as nitrates which supply aquatic zones located further downstream;

4E Prescribed Burning Savannas - Category not applicable to national bio-geographical conditions;

4F Field Burning of Agricultural Residues - These emissions do exist in Portugal but have not been recorded owing to the non availability of basic statistics;

5 Land-Use Change & Foresty - Emissions and removals from forests and alterations to soil use. The negative value indicates a surplus of removal over emission activities. The only category which has been quantified is 5A, and the following were either not considered to be significant or the quantification thereof was not available:

5A Charges in Forest and other Woody Biomass Stocks. A balance has been established between carbon retention activities by vegetal growth and removal activities through the thinning of plantations;

5B Forest and Grassland Conversion;

5C Abandonment of Managed Land;

6 Waste - Derivative emissions from the management of solid wastes and waste water. Includes the following categories:

6A Solid Waste Disposal on Land - Includes emissions resulting from a process of anaerobic decomposition of the organic wastes emptied on to landfills. The total emissions of the breakdown of the wastes generated during the year are calculated on an annual basis, although their effective emission only occurs over a period of several years after they have been emptied on to the landfill. Includes solid urban, industrial and dangerous wastes;

6B Wastewater Treatment - Emissions resulting from the decomposition of organic material produced by domestic and industrial waste water collection or processing systems;

6C Waste Incineration - It has only been possible to quantify the emissions resulting from the incineration of hospital wastes;

2.2 Results

The results of the emission estimates between 1990 and 1994 have been set out in the tables referred to in Annex A, which have been prepared in accordance with IPCC recommendations.

Tables 2.1 to 2.5 synthesise the results in aggregate form.

The units used for the presentation of the results, although not in common use, are those specified by IPCC norms, Gg (giga-grams) are generally referred to as thousand tonnes (kton) and Tg (Tera-grams)as megatonnes (Mton).

Table 2.1 Summary of annual inventory of greenhouse gas emissions - 1990

CATEGORY	CO2	CH4	N2O	(Gg) NOx	CO	NMVOC	GWP
Total N. Emissions and Removals	45 971	808.5	14.00	339.5	983.9	257.7	67 445
1 All Energy	43 440	19.1	1.78	335.0	952.5	148.7	44 414
1A Fuel Combustion Activities	43 281	14.9	1.78	335.0	952.5	101.5	44 165
1B Fugitive Fuel Emission	159	4.3	na	na	na	47.1	248
2 Industrial Processes	3 421	0.4	1.94	4.5	30.8	17.6	4 053
3 Solvent and other Product Use	262	na	na	na	na	84.1	262
4 Agriculture	ne	210.7	7.35	ne	ne	ne	6 783
5 Land Use Change & Foresty	-1 152	na	na	na	na	na	-1 152
6 Waste	0,00	578.3	2.93	0.0	0.6	7.3	13 085
7 Other	0	0.0	0.00	0.0	0.0	0.0	0
INTERNATIONAL BUNKERS	2 062	2.1	0.04	36.5	2.4	0.1	2 119

Source: Institute of Meteorology

Table 2.2 Summary of annual inventory of greenhouse gas emissions - 1991

CATEGORY	CO2	CH4	N2O	(Gg) NOx	CO	NMVOC	GWP
Total N. Emissions and Removals	47 717	819.5	14.10	354.6	1 028.8	263.2	69 453
1 All Energy	45 179	19.2	1.84	349.9	1 009.8	151.7	46 172
1A Fuel Combustion Activities	45 030	15.1	1.84	349.8	1 009.8	107.6	45 937
1B Figitive Fuel Emission	149	4.1	na	na	na	44.2	235
2 Industrial Processes	3 421	0.4	1.94	4.6	18.4	17.8	4 053
3 Solvent and other Product Use	269	na	na	na	na	86.3	269
4 Agriculture	ne	212.8	7.39	ne	ne	ne	6 842
5 Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 152
6 Waste	0,00	587.1	2.93	0.0	0.6	7.4	13 270
7 Other	0	0.0	0.00	0.0	0.0	0.0	0
INTERNATIONAL BUNKERS	2 068	2.1	0.04	37.0	2.4	0.1	2 125

Source: Institute of Meteorology

Table 2.3 Summary of annual inventory of greenhouse gas emissions - 1992

CATEGORY	CO2	CH4	N2O	(Gg) NOx	CO	COVNM	GWP
Total N. Emissions and Removals	51 846	814.3	13.97	376.0	1 125.1	277.0	73 431
1 All Energy	49 311	19.4	1.90	371.4	1 093.5	166.5	50 328
1A Fuel Combustion Activities	49 139	15.4	1.90	371.4	1 093.5	114.9	50 071
1B Fugitive Fuel Emission	172	4.1	na	na	na	51.6	257
2 Industrial Processes	3 421	0.4	1.94	4.6	31.0	17.8	4 053
3 Solvent and other Product Use	266	na	na	na	na	85.2	266
4 Agriculture	ne	198.6	7.20	ne	ne	ne	6 483
5 Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 152
6 Waste	0,00	595.9	2.93	0.0	0.6	7.6	13 454
7 Other	0	0.0	0.00	0.0	0.0	0.0	0
INTERNATIONAL BUNKERS	2 133	2.1	0.04	37.7	2.5	0.1	2 192

Source: Institute of Meteorology

Table 2.4 Summary of annual inventory of greenhouse gas emissions - 1993

CATEGORY	CO2	CH4	N2O	(Gg) NOx	CO	NMVOC	GWP
Total N. Emissions and Removals	49 103	812.1	13.91	364.4	1 163.3	279.2	70 622
1 All Energy	46 568	18.6	1.96	359.7	1 131.8	168.6	47 588
1A Fuel Combustion Activities	46 401	14.8	1.96	359.7	1 131.8	118.4	47 341
1B Fugitive Fuel Emission	167	3.8	na	na	na	50.2	247
2 Industrial Processes	3 421	0.4	1.94	4.6	30.9	17.8	4 053
3 Solvent and other Product Use	266	na	na	na	na	85.2	266
4 Agriculture	ne	188.4	7.08	ne	ne	ne	6 229
5 Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 152
6 Waste	0,00	604.7	2.93	0.0	0.6	7.7	13 639
7 Other	0	0.0	0.00	0.0	0.0	0.0	0
INTERNATIONAL BUNKERS	1 848	1.8	0.04	31.1	2.2	0.1	1 897

Source: Institute of Meteorology

Table 2.5 Summary of annual inventory of greenhouse gas emissions - 1994

CATEGORY	CO2	CH4	N2O	(Gg) NOx	CO	NMVOC	GWP
Total N. Emissions and Removals	49 689	827.0	14.10	372.4	1 192.0	294.4	71 583
1 All Energy	47 154	18.3	2.07	367.9	1 158.5	183.7	48 205
1A Fuel Combustion Activities	46 953	15.0	2.07	367.9	1 158.5	122.2	47 932
1B Fugitive Fuel Emission	201	3.4	na	na	na	61.5	272
2 Industrial Processes	3 421	0.4	1.94	4.5	32.9	17.7	4 053
3 Solvent and other Product Use	266	na	na	na	na	85.2	266
4 Agriculture	ne	194.8	7.16	ne	ne	ne	6 389
5 Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 152
6 Waste	0,00	613.5	2.93	0.0	0.6	7.8	13 823
7 Other	0	0.0	0.00	0.0	0.0	0.0	0
INTERNATIONAL BUNKERS	1 850	1.7	0.04	30.1	2.3	0.1	1 897

Source: Institute of Meteorology

2.3 Global Analysis of Results

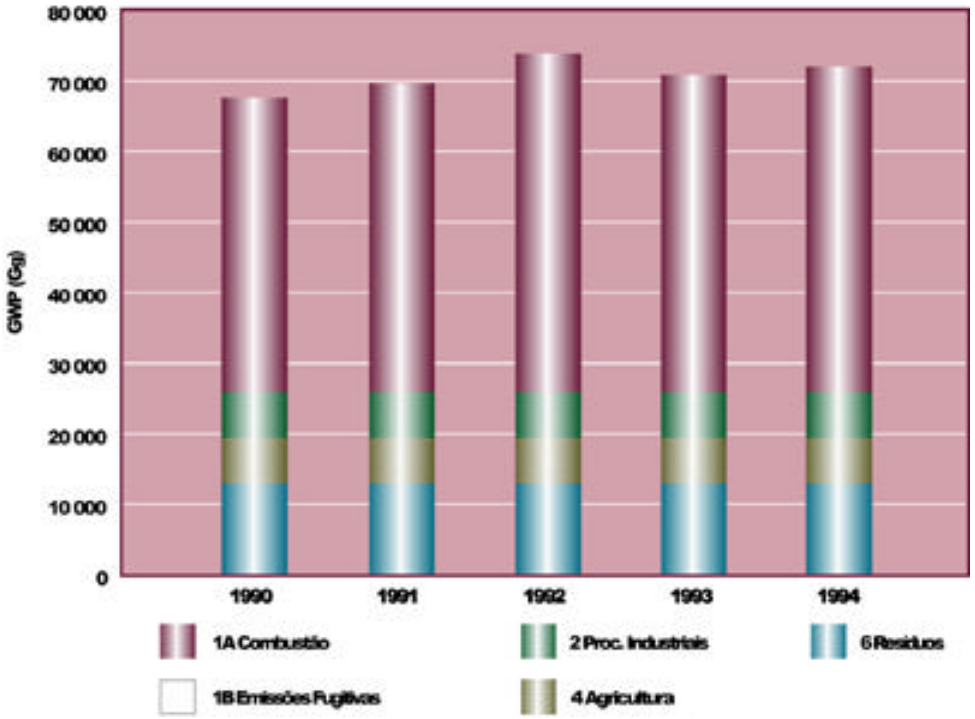
Global Warming Potential

A global analysis of emissions estimates, shows that combustion processes (Activities IA) in Portugal constitute the principal sources of emission of greenhouse gases and, consequently, the major responsibles, (65 to 68 %) in respect of Global warming potential (Figure 2.1).

The emissions expressed by the GWP indicator have grown since 1990, the year in which they came to 67 Tg, and 1994, in which they came to a total of 72 Tg. The variation occurring during the period was not uniform, and the highest value of 73 Tg was recorded in 1992. This maximum value, recorded in 1992 is, to certain extent, justified by the significant effect of meteorological conditions on the operation of the Portuguese electricity production system, which has a large hydropower component part. 1992 was effectively a extremely dry year and required major production by the thermal sub-sector in order to compensate for the drastic reduction of the electricity productivity of the hydro sub-sector.

The emissions resulting from international, maritime and aviation bunkers varied between 1 897 Gg, in 1994, and 2 192 Gg of GWP, in 1992. These values are 3%-5% of national emissions, although they have not been included in the national total.

Figure 2.1 - Contribution of diverse sectors to Global warming potential (GWP)



2.4 Pollutant by pollutant analysis

2.4.1 Carbon dioxide (CO2)

The variations in the total annual emissions of carbon dioxide which rose from 46.0 Tg in 1990 to 49.7 Tg in 1994, and reached a peak of 51.8 Tg in 1992 have been slight. These values exclude emissions resulting from the burning of fuel by international aviation and shipping bunkers and emissions resulting from the burning of biomass.

The 1992 value is justified by the one-off increase in Combustion emissions, mainly owing to Energy Production Activities, as a result of dependence on rainfall.

Around 93% of the total annual emissions of CO2 (excluding those resulting from the burning of fuel by aviation and shipping bunkers and wastes) were fundamentally the result of the most important combustion related groups (Figure 2.2). The remaining 7% have been essentially attributed to industrial production processes and, fundamentally, cement production.

Of combustion processes, the major sources involve activities for the production and processing of energy which, in 1994, were responsible for around 39%-41% of these emissions, followed by transport and industrial combustion with around 32%-36% and 15%-17% respectively, as set out in Figure 2.3.

Biomass, for energy production, is responsible for around 20% of the total emissions of this pollutant, resulting from combustion activities.

Figure 2.2 - Variation of National Emissions (Net) of CO2

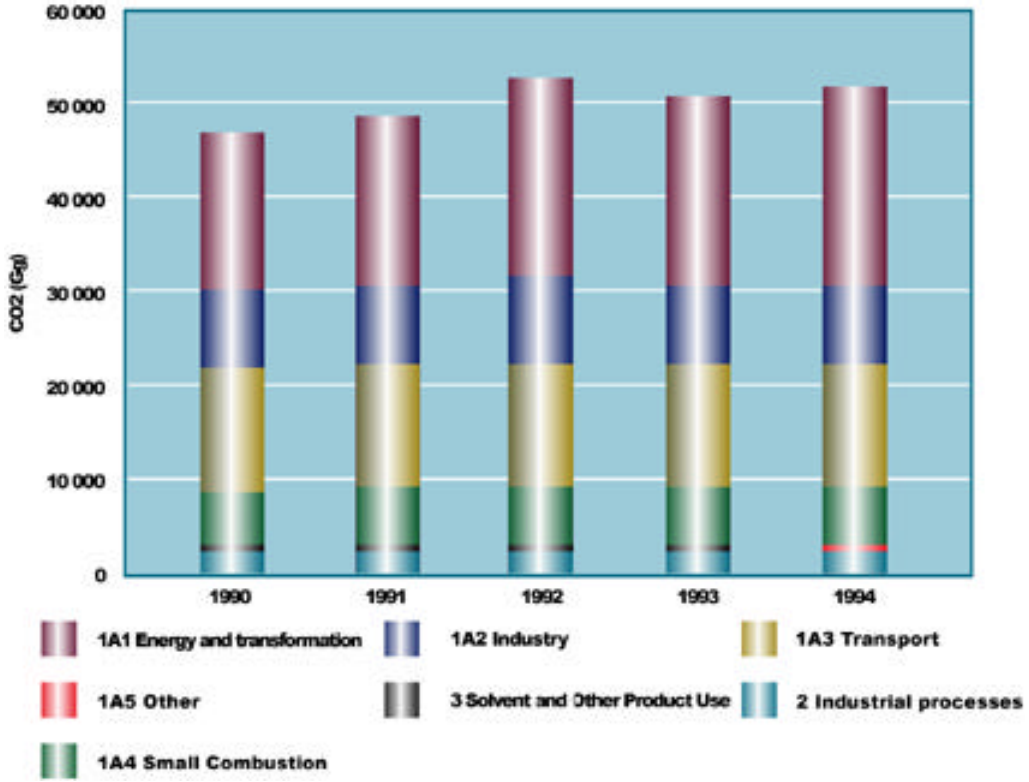
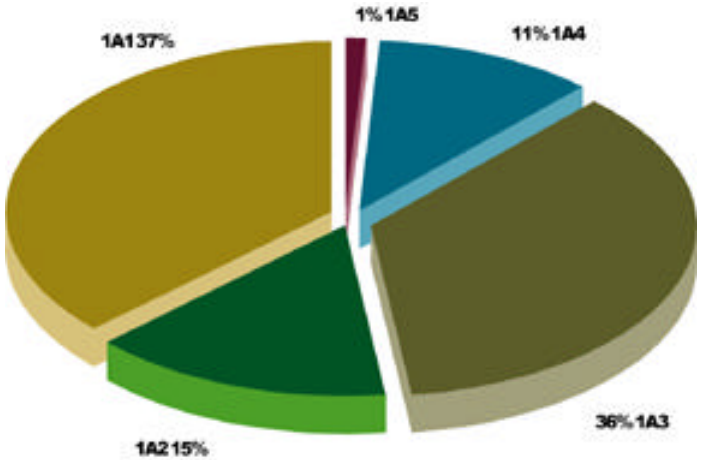


Figure 2.3 - Emissions of CO2 resulting from combustion processes in 1994



2.4.2 Methane (CH4)

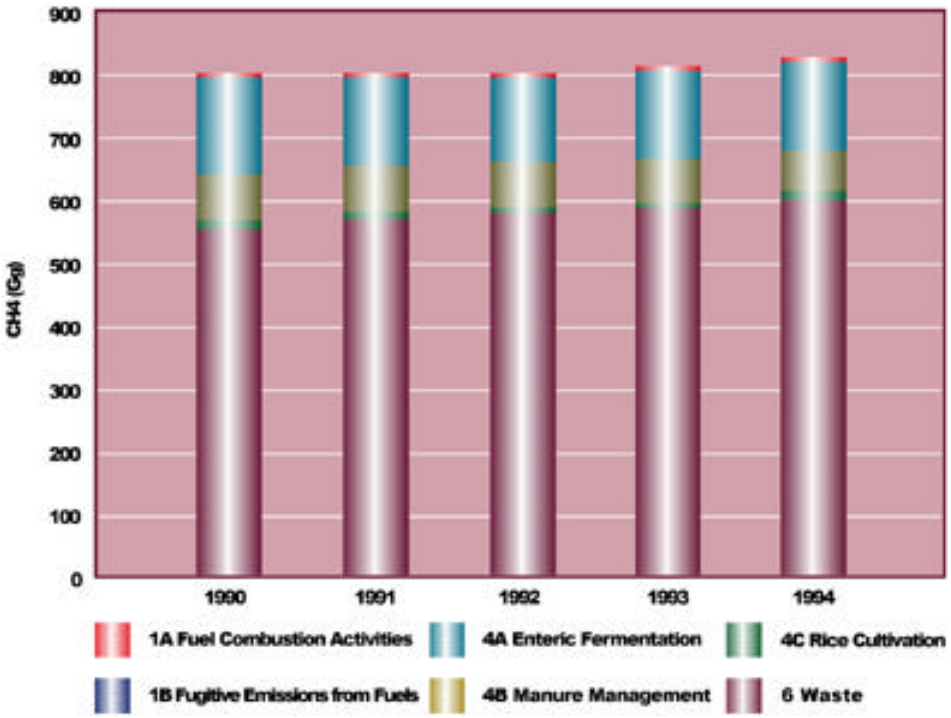
The evolution trend of the total national emissions of methane was one of growth, and varied between 808 Gg in 1990 and 827 kton in 1994 (Figure 2.4).

Around 71%-74 % of the total national emissions of this pollutant, were caused by waste.

Also of some importance are the emissions resulting from agriculture, which account for between 24%-26 % of the total emissions of this pollutant.

An analysis of the results also shows that enteric fermentation from livestock is responsible for between 59%-63 % of agricultural sector emissions. This is followed by emissions from animal wastes (manure), with around 32%- 33%, and emissions from rice cultivation, with between 7%-9%.

Figure 2.4 - Variation of National Emissions (Net) of CH4



2.4.3 Nitrous oxide (N2O)

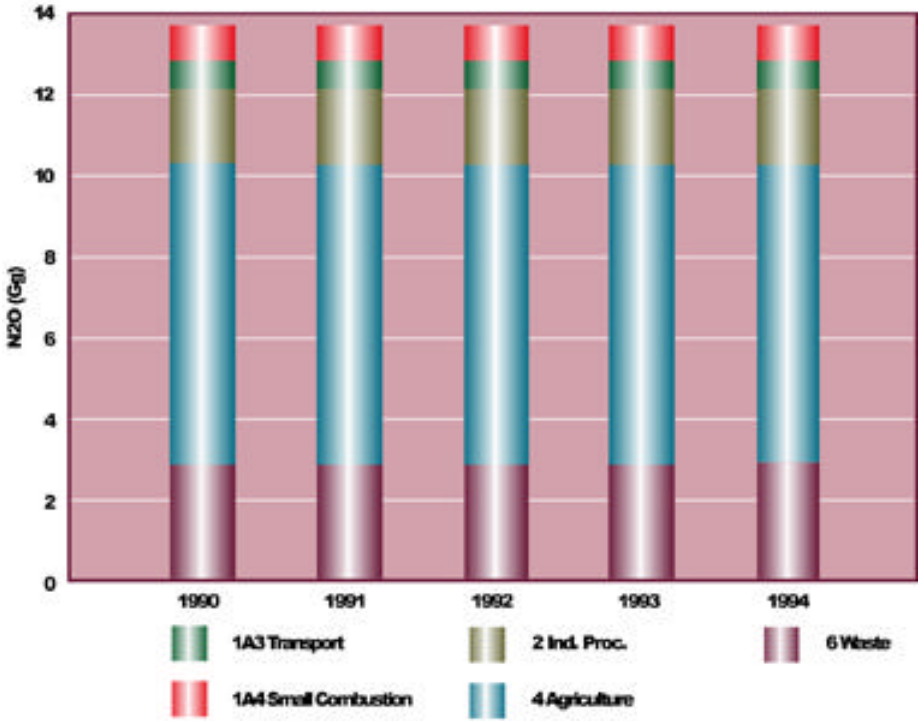
Figure 2.5. shows the evolution of nitrous oxide emissions in which there were no significant variations during the 1990-1994 period at around 14 Gg per annum.

Reference should be made to the fact the estimates only include anthropogenic emissions and that only the increase in emissions from agricultural land, as the direct or indirect result of the application of fertilisers and manure, and from other increases involving nitrogen owing to agricultural practices, have been recorded.

The contribution made by emissions from agricultural land is around 52% of the total of the emissions of this pollutant.

Emissions resulting from wastes, which account for around 21% of total emissions, are also important. Reference should also be made

Figure 2.5 - Variation of National Emissions (Net) of N2O



to the fact that around 11% of the total of N2O emissions are produced by combustion processes.

2.4.4 Nitrogen oxides (NOx)

The total national emissions of this pollutant, varied between 339 Gg, in 1990, and 372 Gg, in 1994, although the trend is one of growth.

As justified in the case of the emissions of CO2 in 1992, NOx was also affected by rainfall, and, accordingly reached a peak emission value of 376 Gg in the same year.

An analysis of the results (Figure 2.6) shows that the annual emissions of this pollutant are practically associated with combustion processes which account for around 99 % of total emissions. A small contribution (of around 1%) is also made by industrial processes. International bunkers, which have not been recorded in the total, account for between 8% - 11% of the emissions of this pollutant.

Around 58%-61% of the emissions resulting from combustion processes (Figure 2.7) are produced by the transport sector, and are growing. Emissions by the energy processing sector (19%-21%) are also significant.

2.4.5 Non Methane Volatile Organic Compounds (NMVOC)

Figure 2.8 shows the constant evolution of the estimated annual anthropogenic emissions of non methane volatile organic compounds, between 1990 and 1994, with a growth of somewhere between 258 Gg and 294 Gg.

Combustion processes are the main responsible in respect of the emissione of non methane volatile organic compounds in Portugal, and account for between 39%-42 % of the total emissions of these pollutants, followed by the use of solvents, with between 29%-33 % of total emissions.

Of total combustion processes the transport sector is the main responsible, with around 65% -72% of emissions from the combustion sector (Figure 2.9).

Figure 2.6 - Variation of National Emissions (Net) of NOx

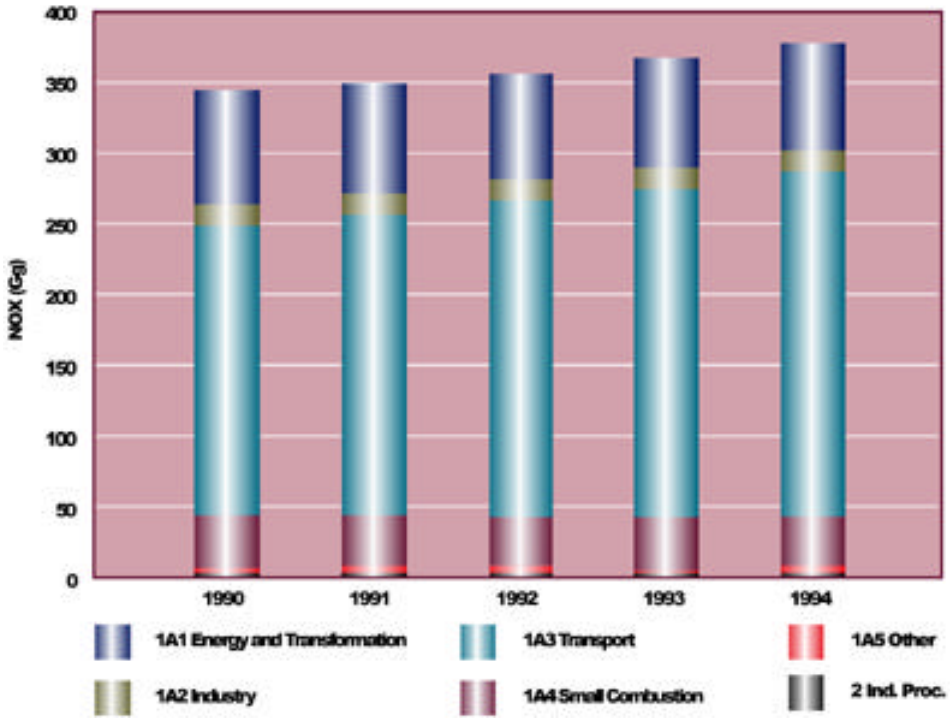
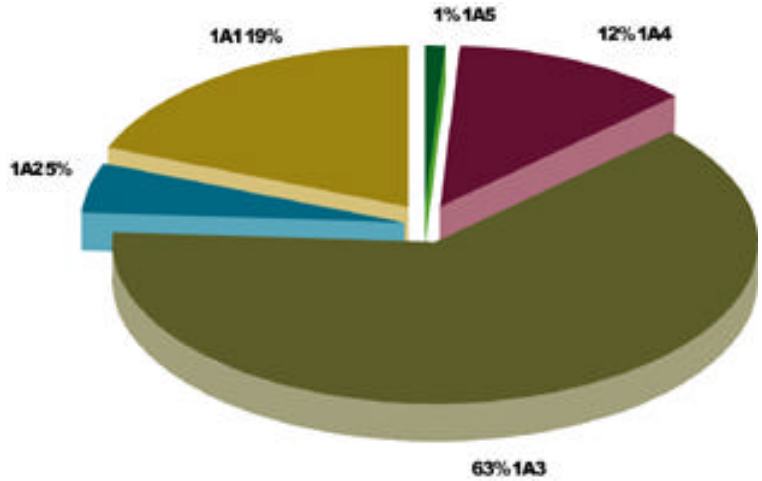


Figure 2.7 - Emissions of NOx resulting form combustion processes in 1994



2.4.6 Carbon monoxide (CO)

There has been continuous growth in the emissions of this pollutant from 984 Gg in 1990 to 1 192 Gg in 1994, as set out in Figure 2.10.

The increase in emissions from the transport sector, accompanied by an increase in emissions from combustion in the energy processing sector, although less marked owing to its lesser importance in the total emissions of this pollutant, were mainly responsible for the recorded increase.

Combustion processes are effectively responsible for around 97% of the emissions, and special reference should also be made to the minor contribution made by industrial production processes.

Combustion in the transport sector is mainly responsible for CO emissions, with around 68%-73 % of total emissions from the combustion sector (Figure 2.11). There is also a significant proportion of emissions from the residential sector in this category (24%-29%) essentially resulting from the combustion of biomass (globally 23%-28%).

Figure 2.8 - Variation of National Emissions (Net) of NMVOC

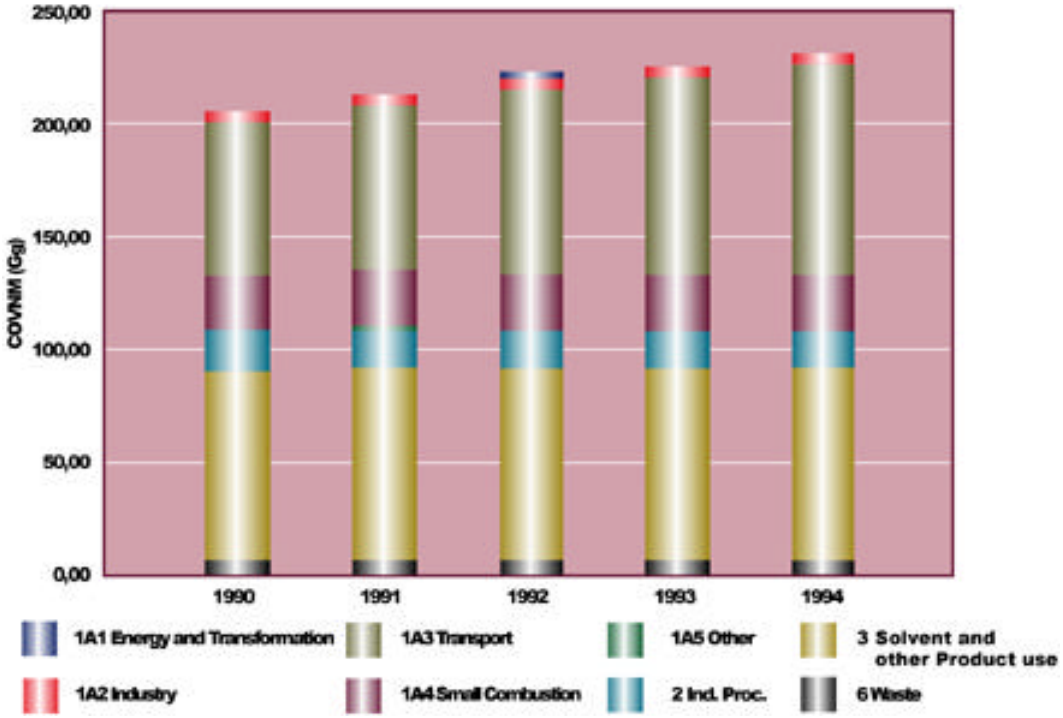
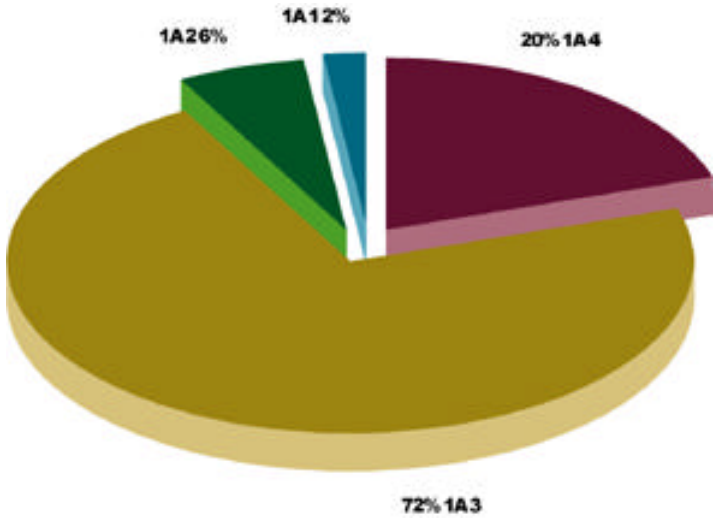


Figure 2.9 - Emissions of NMVOC by categories of sources of emission of combustion in 1994



2.5
Reliability of estimates

There must be a certain degree of uncertainty associated with any estimate of emissions owing to a series of factors related both with the quality of the basic data and the methodology used in respect of the calculation thereof.

Table A6.1 of Annex A6, which has been prepared in conformity with the IPCC proposal attributes categories of reliability to emission estimates recorded in the Portuguese inventory as well as the level of sub-classification used.

The degree of reliability of the estimates is, in general, considered to be average.

2.6
Inventories of sink-holes

2.6.1
Carbon content of soil

As Portugal does not have a reasonably detailed soil chart, the amounts of carbon (C) stored in the soil, have been determined via the use of databases on soil fertility. The total stored

Figure 2.10 - Variation of National Emissions (Net) of CO

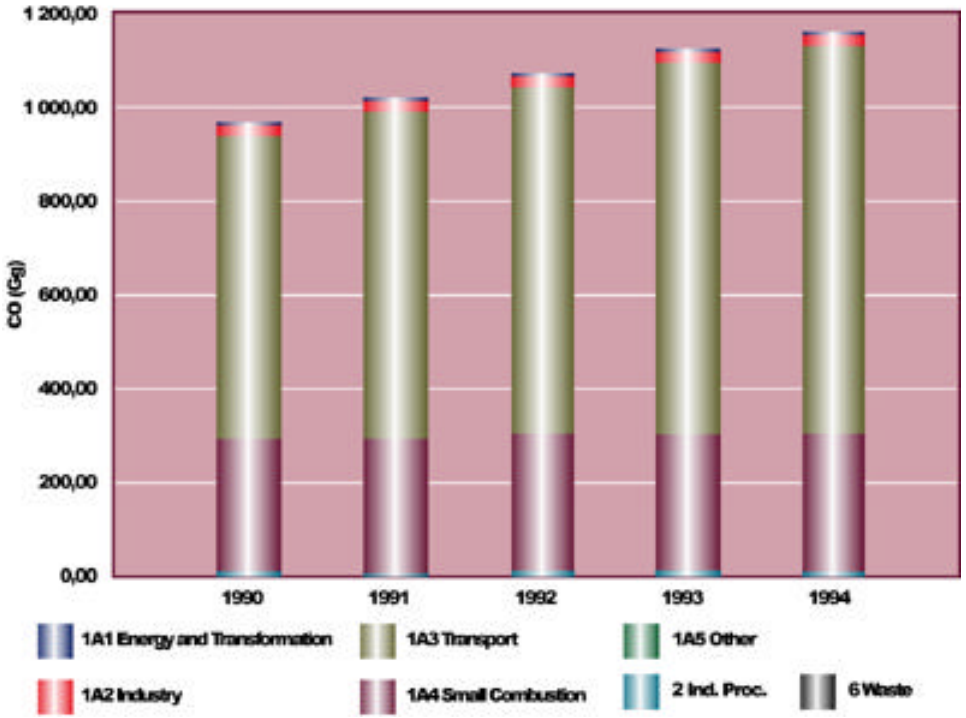
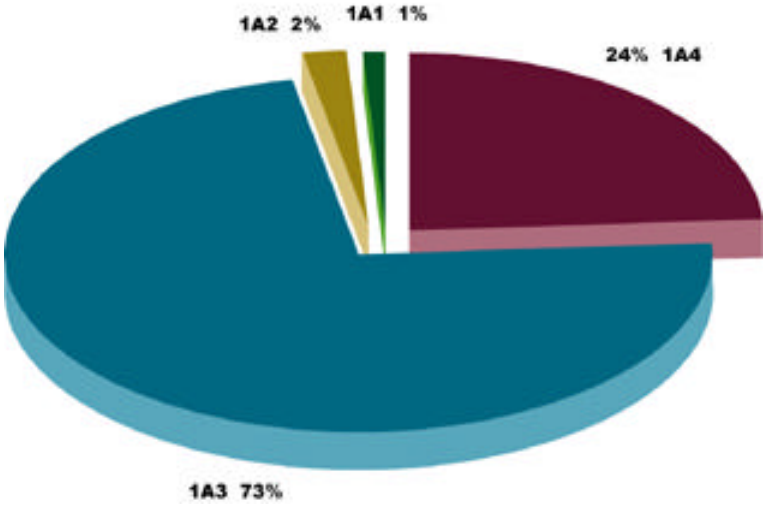


Figure 2.11 - Emissions of CO resulting from combustion processes in 1994



amount has therefore been calculated at 390 000 Gg of C, with an average content of 47 Mg/ha of C. The values have probably been underestimated. The lowest values refer to lithosols with around 12.5 Mg/ha of C, and the highest to histosols with 200 Mg/ha of C.

2.6.2 Average annual carbon dioxide (CO2) content of Portuguese Forests

According to data supplied by the National Forestry Inventory, an area of around 3.3 million hectares on Mainland Portugal has been planted with trees. The distribution of species is set out in Table 1.7.

On the basis of this information, it has been possible to calculate the annual carbon increase, which has been estimated at 3 914.43 Gg, as set out in Table 2.6. The annual amount of carbon elimination has been estimated at 3 600.25 Gg (Table 2.7).

Reference should, however, be made to the fact the wood extracted continues to represent carbon “in stored form”. Table 2.8 shows that the average annual carbon dioxide (CO2) content of Portuguese forests is 1.14 Tg of CO2.

Table 2.6 - Estimate of annual Carbon (Gg C) increase

Species	Area (1 000ha)	Growth rate (m3/ha/year)	Conversion Coefficient (dry material)	Total increase in dry material (Gg dry material)	% Carbon	Total carbon increase (Gg C)
Eucalyptus	705	9.5	0.70	4 688.25	0.45	2 109.71
Wild pine	1 034	5.6	0.53	3 068.91	0.45	1 381.01
Other resin prod. species	125	5.6	0.53	371.00	0.45	166.95
Other leafy species	1 482	0.5	0.77	570.57	0.45	256.76
TOTAL	3 346	-	-	8 698.73	-	3 914.43

Source: DGF and IPCC

Table 2.7 - Estimate of annual elimination of Carbon (GgC)

Species	Volume extracted (1 000 m3/year)	Conversion coefficient (dry material)	Total biomass Consumed (Gg dry material)	% Carbon	Annual consumption of carbon (Gg C)
Wild pine	7 363	0.53	3 902.39	0.45	1 756.08
Eucalyptus	5 750	0.70	4 025.00	0.45	1 811.25
Other leafy species	95	0.77	73.15	0.45	32.92
TOTAL	13 208	-	8 000.54	-	3 600.25

Source: DGF and IPCC

Table 2.8 - Annual balance of release (-) or fixing (+) of Carbon Dioxide (Gg CO2)

Total increase in Carbon	3.91
Annual Carbon consumption	3.60
Balance of fixed (+) or released (-) Carbon	0.31
Conversion for release (-) or annual fixing (+) of CO2	1.14

Source: DGF and IPCC

3.
POLICIES AND MEASURES

3.1
Agrarian sector

3.1.1
Introduction

Within the agricultural sector in Portugal, the reduction of emissions of greenhouse gases is essentially the indirect effect of policies and measures designed to support the sector, which are generally the result of the application of the European Union's Common Agricultural Policy (CAP).

Recent CAP alterations and the progressive implementation thereof, have had a beneficial effect on this area. Direct and indirect incentives to vegetal and animal production on a Common Market Organisations (CMO) level, have contributed towards a less intensive use of agricultural activity, and a consequent reduction of the use of fertilisers and of heads of cattle, which permits the reduction of emissions of nitrous oxide (N2O) and methane (CH4).

Measures Accompanying CAP Reform, on the other hand, by contributing both towards a reduction in the intensity of agricultural activity, and the planting of land formerly used for agriculture with trees, have also had a positive effect and particularly so in the case of the latter measure in the specific case of carbon dioxide (CO2). As regards this gas, forestry policy, in general, and the maintenance and expansion policies of forestry areas, play an important role.

An analysis is now being carried out on the effect of the policies and measures, both on a level of emissions as well as the fixing of the principal gases, in which special emphasis has been given to the role played by forests in this latter aspect.

3.1.2
Carbon dioxide (CO2)

In addition to the alterations involving the changeover in the use from agricultural to forest land, agricultural activity can make a positive

contribution to the balance of atmospheric CO2 via a higher degree of concentration of Carbon in the soil. As such, the extending of agricultural activity could have a beneficial effect owing to the fact that the organic material content of the soil tends to increase with the use of less intensive practices.

The current operating rules of the cereals, cattle (beef production) and sheep and goats CMOs, by directly or indirectly helping to increase agricultural and cattle breeding activities, have had a positive effect on the balance of atmospheric CO2. Other measures having the same effect are the Indemnities (Regulation no. 2328/91/CEE) and Agro-Environmental Measures (Regulation no. 2078/92/CEE).

On the other hand, owing to the nature and dimension of the implications involving the flows of greenhouse gases, forests are of particular importance as "sink-holes" or "reservoirs", for reducing or stabilising the concentration of CO2 rates in the atmosphere. Efforts therefore continue to be made in the following areas:

1 - Maintenance and expansion of forest areas

- Implementation of the II Forest Development Programme as part of the Community Support Framework, with the following principal objectives:
  - to replant areas affected by fires;
  - to replant other areas and make improvements to currently existing areas, through the use of natural regeneration;
  - to promote and afforest new areas, giving priority to those which are not eligible, under national legislation, for the application of Regulation no. 2080/92/CEE on forest measures in agriculture.

72 000 hectares are expected to be planted with trees and improvement works are expected to be carried out on a further 108 000 ha under this programme, whose period of application is between 1994-1999.

During the first few years of its application (1994-1995) 9 600 ha were planted with trees and a further 12 200 ha were replanted, of which 11 200 ha were areas affected by fire. Improvements were made to a further 48 000 ha.

Application of Regulation no. 2080/92/CEE, as part of forestry measures in CAP reform, with a period of application of 4 years (1994-1998), which establishes a series of incentives for afforestation and improvements to forest plantations. The projected target is 124 000 ha with improvements being made to a further 35 000 ha.

Pursuant to the terms of these Regulations, in 1994 and 1995, afforestation activities covered an area of 77 734 ha with improvement work being carried out on a further area of 5 265 ha.

Around 5 300 ha were planted with fast growth species such as eucalyptus and poplar trees in 1995. These species are exploited in short cycles and are not eligible for the above referred to financial instruments.

2 - Future forest policy

Forest conservation, as a resource which is indissoluble from other natural resources and which stabilises the fixing of Carbon Dioxide has been unequivocally provided for in the recently published Basic Law on Forest Policy, as one of the principal guidelines of national forest policy. The State, in order to achieve this objective, will support, as forest policy measures and via the creation of financial instruments, initiatives designed to enhance the value of and expand private forest land, in addition to promoting an expansion of public forest land, both in economically productive as well as in protected areas. In furthering this objective, it is also the

responsibility of the State to define actions appropriate for the protection of forests from biotic and abiotic agents of which special reference should be made to protection from forest fires by means of:

- the establishing of norms designed to encourage preventative silviculture;
- support for the participation of rural communities, associations of producers and local municipalities in their support for actions for the prevention, detection and fighting of forest fires;
- the creation of a fire risk forecasting system with the objective of reducing the number of outbreaks of fire and areas affected;
- the organisation of awareness campaigns targeted at citizens, emphasising the importance of safeguarding and increasing the value of forest resources.

3.1.3 Methane (CH4)

The rice area in Portugal is not expected to exceed the production quota attributed to Portugal of 33 000 ha by the year 2000.

Slight variations have been recorded in the case of livestock over the last five years. This is another important source of emission of methane and in respect of which there have been increases in the case of several species and reductions in the case of others. Measures having an effect on this evolution are cattle (meat production), sheep and goats COMs as well as Indemnities (Regulation no. 2328/91/CEE) and Agro-Environmental Measures (Regulation no. 2078/92/CEE) owing to the fact that they all establish maximum levels of heads of cattle as eligibility conditions for premiums with a view to encouraging extension activities.

3.1.4 Nitrous oxide (N2O)

The application of nitrogen based fertilisers in Portugal has been diminishing since 1990, although, as referred to above, there are no statistics available to quantify their real consumption trend. This reduction is based on a diverse range of factors such as, inter alia, the already referred to measures designed to encourage extension activities.

3.2 Energy sector

3.2.1 Objectives and Policies

National energy policy has been designed to cater for meeting the global objective of guaranteeing that the country will benefit from the supply and availability of energy, in the quantities required, and in conformity with price conditions which will help to keep the national economy competitive and with due respect for environmental considerations.

In the area of environmental protection, the decision has been taken, to further the strategic objective of limiting the effects on the environment resulting from the production, processing and use of energy.

The various policies leading to the fulfillment of this objective can be classified as followed:

- Energy Resources Policy, including the introduction of natural gas and the intensified use of renewable national resources
- Rational Use of Energy Policy
- Technological Development Policy
- Emission Limitation Policy

3.2.2 Measures

For the purpose of realising the above referred to policies, a diverse range of measures, listed below, are being put into effect:

1 - Introduction of natural gas

Diversification of the supply of primary energy, through the use of natural gas, is one of the measures being implemented. The first supplies of natural gas to the public were delivered in the first quarter of 1997.

During the first few years of use of this fuel, around 40% of consumption will be used for electricity production, and the first gas fired powered station is expected to come into operation in 1998, followed by alteration works to be carried out on already existing power stations for mixed burning operations.

The increased demand for electricity projected for the year 2010 will therefore essentially be fulfilled by natural gas.

The projections suggest that natural gas will be used as a replacement fuel for other, more polluting fuels. This will represent around 10% in industry and 11% in the domestic/services sector by the year 2010.

The consumption of natural gas in Portugal in the years 2000 and 2010 is expected to represent around 8% and 14% of the total consumption of primary energy, respectively.

The introduction of natural gas has benefited from the support of the Energy Programme, both in respect of the building of transport and distribution infrastructures as in actions designed to further the penetration of gas on the market, particularly as regards reconversion to consumption of natural gas.

2 - Intensified use of renewable endogenous resources

The most important component part of renewable energies, which could make a substantial contribution to containing the global emissions of CO2, is the hidroelectricity sector. Special reference should be made, in this domain, to the importance of the projects to be realised in the coming future, in the Quinta das Laranjeiras (River Sabor), Alqueva (River Guadiana), Fridão (River Tâmega) damns and the reinforcing of the Venda Nova Dam (River Cávado).

Of the various instruments designed to implement this measure currently in use, special reference should be made to the following:

- The diffusion and use of investment incentives for hydropower installations and wind farms, which are expected to represent an estimated additional installed capacity of 170 MW by 1999 (100 MW in the case of mini hydropower stations and 70 MW in the case of wind farms).

The legislation in the sector has made a contribution by applying a special statute to independent producers under which they enjoy preferential conditions in selling their electricity production.

- There are also inducements for the use of other renewable sources. These include the use of vegetal wastes and sub-products, in co-generating stations.

- On a Municipalities level, an Action Plan covering the use of endogenous resources has been prepared. Financial provisions are contained in the Energy Programme, with the objective of increasing the production of energy and exploiting local energy resources.

- Energy Programme has also provided investment subsidies. There are also fiscal incentives for the purchase of equipment designed to use renewable energies (VAT reductions and deduction of investment from personal income tax IRS).

3 - Rational Use of Energy

This policy, which has been targeted at energy efficiency, has been implemented in the form of:

- An incentives system for the rational use of energy (SIURE), applied to the industrial, transport and residential sectors (essentially under the Energy and PEDIP II Programmes) and the application of legislation in the form of diverse Regulations on:

- management of energy consumption (RGCE);
- characteristics of the thermal behaviour of buildings (RCCTE);
- quality of energy systems for air conditioning applications in buildings (RQSCE);
- labelling of household appliances (refrigerators, freezers, washing and drying machines and dishwashers);
- Action Plan covering energy management in Municipalities, including the demand for energy in the public and private domains and energy production, as well as exploiting local energy resources, including urban wastes;
- encouragement of efficiency in the use of electricity in the form of peak, off-peak tariff systems, etc;
- introduction of information and training on the rational use of energy, specifically targeted at the domestic consumer and road users;

4 - Technological Development

New, more sophisticated, albeit not necessarily innovative technologies have been applied in this domain, for modernising current equipment and installations:

- in the refining sector as regards the installation of de-sulphurisation facilities;
- in electricity production, through the use of new combined power stations allied with an increase in the efficiency of thermal conversion and the conversion of power stations to use mixed fuel (fuel-oil and natural gas);
- on network development, minimising transport and electricity distribution losses;
- in energy conservation, for recovering thermal losses or recovery of energy from wastes and industrial or agro-food sub-products.

The technological development measures are also targeted at Demonstration and Development projects under the Energy Programme and operate with the support of the various agents involved (Public Administration, Universities and Private Enterprise).

5 - Limiting of Emissions

A diverse range of regulatory alterations have been introduced in this area, as regards the specifications of fuel characteristics, with the objective of progressively reducing the sulphur content of fuels.

3.3 Industrial sector

3.3.1 Environment aspects of Portuguese industrial policy guidelines

Portuguese Industrial Policy has been developing towards the integration of environmental issues through harmonisation and the requirement for a less aggressive posture

in environmental terms, with the objective of diminishing external factors caused by industrial pollution. The objective of the scope of application of Policy instruments is to realise actions in conformity with the principles of the 5th Community Action Programme on issues related with the Environment, pursuant to the guidelines issued under the European Community Council of Minister's Resolution on "Industrial Competitiveness and the Environment".

The national strategy put into effect, is based on the harmonising of the above two points of reference and is, inter alia, evident, in Industrial policy. This Industrial Policy therefore includes an environmental strategy which has been designed to make up for the lack of infrastructures, reduce the negative effects of manufacturing activities and resolve environmentally serious dysfunctions which, set out, in practice, in fourteen different areas in articulation with the National Environmental Policy Plan:

- Articulation with and optimisation of PEDIP II Funding - "Strategic Programme for the Revitalization and Modernisation of Portuguese Industry" (referred to below) and the Environment Programme;
- Protection of the environment as an instrument for business competitiveness;
- Integration of environmental component as part of the total quality concept;
- Encouragement to growth of "eco-industries";
- Promotion of a new legislative approach for a less aggressive industry from an environmental viewpoint;
- Awareness activities and increased dialogue with and participation by industry in resolving environmental issues;
- Development of technological infrastructures;
- Promotion of innovation and technology transfers;
- Preparatory works on setting up a system for the prevention and integrated control of industrial pollution;
- Equipping of industrial zones and land allotment operations for industrial zones with suitable respective sanitation facilities;
- Consolidation and reinforcing of environmental aspects associated with business strategies;
- Encouragement of environmental audits and diagnostics;
- Revitalization of system for the award of the Community Ecological Label;
- Integration of waste issues in industrial strategies.

In light of the diversity of the interests involved, the harmonisation process has involved a strategy based on agreement and dialogue. A Global Agreement on the issue of the Environment and Development was therefore entered into in 1994 between the Ministries of the Environment and Natural Resources, Industry and Energy and Agriculture, as well as the Confederations of Portuguese Agriculture and Industry.

In the area of eligibility for incentives, a specific Protocol has also been entered into between the Ministries of the Environment and Natural Resources and the Ministry of Industry and Energy for ensuring the rationalisation and use of PEDIP II and Environment Programme funding, with the objective of encouraging manufacturing activity to become involved with environmental concerns, providing support to investment projects using cleaner production technologies, creating collective infrastructures for environmental protection, realising environmental audits and supporting the rehabilitation of run-down industrial areas.

Portuguese Industrial Policy is therefore, in general, and except for very specific cases, a horizontal policy targeted at companies in which the Environment is considered to be one of the horizontal priorities of the same Policy, with the objective of maintaining a suitable level of convergence with the "best industrial practices" existing in the European Union. The development strategy is therefore principally targeted at companies rather than adopting a blanket industrial sector approach.

Another relevant issue is the fact that Portugal, as a Signatory to the Climate Change Convention, and a member of European Union has always defended a multi-gas approach in the various negotiating forums dealing with the subject matters, arising from the horizontal nature of Industrial Policy and respective measures, targeted at a multi-sectoral approach.

3.3.2
Measures in general

The measures which have been implemented in the industrial sector and which help to achieve the objectives associated with the defence of the environment, include actions which are fundamentally involved in the following areas:

- Infrastructural and framework measures associated with the creation of technological infrastructures or laboratories in the area of the environment or infrastructures for environmental protection in processing effluent, gaseous emissions or wastes of more than one industrial company;
- Economic and financial measures - including PEDIP II, PRODIBETA, RETEX, SIMIT;
- Information and awareness measures - of which special reference should be made to the "environmental awareness missions" sponsored by the Directorate General for Industry, with the support of PEDIP II;
- Legislative measures and/or measures arising from the application of Community and international legislation - including legislation on industrial licensing, legislation on gaseous and liquid emissions, as well as actions arising from the implementation of Community Directives and International Conventions;
- Measures on alterations to consumption trends - of which a relevant example, in the industrial area, is the implementation of the System for Awarding the Community Ecological Label;
- Measures on the promotion of a better voluntary environmental behaviour by industrial companies - including the implementation, on behalf of the Administration of the Community eco-management and audit system which permits the voluntary participation of companies in the industrial sector.

3.3.3
Industrial Policy Instruments

3.3.3.1
Intersectorial Instruments

The principal and most significant measures implemented under Industrial Policy are primarily horizontal instruments, such as the case of the principal support instrument for reinforcing the competitive capacity of Portuguese industry for the 1994-1999 period, in the form of the above referred to PEDIP II "Strategic Programme for the Revitalization and Modernisation of Portuguese Industry".

In the area of environmental protection, the various sub-programmes contained in PEDIP II, support initiatives targeted at the following:

- Installation of cleaner technologies;
- Introduction of technological processes for minimising noise, waste and pollution discharges of liquid and gaseous effluent;

- Use of waste recycling technologies;
- Consolidation and development of technological infrastructures in the domain of the environment;

Several types of actions may be eligible for support under these actions. These include:

- training /awareness /promotion;
- consolidation of supporting environment of companies;
- direct support to companies;
- environmental treatment of geographical areas (through the creation of collective infrastructures, or the rehabilitation of contaminated industrial areas).

PEDIP II and, in addition, Environment Programme funds totalling PTE 70 billion are available for the above applications.

Owing to the need to bring Industrial Policy considerations into line with Environmental Policy, reflected in the articulation between the competitiveness of companies and the inclusion of assumptions of sustainable development, eligibility conditions for PEDIP II industrial projects require the inclusion of an analysis of environmental issues in prior diagnostics and studies, as a matter of course.

Another Programme which is also worthy of reference, in the Environment/Industry interface is PRODIBETA - "Programme for the Revitalization of Environmental Equipment and Technologies". The characteristic of this Programme, which was approved in 1995, is one of horizontal development, in what is considered to be a strategic area and, after having been subject to specific adaptations, has been included as part of the various PEDIP II support mechanisms.

PRODIBETA has therefore been designed to promote the sustainable development of Portuguese industry, in the form of measures designed to encourage the development of national capacities in the area of capital equipment in the environmental technologies domain, by providing support to companies which operate in the said areas. The following is, inter alia, supported:

- industrial companies manufacturing capital equipment or with projects for the design and manufacture of equipment and installations for environmental protection and energy conservation;
- service companies for supporting industry in the domain of technologies for the protection of the environment.

3.3.3.2

Sectorial instruments

Notwithstanding and, as referred to and explained above, the fact that Portuguese Industrial Policy has a horizontal approach, the existence of several measures of a sectoral type is justified, owing to the existence of specific issues which could occur in each of them. Accordingly, and without wishing to be, in any way, exhaustive, reference shall be made to the implementation of the principal measures, in several sectors of Portuguese industry.

1 - Textiles sector

The textiles sector in Portugal is very important. The Portuguese textiles industry is the largest in terms of the European Union (in terms of GVA, employment and exports). Special attention has also been paid to the sector on account of this.

There are two specific instruments in this sector, in the economic and financial area, RETEX and the SIMIT.

RETEX - "Programme for regions which are heavily dependent on the textiles and clothing industries", is a Community Programme covering

the 1993-1997 period , and whose application to Portugal was approved in June 1993. It should, however, be pointed out that this Programme is at its final stages.

The objective of this Programme is to modernise the business structure in regions which have been particularly affected by the restructuring process affecting textiles and clothing industries, in conformity with three major guidelines:

- regional productive diversification, through the creation or modernisation and/or internationalisation of companies in sectors other than textiles and clothing;
- modernisation and/or internationalisation of the most dynamic textiles companies;
- technological upgrading and reinforcing of the quality of the currently existing industrial base, through the creation or modernisation and/or internationalisation of companies operating in activities related with the textiles industry.

This Programme has been designed to provide support to investment projects for pollution control, as well as the realisation of global diagnostics studies and the formulation of the modernisation and internationalisation strategies of companies, and surveys and analyses of situations which affect productivity and competitiveness in specific areas.

IMIT ("Initiative for the Modernisation of the Textiles Industry"), in turn, has been designed to revitalize the modernisation of companies in the textiles and clothing sectors, with a view to increasing their competitiveness in a context of greater international competition. IMIT was approved in 1995, but was only introduced at the beginning of June 1996.

This initiative is part of SIMIT (Incentives System for the Modernisation of the Textile Industry) whose various regimes provide support for tangible investments associated with the environment and energy rationalisation, production equipment designed to make economic use of waste resulting from production processes or consumption in Portugal, provided that this is recognised as being of interest in industrial and environmental terms and equipment having energy and environmental applications, which is not directly used for production, including the respective investment in civil construction.

2 - Chemicals sector

Special reference should be made, in this sector, to Petrochemicals which, together with the Paper Pulp and Steel sectors were signatories to the National Programme for the Reduction of pollutant atmospheric discharges at the beginning of 1997. This Programme is the result of the application of Directive 88/609/CEE, on Major Combustion Installations and establishes reductions of emissions of nitrogen and sulphur oxides.

Three Community ecological labels were issued to Portuguese manufactured paints in 1996 in the paint sector.

3 - Paper Pulp Sector

As referred to above, reference is made, as in the case of the chemicals sector, to the signing of the National Programme for the Reduction of polluting emissions into the atmosphere, resulting from the application of Directive 88/609/CEE, on Major Combustion Installations, fixing the reductions for emissions of nitrogen and sulphur oxides.

4 - Steel Industry Sector

Reference is made, in this sector, as in the chemicals and paper and pulp sectors, to the signing of the National Programme for the Reduction of atmospheric pollution, resulting

from the application of Directive 88/609/CEE, on Major Combustion Installations, which fixes the reductions for emissions of nitrogen and sulphur oxides.

3.3.4 Implementation and/or Commitment Status in respect of Measures

Companies and other economic agents have shown major interest in PEDIP II. Notwithstanding the fact that 1995 was only the second year of the implementation of this Programme in formal terms, it was, in practical terms, its start-up year, owing to the concentration of applications at the end of 1994, which was the year of the beginning of the Programme.

The global number of PEDIP II applications received by the end of 1995, rose to 3 754 and represents a global investment of around PTE 1.3 thousand billion. Approximately one third of this amount is for PEDIP II measures, involving an environmental component part, up until 1995.

IMIT was approved in 1995, but was only introduced in June 1996, and no official data regarding its implementation therefore exists.

Three Community Ecological Labels were awarded in Portugal in 1996 to Portuguese manufactured paints.

3.3.5 Classification of Policies and Individual Measures according to their Relative Importance as regards Mitigation

There is no data enabling a quantitative appraisal to be made of the degree of mitigation achieved by the implementation of the Policies and measures. However, in terms of a ranking of policies and individual measures in accordance with their relative importance as regards mitigation, those measures tending to reduce emissions from major Combustion Centres will certainly have a more direct and immediate effect on emission reductions.

This is followed by PEDIP II as the principal instrument, owing to its dimension, as the principal instrument for various, i.e. infrastructural and framework, economic and financial and training, information and awareness measures, and particularly, owing to its aspect as an economic and financial measure for supporting industry, in respect of projects incorporating an environmental issue, both from a remedial and preventative aspect, for revitalizing factors which help to internalise concerns over pollution by industrial sources and the corresponding reduction of emissions.

PRODIBETA, SIMIT, RETEX, etc., have also contributed towards a growing internalisation of industrial pollution issues, albeit of a more sectoral and/or regional nature.

Lastly reference should also be made to the award of Community Ecological Labels to products manufactured in Portugal, not only on account of their more direct effects, but particularly owing to the knock-on effect in terms of alterations to consumption patterns which, in turn lead to better design/production of products based on life cycle analyses which are increasingly based on a prospect of sustainable development.

4.

PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

4.1 Introduction

Two projections of carbon dioxide emissions have been prepared. One of them was based on exhaustive studies carried out by the Directorate General for Energy, in 1995, and which encompass acceptable measures for an endeavour to limit emissions, without prejudicing the country's economic development. This projection considers a high level of national economic development, as well as the existence of population growth.

The other projection contains more restrictive estimates, in line with the national commitment in respect of the increases in emissions forecast for the years 2000-2010.

4.2 Framework

CO2 emission projections from the energy sector derive from an exhaustive project depicting a long term scenario which was prepared by the Directorate General for Energy in 1995. The scenario encompasses the acceptable existing and additional measures for an endeavour to limit emissions, without prejudicing the country's economic development.

A "bottom-up" type methodology was used and which, via the use of a framework of demographic, economic and social trends prepared in Portugal, has made it possible to simulate associated energy consumption.

The energy demand model used has been developed on the basis of the most significant uses of energy in each sector - Industry, Transport, Domestic, Services, Agriculture and Fisheries and Construction and Public Works. Consumption by type of energy has been derived on the basis of final energy consumption by each sector.

Annex B contains Tables B1 and B2 which set out a summary of the projections realised.

4.2.1 Possibilities underpinning projections Global level

A high level of national economic development and demographic growth

associated with an increase in tourism levels have been considered.

The possibilities submitted indicate substantial growths in energy consumption in the Domestic/Services sector and a reduction of energy in the terrestrial Transport sector, owing both to specialisation by industry into lighter products and a lesser degree of mobility of the urban population. There are also concerns in respect of energy and environmental problems.

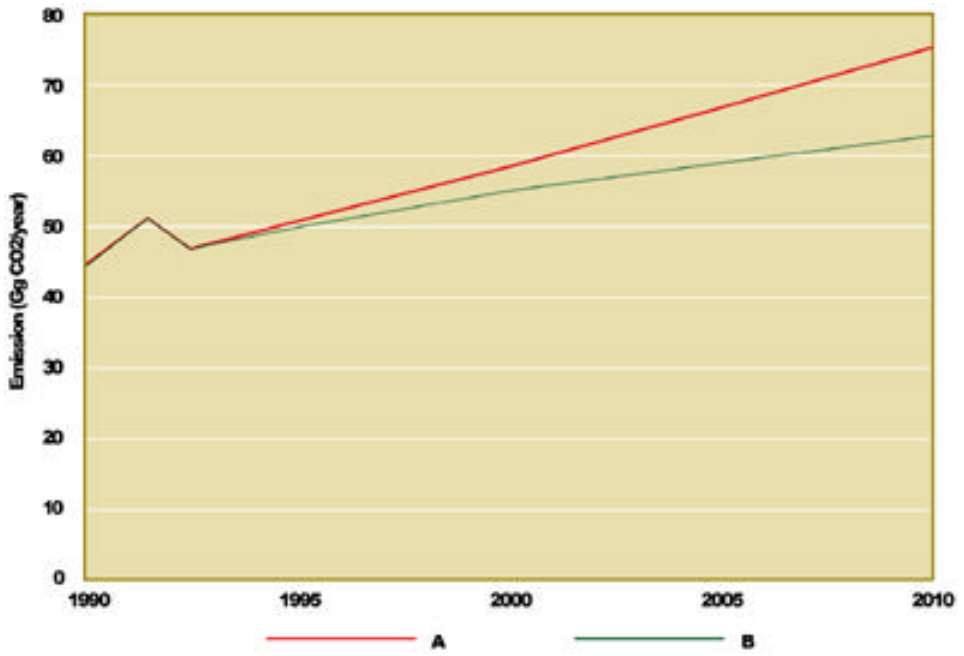
Sectoral level

From a viewpoint of fuel consumption for the production of electricity, the calculations put forward consider the occurrence of average rainfall and the possibility of adapting the existing fuel-oil powered generators to operate on a mixed burning process.

The introduction of natural gas, as part of the political and economic context of Trans-European Energy Networks, will help to improve the level of production of thermal power stations as a result of the greater efficiency of combined cycle power stations.

Industry is the sector which has shown improvements as regards a reduction of global energy intensity, both owing to the use of energy efficiency programmes as well as the renewal of equipment and processes.

Figure 4.1 - Projection of emissions of CO2 from the use of fossil fuels and mineral materials in industrial processes up to the year 2010



The scenario taken into consideration provides for a continued improvement to energy efficiency in the sub-sectors consuming the highest amounts of energy, with a natural renovation of equipment and the introduction of technological improvements.

Reference should also be made to the decrease in the weight of the traditional sub-sectors and diversification in the case of traditionally non exporting sectors (ceramics and glass, furniture, cork insulation and metal products).

In the case of the Transport sector, due consideration has been given to the development of combined solutions for goods transport, which will result in an increase in rail traffic. In the case of passenger transport, the current average European car ownership figures are expected to be reached in the year 2005, with less use being made of private vehicles as opposed to greater use of public transport. Greater long-distance mobility per person and less commuting have also been considered.

Figure 4.2 - Projection of Methane emissions up to the year 2010 (CH4)

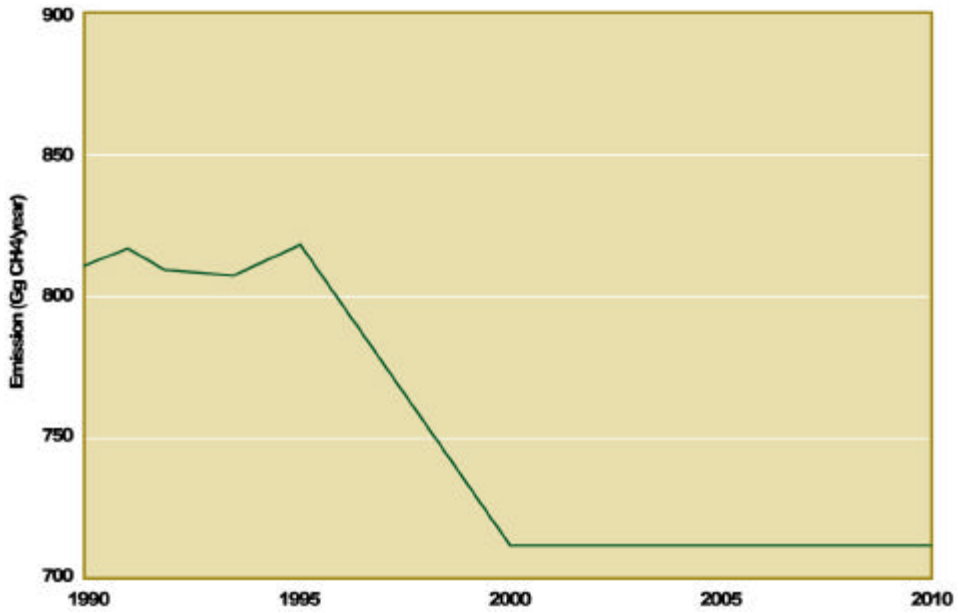
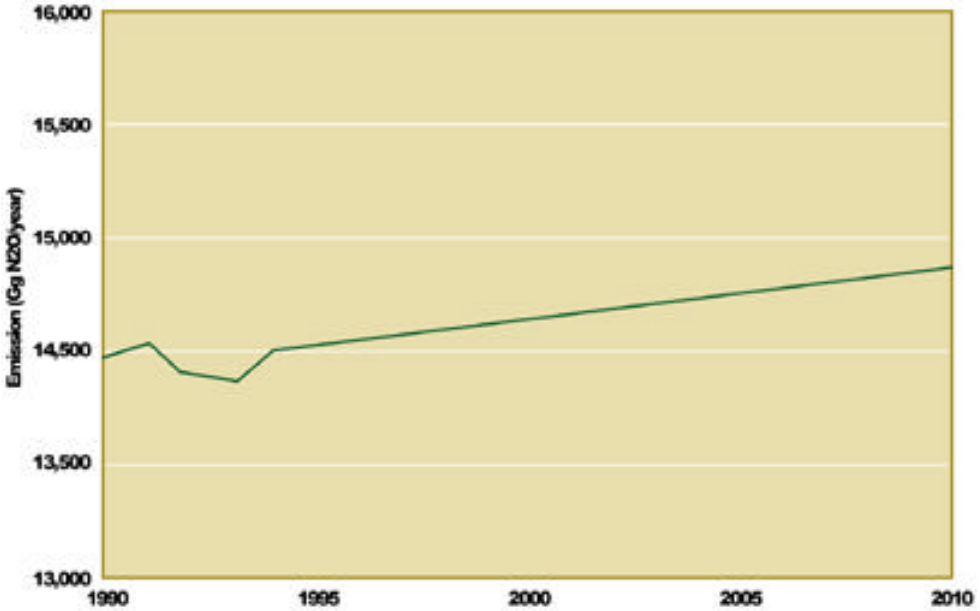


Figure 4.3 - Projection of Nitrogen Oxide (N2O) emissions up to the year 2010



In the Domestic /Services sectors, due consideration has been given to an increase in population during the period, based on an increase of population from other countries. The scenario is therefore associated with both greater use of household appliances and greater demands for air conditioning to increase the level of comfort in residences and the workplace. The evolution of energy consumption in service locations has been simulated on the basis of the underlying socio-economic scenario, geared towards high quality tourism, as well as concerns over the areas of health, training and education, targeted at technological and energy efficiency associated with environmental concerns.

Table B3 of Annex B shows the key variables and assumptions used in the projections.

Reduction Policies and Measures

The calculation of the effects of energy policy measures enabling reductions to be made to emissions of CO2 and other greenhouse gases, have been prepared for three groups of principal measures:

- Energy diversification through the introduction of natural gas;
- Promotion of the use of renewable energies;

- Promotion of energy efficiency in all sectors of activity.

The method used, consisted of the construction of an energy demand scenario using only currently existing measures, i.e. without the introduction of natural gas, without the development of more renewable energy and co-generation projects and without any concern over improving energy efficiency after 1995. The effects of limiting emissions of CO2 are the result of the difference between the emission values calculated for the two scenarios: with the existing measures and with the existing, plus additional, measures.

4.3 Estimate of emissions

4.3.1 Carbon dioxide

The projections refer to Carbon Dioxide i.e. all of the carbon which is directly or indirectly discharged into the atmosphere as a result of the use of fossil fuels and several mineral materials.

Figure 4.1 shows the differences between the estimates of the Directorate General for Energy (A) and the national commitment (B).

The global value does not include emissions from the consumption of biomass, either traditional or not, nor emissions of CO2 resulting from either maritime or aviation bunkers.

The national commitment fixes the increase in emissions of carbon dioxide at 40%, in the year 2010 (63 Gg), using 1990 as the base year.

4.3.2 Methane

The expected evolution in emissions of CH4 can be analysed in Figure 5.2. This estimate is based on the evolution of fuel consumption, alterations to the type of fuels used, increase in the rice cultivation area as well as the forecast alterations to the management of wastes i.e. the use of incineration.

It should, however, be pointed out that the submission of emissions referring to wastes is based on potential emissions from wastes generated and deposited each year. Methane emissions are released over many years after deposition in a landfill. Accordingly, the reduction of emissions will effectively occur later than forecast in the estimates.

4.3.3 Nitrous oxide

The emission estimates of N2O are the result of the forecast evolution of fuel consumption and have already taken the introduction of natural gas into consideration. It is not possible to include the alteration of emissions from agricultural activity.

5.

CLIMATE VULNERABILITY AND THE POTENTIAL EFFECTS OF CLIMATE CHANGES

5.1 Introduction

Portugal is a country of contrasts, not only on a topographical and climate level but also on a level of ecosystems.

Temperature distribution is the result of the difference in latitude (continentality) and altitude; the spatial distribution of precipitation contrasts markedly between regions north of the River Tagus and regions to the south of the river. The geographical situation of the territory of Mainland Portugal favours the occurrence of droughts which are almost always associated with blocking situations in which the sub-tropical anticyclone in the North Atlantic is maintained in a position which prevents disturbances on the polar front from reaching the Iberian Peninsula.

The potential effects of climate change will obviously depend on the dimension and degree thereof. The forecast climate changes will have a marked effect on agriculture, water resources, human health, sea levels and global ecosystems.

5.2 Climate vulnerability

Droughts, Floods and Inundation

Droughts are common occurrences on Mainland Portugal, and special reference should be made to the most severe drought years of 1980/81, 1982/83, 1991/92, 1992/93 and 1994/95. Floods and inundation are also frequent and it should be pointed out that the major floods occurring over the last 20 years were in December 1981; November (catastrophic flooding in the Lisbon and Setúbal Regions) and December 1983; January and December 1996.

Heavy, violent “downpours” in specific locations and of short duration can cause “flash flooding” which can occasionally have dramatic effects, particularly in the case of small hydrographic basins and in the west, south and urban regions owing to defective drainage.

Desertification

Desertification is currently a reality which depends upon natural (droughts and climate

change) and human factors.

This phenomenon is visible in Portugal and principally so in the inner eastern and southern regions which have been seriously affected by soil erosion caused by unsuitable agricultural practices and occurrences of intense precipitation over short periods of time.

According to the United Nations Convention on Combating Desertification, zones in which the ratio between annual precipitation (P) and potential Penman evapotranspiration is between 0.05 and 0.65, and there is a reduction or loss of biological or economic productivity in the respective bio-productive system, can be classified as suffering from desertification processes.

The map of Portugal (Fig. 5.1) which sets out the P/ETP ratio values for the 1961-1990 period shows that the phenomenon of desertification deserves particular attention in the regions of the Alentejo and Algarve and in the eastern region of Trás-os-Montes and Beiras.

Heat Waves

Portugal is still affected by heat waves, i.e. major sequences of days with high air temperature levels and very low relative humidity levels.

An increase in the frequency of the occurrence of heat waves has a major effect on human health, e.g. heart disease. Atmospheric pollution, on the other hand has a markedly determining effect on certain types of illnesses such as asthma and emphysema. Accordingly, hotter and more extensive periods of time can aggravate atmospheric pollution conditions and, consequently, the incidence of these types of diseases.

5.3 Potential Effects of Climate Change

Eventual changes to climate conditions will most probably affect the hydrological cycle, the spatial-temporal distribution of hydro resources and water quality.

Changes in precipitation patterns in Portugal, i.e. the significant reduction of the amount of precipitation in Spring over the last 30 years, with an even greater concentration of precipitation in Winter (practically over the Country as a whole, even if more expressive in the Beira Interior and the Alentejo, which are regions in risk of desertification), will have an effect on hydro resources, and will affect the availability of water for human consumption, energy production, the diluting of effluent and in agriculture.

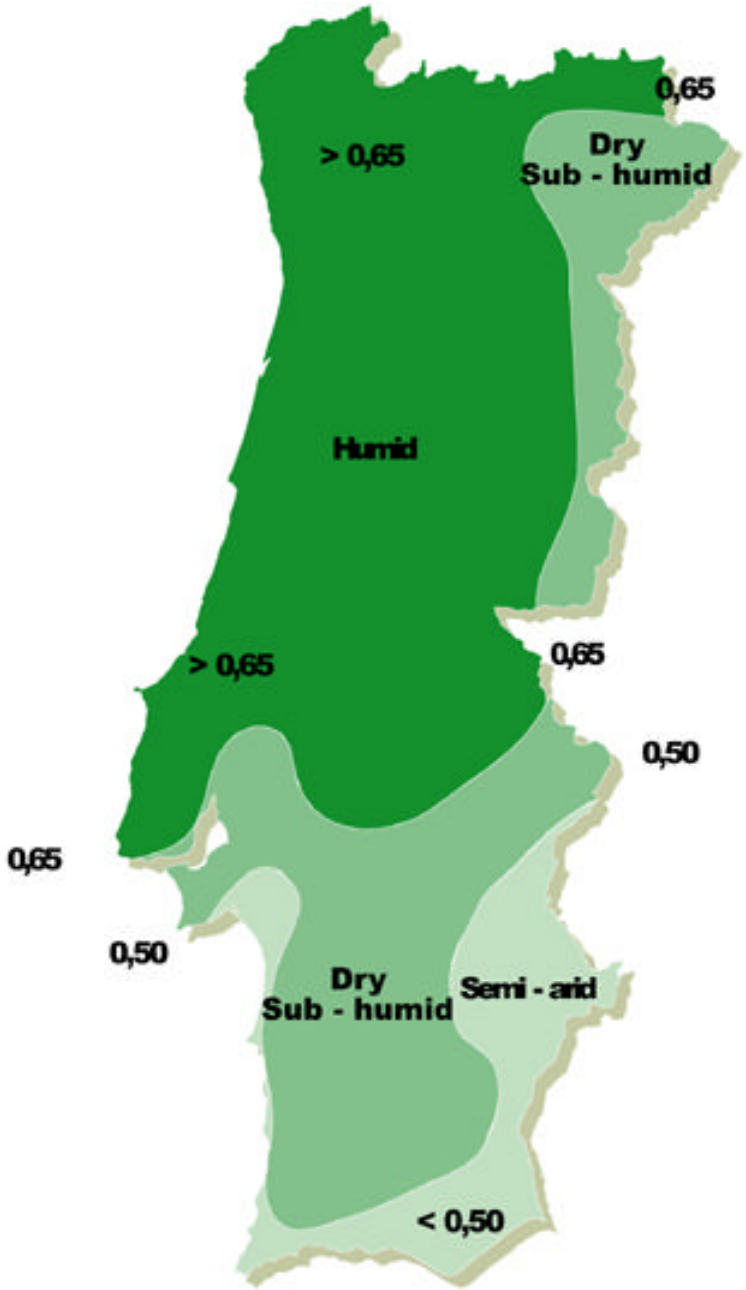
Effects on agriculture will have an effect on local communities, the regional economy, particularly owing to changes in agricultural income and profitability, regional production costs, regional food production, regional disparities in income from agriculture and economic activity and regional employment.

Average Sea Level

The average rise in sea level in Portugal will precipitate the action of storms on the coast and may be the cause of several problems of which special reference should be made to the following:

- the acceleration of coastal regression; erosion is causing a recession to the coastline which, in several locations, can be as high as 1 m per annum; with the acceleration of the increase in sea level, this regression will tend to get worse and several urban zones are in danger;
- occupation of low lying coastal areas

Figure 5.1 - Average annual P/ETP values (1961-1990)



and the estuaries of several rivers particularly the Rivers Tagus and Sado;

- increased risk of flooding close to the mouths of several rivers, particularly the River Douro;
- increased risk of storm damages to structures located close to beaches, particularly tourist resorts such as Praia Grande, Alvor, etc.;
- increased risk of damages and destruction of port and coastal works;
- contamination of aquifers by salt water (Southern Coast -Algarve).

6.
ADAPTATION MEASURES

Forests and natural ecosystems

- to conserve forest resources, exploiting soil aptitude, for which reasons soils suitable for forestry applications should not be used for another purpose, and to promote actions targeted at the control and rehabilitation of forests in decline;
- to promote reforestation;
- to protect natural ecosystems through the conservation of resources and the rural countryside, by including them as part of planning and rural development programmes

Agro-environmental

- extension activities and/or maintenance of traditional agricultural systems;
- alteration of policies and practices for providing better support to improved soil management, such as the control of erosion, the more rational use of fertilisers and pesticides and better management of irrigation and other water uses, etc.

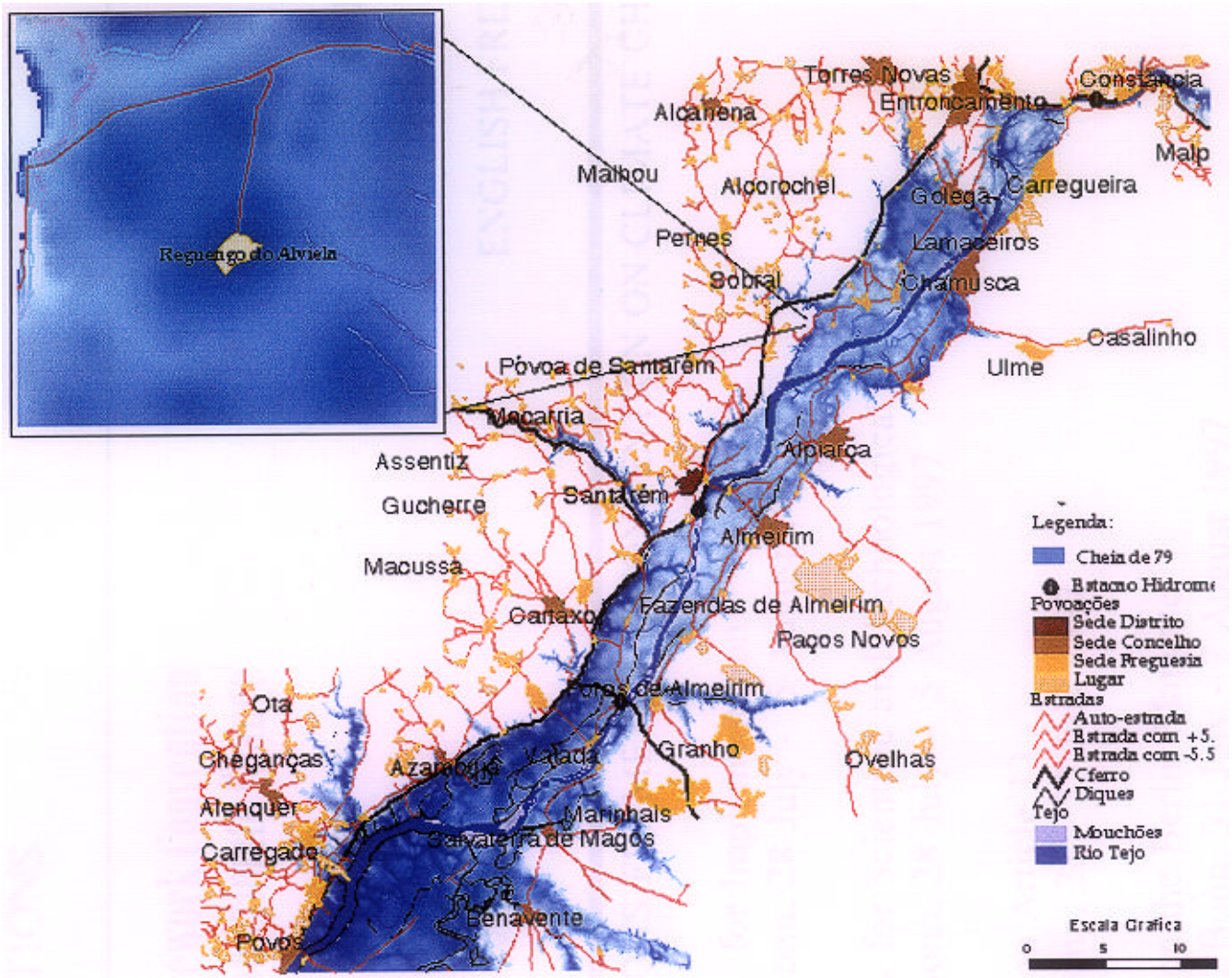
Rise in average sea level

- to make an inventory of regions at risk of rises in sea level;
- to adopt regulations enforcing consideration of the problem of average increases in sea level in respect of all construction projects located close to the coast and, in particular, all coastal and port engineering works;
- a careful, independent assessment of the problem of coastal erosion;
- obligation to consider downstream effects on coastal works projects;
- to avoid excess overpopulation of locations at risk;
- to promote the natural conservation of beaches and dunes;
- to avoid actions susceptible of causing subsidence in locations at risk, such as the extraction of subterranean water.

Monitoring and Flood Alert System

The carefully planned accompaniment of

Figure 6.1 - Example of visualisation of special information. Flooding in Tagus Basin



extreme phenomena such as flooding, has led to the creation of SVAC ("Monitoring and Flood Alert System") by INAG ("Water Institute").

SVAC, which came into operation for the first time in the Tagus Basin at the time of the December 95/February 96 flooding, is operational throughout the year, although several functions were slow to come into effect during dry periods.

Several adjustments were then made to SVAC, in which priority was afforded to international basins, through the inclusion of new automatic hydrometric stations providing real-time information on reservoir operations. In the case of the Tagus Basin, this expanded scope was extended to cover the largest affluent on the left hand bank (River Sorraia). Together with this evolution in the case of international basins, exclusively national basins such as the Vouga, Modego and Sado, have also been considered.

In addition to obtaining information on levels and flows at specific strategic locations, the programme accompanying the evolution of the flooding is also based on the distribution of spatial information, in such a way as to control zones clearly in danger of being submerged in addition to making it possible to provide a graphical representation (Fig. 6.1) of the progression of the area being swamped. INAG has been specially equipped for this purpose with a digital land model (on a scale of 1 to 25000) which includes analytical capacity, connected to a database incorporating information on hydraulic works (dikes), roads, local resident communities, etc. This enables the system to be interrogated in respect of any of these component parts.

The system also has the capacity to incorporate the modelling and forecasting of levels for advance viewing of the areas to be flooded over the short to medium term using the digital model. During the latter stage it is expected that the model will be made dynamic to the extent that it will be able to incorporate information on the rupture of dikes, permitting the hydraulic propagation of its effects and the re-configuring of the digital model.

7.

FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

7.1 Introduction

Development cooperation policy constitutes one of the fundamental aspects of Portuguese foreign policy, centred on concerns such as the search for peace, solidarity, the promotion and consolidation of democracy and a Law Abiding State, and respect for Human Rights and fundamental liberties, the defence and affirmation of the Portuguese Language and conservation of the environment.

This same development cooperation policy is increasingly involved with "environment and development" issues, both as regards the process for the preparation of projects, as in support for actions in this development area. It was effectively from the date of the major Earth Summit which was held in Rio of Janeiro in 1992, that the relationship between the environment and development (and most specifically environmental problems) gained momentum in Portugal.

The environmental issue, on its own account, however, does not, as yet, constitute a central priority of cooperation policy; it is, inter alia, to a certain extent, included in other sectors of intervention, such as agriculture, fisheries and tourism.

7.2 Cooperation and Financial Assistance

The total amount of Public Development Aid (PDA) (i.e. funds earmarked for developing countries and multilateral institutions provided by public organisations with the principal objective of promoting economic development and the well-being of developing countries and which usually takes the form of "subsidies" of which at least 25% is usually non repayable), in 1995 was 270 million US dollars, which corresponded, in terms of the PDA / GDP ratio at market prices to 0.26%.

Reference should also be made to the fact that the Portuguese PDA is principally geared to Less Advanced Countries (LAC). Aid to these countries in 1995 represented 59% of the total.

Of these LACs, Portuguese speaking African Countries are the principal beneficiaries of Portuguese State aid.

Portuguese Cooperation is still at an embryonic stage in the case of Central and Eastern European Countries / Commonwealth of Independent States formed from the ex-Soviet Union (CEEC/CIS), and endeavours are being made to begin a closer relationship among the Parties Involved. No projects in the environmental area nor any other projects with an environmental component were carried out with these countries in 1995.

Several bilatreal actions were taken, namely in the domains of education and training and support for the preparation of legislation on the environment.

Cooperation actions exclusively associated with environmental concerns in 1995 came to around 0.5 million USD dollars (0.61% of bilateral public spending per target segment, excluding financial funds) and were principally carried out in Guinea-Bissau, Mozambique, Cape Verde and São Tomé and Príncipe.

The 1995 distribution of bilateral public spending per target sector (excluding financial funds), was as follows:

- Infrastructures and Social Services 3.78%
- Infrastructures and Economic Services 10.20%
- Production Sectors 8.55%
- General Environmental Protection 0.61%
- Other 6.86%

Special reference should be made, in the case of Guinea-Bissau, to training actions and defence and the rational use of currently existing forest resources projects. Support to the Ministry of Agriculture's Forest Services has been given since 1990 and the "Forest Industries" Project has been in force since 1994. This is part of the Tropical Forest Action Programme, whose objectives are summarised below:

- audit of local forest industries;
- technological improvements to secondary species;
- training of technical operatives;
- creation of a professional association.

Reference should also be made, on this issue, to the implementation of the project for the National Park of Lagoa de Cufada (co-financed by the European Union and Portugal).

In Mozambique, there will be an involvement in the "Project for Reinforcing the Intervention Capacity of the National Directorate of Forests and Wild Fauna", via the formation of a group of 12 DNFFB technical operatives, in the area of the management of forest resources in parks and reserves.

Projects in Cape Verde have been centred on the regulating of the Basic Environmental Law, dangerous urban wastes, information, documentary sources, improvements to the quality of the environment and training.

In São Tomé and Príncipe support has been provided in the areas of legislation, education, environmental awareness and the quality of the environment and training/refreshing of staff.

8.

RESEARCH AND SYSTEMATIC OBSERVATION

8.1 Introduction

Portugal's endeavours in this domain are part of the definition of its general policy and it is an active participant in the international organisations to which it is a party. These include the World Meteorological Organization, (WMO), European Organisation for the Exploitation of Meteorological Satellites, (EUMETSAT) and the European Centre for Medium Range Weather Forecasting, (ECMWF) in addition to the International Programmes: World Weather Watch, World Climate Programme, containing the research component,(WCRP), Global Climate Observing System and others from the United Nations and from the European Union.

Also included are the National Observing and Monitoring Programmes for the Atmosphere and studies on the composition of the atmosphere and climate.

In EUMETSAT, Portugal is a party to the proposal for the creation of a Climate SAF (Satellite Application Facility) and is preparing to create an Land SAF.

8.2 Research Programmes

8.2.1 National Research Programmes

These projects are subsidised under the PRAXIS XXI, programme which is co-financed by the European Commission as part of Structural Funds.

Only 9 of the 21 proposals submitted in the area of Global Change have been financed (US$ 1 720 000), and only two of them deal specifically with climate change viz: “THE EFFECT OF LOCAL CLIMATE CHANGE ON THE NORTH ATLANTIC AND IBERIA” - University of Aveiro and “ROCA” (Air Composition and Monitoring Network) - Institute of Meteorology”.

A tender was issued in September 1995 for the support structure (Nucleus of Global Change in the Azores). The International Appraisal Committee decided to award US$ 20 000 to a study of the viability of this Nucleus.

There is a collection of new aspects in this area in Portugal owing to the influence of PRAXIS:

- Creation of the National Committee for the International Geosphere-Biosphere Programme (IGBP);
- Promotion of national and international cooperation;
- Domain of specific techniques;
- Diffusion.

8.2.2

JNICT SPONSORED R&D Programmes (Protocol between JNICT and Directorate General for the Environment)

Specific Programme for the Environment

a) Projects financed by JNICT

"Modelling of atmospheric circulation over the Island of Madeira: Generation and turbulence at airport" - University of Lisbon

"Use of satellite images in the cartography of the desertification of Southeast Portugal" - University of Lisbon.

"Long term meteorological forecasting system for Mainland Portugal"- University of Évora, ICAT, Institute of Meteorology.

"Expert System for the interpretation of satellite images for assessing desertification in Portugal" - Universidade Nova de Lisboa.

b) Projects financed by Directorate General for the Environment

"Environmental impact models of coastal breezes"

8.2.3

Participation in Community Programmes

a) The following projects with Portuguese participation have been chosen under the "Environment and Climate" Community programme:

"Annual to decadal variability in climate Europe" - Universities of Lisbon, Évora and Oporto.

"ACE - 2 Clear Sky Column" - University of Évora

"Integrated management methods: monitoring environmental change in coastal dune ecosystems" - University of the Algarve.

b) The following projects have been financed under the STRIDE-Portugal Programme:

"Analysis of recent climate changes and their stratigraphic record in the Algarve region" - University of the Algarve;

"Atmosphere over the Southeast Iberian Region: a study of its dynamic structure and composition based on satellite and surface observation data" - University of Évora.

8.3

Acquisition, Monitoring and Systematic Observation

8.3.1

Control of Climate System

The Institute of Meteorology is responsible for fulfilling commitments undertaken in the Meteorological and Climatology domains and has consequently been engaged on continuing and further developing these scientific and technical activities which began in Portugal in the middle of the 19th century with the

installation of meteorological stations and the beginning of meteorological and climatological observations.

Therefore, climatological series with several parameters which are currently more than 140 years old, make it possible to undertake research into the domain of climate changes, namely in terms of the analysis of trends and variability.

Systematic Observation implies the need for observation networks and the Institute of Meteorology has been responsible for the continued maintenance of 30 synoptical stations, 70 climatological stations, 700 udometric units (the majority of which come under the responsibility of INAG) and 3 aerological stations. It has also launched a process for the purchase and installation of automatic stations.

Portugal is a member of two programmes in respect of the network for the Composition of the Atmosphere: BAPMoN (Background Air Pollution Monitoring Network and GO3OS (Global Ozone Observing System).

8.3.2 Remote Sensing

In the domain of Remote Sensing we are equipped with reception facilities for METEOSAT and NOAA series meteorological satellites, a meteorological radar, and an aero-transportable multispectral sweep radiometer as well as the necessary, hardware and software for filing and processing applications in addition to SPOT and LANDSAT satellites.

In addition to the international effort being made in the domain of meteorological satellites, climatological studies on clouds have been carried out in addition to the cartography of major areas of vegetal covering in cooperation with the ISPRA Centre, the study of droughts, dryness indices of vegetal covering, biomass production calculations, etc. Several studies have been carried out on international environmental management projects under SGEOS.

The Institute of Meteorology is currently setting up a network of meteorological radar.

Studies in this domain have been fundamentally covered by the COST intercommunication network and data Projects, in addition to projects directly related with the estimate of precipitation in hydrographic basins (flooding). The objective of the sweep spectroradometer was to equip the country with a facility for acquiring data on national territory in order to improve the management of existing resources as well as to facilitate prompt intervention in the event of natural catastrophes, forest fires, flooding and/or drought or industrial accidents.

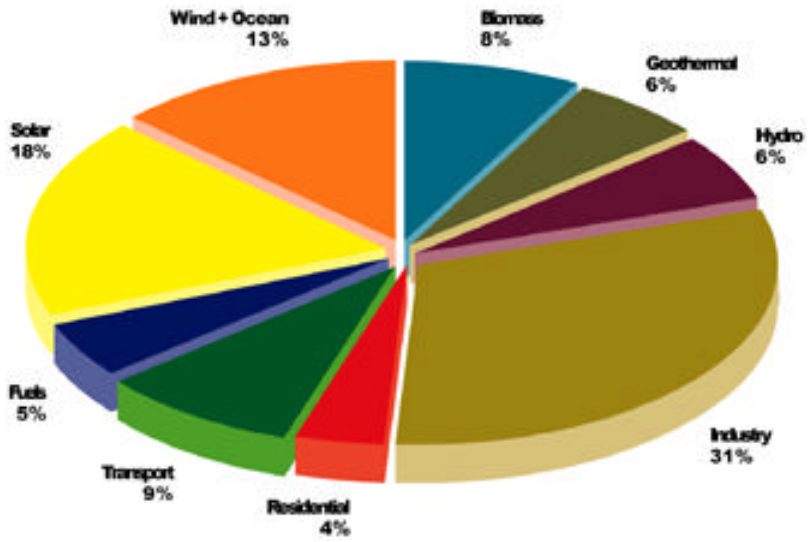
The equipment is also expected to be used for the study of the heat island effect of residential communities populations and the study of microclimates.

8.4 Technological Research and Development

The lines of action established, which have been furthered in the form of national and international programmes, have concentrated on the more efficient and cleaner use of fuels, both in the supply and demand sectors and the promotion and demonstration of renewable energies.

The priority thrust of Energy/Environment programmes is to undertake research into mechanisms for the formation and removal of pollutants, the development of methodologies for the control of emissions at source, the development and demonstration of technologies for separating and removing pollutants and the development of processes for the conversion of fuels into other cleaner, easier to use fuels.

Figure 8.1 - R&D priorities (1997 estimates)



The priorities in the demand sector are energy management in industry, the optimising of combustion processes with the twofold objective of maximising efficiency and minimising environmental effects and the development of new technological concepts for the combined production of heat and electricity by industries.

In the area of renewable energies, the objectives involve diversifying sources of primary energy and minimising environmental effects; around half of the R&D investment on overall energy applications is spent on these energies (Figure 8.1).

8.5 Future Developments

The thrust is expected to be in broadening and increasing surveillance of the composition of the atmosphere, climate variability and the possibility of climate change caused by human activity, in accordance with the principles and/or obligations created, inter alia, under the United National Framework Convention on Climate Change.

With the above in mind, the regional limited area models included as part of numerical General Circulation models will play an important role in the evaluation of the effects forecast by the climate scenarios in the different domains, as well as adaptation measures.

Portugal is expected to reinforce its involvement in international research programmes into climate comprehension and global change namely the WCP (World Climate Programme) under the aegis of the WMO with its research component and the International Biosphere-Geosphere Programme.

9.

EDUCATION, TRAINING AND PUBLIC AWARENESS

9.1

Education and the environment

Support for environmental education projects, both in basic and secondary education and kindergartens represent an area of concern which involves the committed collaboration of the structures of the Ministry of Education (ME) and the Institute of Environmental Promotion (IPAMB) of the Ministry of the Environment (MA). The objective behind this cooperation is the horizontal integration of these issues as part of school programmes, motivating the involvement of the community, environmental protection associations, local authorities and local companies, necessary for a full, civic education.

Pursuant to the referred to perspective, the issue of climate change is not subject to a specific approach in basic and secondary education, although it is subject to environmental issues in general and those related with the atmosphere in particular. The currently existing basic and secondary educational school programme considers Environmental Education as being a trans-curricular issue, and therefore part of the programme contents of all disciplines and disciplinary areas (including the new discipline of Personal and Social Development), School Area projects (interdisciplinary curricular areas which are compulsory) and the Activities Complementing the Programme (optional).

The issue of Climate Change may, therefore, be approached in isolation, on a level of the contents of disciplines such as Biology or Geology (12th year) and, more systematically, Geography (10th and 11th years) or from a transversal programme perspective.

The promotion of Environmental Education in schools has been an issue involving a high degree of cooperation between Departments and Ministries, in particular Education and the Environment, to which reference has already been made.

Reference should also be made to the following:

- A national competition for basic and

secondary educational establishments in support of Environmental Education projects has been organised annually since 1993/94.

- Various representatives from the ME (DES, DEB, IIE and FOCO) comprise an interdepartmental task force which was set up in 1995 for Environmental Education together with representatives from the Institute of Environmental Protection.
- The "Think Environment" Project which comprises several departments from the ME (DEB and DES) is an initiative of the Council of Europe's North-South Centre, the Ministries of the Environment and Education, the Local Municipality of Lisbon, various Environmental NGOs and young people's groups.

The objectives of this Project are:

- to create awareness of the issue of solid urban waste and the need to reduce, re-use and recycle it;
- to establish forms of cooperation between the different local participants.

The Task Force has realised several training/awareness actions for basic and secondary education teachers and has prepared a school kit and an advertising/information poster, having also sponsored a European Seminar.

The issues dealt with were:

- the 3 R(s): reduction, re-use and recycling (of paper, plastic and glass);
- nature conservation (environmental issues in general);
- interdependent relations between the environment and development (sustainable development).
- In 1996, as Environmental Education was considered to be a priority in the framework of Environmental Education policies, as defined in the Government's Programme, a technical / scientific / pedagogical, financial and logistical protocol of cooperation was agreed between the two Ministries for promoting the development of Environmental Education in schools.

Representatives of the ME (DEB and DES) comprise the Task Force for the development of the actions plans.

In addition to the intensification of support for the development of school projects, the permanent cooperation (i.e. secondment) of 15 teachers for revitalizing Environmental Education projects, pursuant to the framework of the referred to protocol, has been organised.

- A protocol was recently (October 96) entered into between Government agencies of the USA and the Portuguese Ministries of Education and Environment for the participation of Portuguese schools in the GLOBE Programme.

GLOBE environmental measures, realised by the schools participating in critical areas such as: the Atmosphere / Climate, Hydrology / Water Chemistry and Biology / Geology, have been designed to make significant contributions to scientific knowledge of the dynamics of the world environment.

The Cooperation between the Ministry of Education and the Ministry of Agriculture has essentially taken the form of the active participation of the ME (DEB and DES) on the Coordinating Commission for the World Forest Day Celebrations (CCCDMF), coordinated by the Directorate General for Forests and comprising representatives from other ministries and organisations. Every year, the CCCDMF organises and coordinates national activities for increasing the awareness of the population in general and students in particular regarding the importance of forests in respect of planetary equilibrium and the socio-economic and cultural life of Mankind.

9.2
Awareness and training

The necessary consciousness of the importance played by the Environment in our lives, the global dimension of the problems involved and the necessary intervention of all citizens in day-to-day affairs, continues to motivate Environmental Promotion work.

In the area of environmental education and in addition to the intervention of schools, there are living experimental areas of learning such as the cases of the Botanical Garden Centre, in collaboration with the Faculty of Science of the University of Lisbon, and the ISA Project, in collaboration with the Higher Institute of Agronomy of the Technical University of Lisbon, which organises visits by young people and school outings in which the animators/teaching staff involved have received instruction in advance.

Considering the industrial reconversion in progress and the new type of structures recommended for environmental protection, staff training operations have been organised. These have been designed to make up for the shortfalls existing both in the areas of water and waste water and the quality of the air, solid urban and hospital wastes, noise or the assessment of environmental effects.

This type of intervention, which is appropriately structured on the basis of a 1995/1999 training plan and is based on the studies on training needs in the environmental area (realised in 94), involves various entities whose work on the matter has been recognised, and which has been complemented by diverse awareness-information actions, both in the organisation of exhibitions and support materials and the targeted provision of all information and bibliography.

The information and/awareness campaigns on Protection from Forest Fires organised by the Ministry of Agriculture, Rural Development and Fisheries are eligible for Regulation (CEE) no. 2158/92, of 23rd July.

With the above in mind the Directorate General for Forests, which is the organisation in charge of executing this Regulation, has, during the course of the period of application of this instrument, been engaged on organising awareness campaigns targeted at the population in general, as well as promoting and supporting actions realised by other entities in this area.

10.
TERRITORIAL PLANNING

10.1
Planning System

Although the issue of climate change is not specifically dealt with as part of territorial planning policy, it is not, however, possible to ignore that the rational use of natural resources and protection of the quality of the environment, are vectors involved in the said policy and must be considered in the objectives set out in the different plans (Regional, Special and Municipal Territorial Plans).

On the other hand, as one of the territorial planning objectives involves the correct location of activities, the harmonising of the different sectoral policies is carried out on a territorial planning level, particularly in the Regional Territorial Planning and Municipal Master Plans.

In respect of urban areas, this harmonisation also occurs on a level of Urbanisation and Detailed Planning.

As the planning and management of the use of the land is principally the competence of local administration, local council officers are particularly responsible for the preparation and approval of municipal plans for territorial planning (which include Municipal Master Plans, Urbanisation Plans and Detailed Planning) and for the licensing both of land allotment operations and building works as well as private projects in which central government limits its activity to ratifying or issuing an opinion on the plans, and, in the case of licensing activities, in respect of which it is responsible for issuing opinions.

The importance of integrating environmental issues (in any of their aspects - quality, resource management or nature conservation) in territorial planning operations, namely on a level of the respective plans, is not only clearly assumed both in the objectives of regional and municipal territorial planning as is the obligation of taking them into consideration in the proposed plan - and specifying the constraints on the chart - involving different aspects such as Agricultural Reserves and National Ecological Reserves (RAN and REN), protected areas, areas coming under the forest regime, areas for the protection of listed buildings and areas pertaining to the public hydro domain, without which the plans,

even if approved by the Municipal Assembly, cannot be lawfully ratified and are therefore invalid.

The same concern over integrating environmental issues as part of the planning system, justifies the inclusion of the Ministry of the Environment as part of the system for accompanying the preparation of plans.

Public involvement is guaranteed on all planning levels in the form of public consultations, involving the organising of public meetings in the case of "PROT" (Regional Territorial Planning Operations) and exhibitions and public surveys in the case of other plans.

10.2
Land Allotment and Urbanisation Projects

On another level, in the specific case of land allotment - which, although not formally part of the planning system, constitutes one of the most important forms of occupancy or transformation of the use of the land - in addition to imposing an obligation for the preparation of the process to be accompanied by a map setting out the current situation, and which should make reference to the lands covered by the RAN and REN, if the area is not lawfully covered by "PMOT" (Municipal Territorial Planning Operations), Decree-Law no. 448/91 of 29th November states that one of the reasons for the rejection of a licensing application is when archaeological, historical, cultural, countryside, natural or built heritage are affected.

Similarly, although this obligation is not specifically contained in legislation, the Ministry of the Environment is normally consulted as part of the licensing's consultation process.

On the other hand, Ministerial Order no. 1182/92, of 22nd December - which regulates the parameters of the size of the land areas to be set aside for green belts and collective use, road infrastructures and collective facilities to be applied in respect of land allotment operations - have the underlying intent of guaranteeing the existence of conditions conducive to a minimum standard of living based on the respective equipment and infrastructures.

The same concern over correct planning and, therefore, suitable living standard conditions, requires applications for land allotment licensing and urbanisation works operations to be prepared - even in the case of those, inter alia, which are covered by detailed planning, urbanisation or municipal master plans , and make reference to "areas for collective use, including green belts and respective landscaping", and the "solution adopted for the operating of water supply, electricity, sanitation networks ... and their connections to general networks, when appropriate".

Specific case of the environment in urban areas

Owing to the fact that the dimension of the urbanised areas, and the urban population, is increasingly expanding, environmental problems in urban areas are of growing importance as are the living standards of the population.

As these are areas in which constructions i.e. artificial areas, are dominant, the quality of the urban environment depends on a variety of interrelated, complex factors, including the quality of the water air and soil, the elimination of wastes and noise levels, such as those produced by the transport system, the state of conservation of buildings and their architectonic quality, the existence of open public areas (green or not), leisure and recreational facilities, and actual density, structure and urban countryside.

The complexity of the urban system, and the

reciprocal influence of its component parts, means, in improving the quality of the environment in urban areas, that it is not sufficient to act in isolation on a level of the different environmental factors and makes it necessary for any involvement to simultaneously take into account the structure, operating and evolution of urban areas, issues which arise from urban planning and management.

Environmental issues are increasingly shaping urban planning and management strategies, and prevent them from being solely based on economic and functional criteria. They permit the existence of a coordinated, integrated strategy which is particularly important in the case of urban areas.

Tabela A1. Ia - Energy (IA)(Combustion Activities, Emissions of Pollutants

SOURCE CATEGORIES	FUEL	CONSUMPTION (PJ)	EMISSION ESTIMATES (Gg of Pollutant) CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	653.88	54 147	14.88	1.78	334.95	952.52	101.53
1A Fuel Combustion Activities	Liquid	436.54	32 264	7.04	1.27	281.78	666.29	72.41
1A Fuel Combustion Activities	Solid	115.36	11 017	0.53	0.17	46.38	15.62	4.65
1A Fuel Combustion Activities	Biomass Traditional	72.18	7 731	6.54	0.31	4.90	267.68	23.69
1A Fuel Combustion Activities	Biomass (Other)	29.80	3 135	0.78	0.04	1.90	2.92	0.78
1A Fuel Combustion Activities	Internacional Bunkers	27.84	2 062	2.08	0.04	36.52	2.44	0.11
1A1 Energy and Transform. Industries	Total	240.83	20 247	1.28	0.25	71.06	7.05	2.15
1A1 Energy and Transform. Industries	Liquid	121.74	8 682	0.38	0.08	28.31	2.46	0.80
1A1 Energy and Transform. Industries	Solid	88.34	8 333	0.10	0.12	40.88	1.17	0.39
1A1 Energy and Transform. Industries	Biomass Traditional	1.31	133	0.04	0.01	0.09	0.65	0.20
1A1 Energy and Transform. Industries	Biomass (Other)	29.44	3 100	0.76	0.04	1.78	2.76	0.76
1A1a Electricity and Heat Production	Total	211.47	18 244	1.19	0.22	65.50	5.97	2.05
1A1a Electricity and Heat Production	Liquid	93.32	6 769	0.29	0.05	22.86	1.40	0.70
1A1a Electricity and Heat Production	Solid	87.40	8 243	0.10	0.12	40.77	1.15	0.39
1A1a Electricity and Heat Production	Biomass Traditional	1.31	133	0.04	0.01	0.09	0.65	0.20
1A1a Electricity and Heat Production	Biomass (Other)	29.44	3 100	0.76	0.04	1.78	2.76	0.76
1Alb Petroleum Refining	Liquid	28.42	1 913	0.08	0.03	5.45	1.06	0.10
1Alc Solid Fuel Transformation (1)	Solid	0.93	90	0.00	0.00	0.11	0.02	0.00
1A2 Industry	Total	112.91	9 227	1.55	0.18	18.16	25.29	7.63
1A2 Industry	Liquid	66.22	4 551	0.54	0.05	11.21	0.99	0.45
1A2 Industry	Solid	26.93	2 675	0.42	0.04	5.48	14.44	4.25
1A2 Industry	Biomass Traditional	19.41	1 967	0.58	0.08	1.36	9.70	2.91
1A2 Industry	Biomass (Other)	0.36	35	0.02	0.00	0.12	0.16	0.02

1A3 Transport	Total	177.70	14 060	4.78	0.53	196.90	646.71	66.72
1A3ai International Aviation	Liquid	12.11	888	0.23	0.01	3.51	1.72	0.03
1A3aii National Aviation	Liquid	12.32	906	0.26	0.01	3.56	3.32	0.03
1A3b Road Transportation	Liquid	128.68	10 430	1.65	0.40	140.06	639.64	66.26
1A3c Railways	Liquid	2.39	176	0.01	0.07	3.14	1.01	0.28
1A3di International Navigation	Liquid	15.72	1 173	1.86	0.03	33.01	0.72	0.09
1A3dii National Navigation	Liquid	6.48	486	0.77	0.01	13.61	0.30	0.04
1A4 Small Combustions	Total	115.45	10 100	7.08	0.82	45.19	273.31	24.73
1A4 Small Combustions	Liquid	63.98	4 467	1.16	0.59	41.74	15.98	4.14
1A4 Small Combustions	Solid	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4 Small Combustions	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4a Commercial/Institutional	Total	10.43	733	0.18	0.01	3.39	0.30	0.30
1A4a Commercial/Institutional	Liquid	10.42	732	0.18	0.01	3.38	0.30	0.30
1A4a Commercial/Institutional	Solid	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4b Residential	Total	75.63	7 194	5.98	0.26	5.02	263.32	20.66
1A4b Residential	Liquid	24.17	1 562	0.07	0.03	1.57	6.00	0.07
1A4b Residential	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4c Agriculture/Foresty/Fishing	Liquid	29.39	2 173	0.92	0.55	36.79	9.68	3.76
1A5 Other (Civil Construction)	Total	6.98	512	0.19	0.01	3.64	0.16	0.31
1A5 Other (Civil Construction)	Liquid	6.90	503	0.18	0.01	3.62	0.14	0.31
1A5 Other (Civil Construction)	Solid	0.08	8	0.01	0.00	0.02	0.02	0.01

Table A1, Ib - Energy (IA) Combustion Activities

SOURCE CATEGORIES	FUEL	EMISSION FACTORS (t Pollutant/TJ)					
		CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	83	0.023	0.0027	0.512	1.457	0.155
1A Fuel Combustion Activities	Liquid	74	0.016	0.0029	0.645	1.526	0.166
1A Fuel Combustion Activities	Solid	96	0.005	0.0015	0.402	0.135	0.040
1A Fuel Combustion Activities	Biomass Traditional	107	0.091	0.0043	0.068	3.708	0.328
1A Fuel Combustion Activities	Biomass (Other)	105	0.026	0.0012	0.064	0.098	0.026
1A Fuel Combustion Activities	International Bunkers	74	0.075	0.0015	1.312	0.088	0.004
1A1 Energy and Transform. Industries	Total	84	0.005	0.0010	0.295	0.029	0.009
1A1 Energy and Transform. Industries	Liquid	71	0.003	0.0007	0.233	0.020	0.007
1A1 Energy and Transform. Industries	Solid	94	0.001	0.0014	0.463	0.013	0.004
1A1 Energy and Transform. Industries	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1 Energy and Transform. Industries	Biomass (Other)	105	0.026	0.0012	0.060	0.094	0.026
1A1a Electriicity and Heat Production	Total	86	0.006	0.0010	0.310	0.028	0.010
1A1a Electriicity and Heat Production	Liquid	73	0.003	0.0006	0.245	0.015	0.008
1A1a Electriicity and Heat Production	Solid	94	0.001	0.0014	0.466	0.013	0.004

1A1a	Electriicity and Heat Production	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1a	Electriicity and Heat Production	Biomass (Other)	105	0.026	0.0012	0.060	0.094	0.026
1Alb	Petroleum Refining	Liquid	67	0.003	0.0010	0.192	0.037	0.003
1Alc	Solid Fuel Transformation (1)	Solid	96	0.003	0.0014	0.120	0.017	0.003
1A2	Industry	Total	82	0.014	0.0016	0.161	0.224	0.068
1A2	Industry	Liquid	69	0.008	0.0007	0.169	0.015	0.007
1A2	Industry	Solid	99	0.015	0.0016	0.203	0.536	0.158
1A2	Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A2	Industry	Biomass (Other)	98	0.043	0.0039	0.330	0.446	0.043
1A3	Transport	Total	79	0.027	0.0030	1.108	3.639	0.375
1A3ai	International Aviation	Liquid	73	0.019	0.0009	0.290	0.142	0.002
1A3aii	National Aviation	Liquid	74	0.021	0.0009	0.289	0.269	0.002
1A3b	Road Transportation	Liquid	81	0.013	0.0031	1.088	4.971	0.515
1A3c	Railways	Liquid	74	0.005	0.0286	1.315	0.425	0.117
1A3di	International Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A3dii	National Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A4	Small Combustion	Total	87	0.061	0.0071	0.391	2.367	0.214
1A4	Small Combustion	Liquid	70	0.018	0.0093	0.652	0.250	0.065
1A4	Small Combustion	Solid	99	0.100	0.0016	0.150	0.200	0.200
1A4	Small Combustion	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4a	Commercial/Institutional	Total	70	0.017	0.0013	0.325	0.029	0.029
1A4a	Commercial/Institutional	Liquid	70	0.017	0.0013	0.325	0.029	0.029
1A4a	Commercial/Institutional	Solid	99	0.100	0.0016	0.150	0.200	0.200
1A4b	Residential	Total	95	0.079	0.0034	0.066	3.482	0.273
1A4b	Residential	Liquid	65	0.003	0.0014	0.065	0.248	0.003
1A4b	Residential	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4c	Agriculture/Foresty/Fishing	Liquid	74	0.031	0.0186	1.252	0.329	0.128
1A5	Other (Civil Construction)	Total	73	0.028	0.0014	0.521	0.023	0.045
1A5	Other (Civil Construction)	Liquid	73	0.027	0.0014	0.524	0.021	0.044
1A5	Other (Civil Construction)	Solid	101	0.100	0.0015	0.238	0.200	0.090

Table A1. Ic - Energy (IB) Fugitive Emissions from Fuels

SOURCE CATEGORIES		ACTIVITIY DATA (Tg)	EMISSION ESTIMATES (Gg) CH4	COVNM	CO2	EMISSION FACTORS (Gg/Tg) CH4	NMVOC	CO2
1B	Fugitives Emissions from Fuels	-	4.265	47.139	159	-	-	-
1B1	Solid Fuels	0.28	3.144	0.000	9	11.183	0.000	30.752
1B2	Oil and Natural Gas	-	1.122	47.139	150	-	-	-
1B2a	Oil	-	1.122	47.139	150	-	-	-
1B2ai	Exploration	na	na	na	na	na	na	na
1B2aii	Production of Crude Oil	na	na	na	na	na	na	na
1B2aiii	Transport of Crude Oil	10.47	0.074	3.142	10	0.007	0.300	0.955
1B2aiv	Refining/Storage	10.47	1.047	38.595	123	0.100	3.685	11.760
1B2av	Distribution of Oil Products	1.39	0.000	5.402	17	0.000	3.893	12.135
1B2avi	Other	na	na	na	na	na	na	na
1B2b	Natural Gas	na	na	na	na	na	na	na
1B2c	Venting and flaring	ioc	ioc	ioc	ioc	ioc	ioc	ioc

Table A1, IIA - Industrial Processes, Emissions of Pollutants

SOURCE CATEGORIES		PROD. QUANT. (Gg)	EMISSION ESTIMATES (Gg) CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	21 188	3 421.15	0.35	1.94	4.47	30.80	17.59
2A	Iron and Steel	566	0.78	0.00	0.00	0.03	30.80	0.05
2B	Non ferrous metals	1	2.70	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	ioc	ioc	ioc	ioc	ioc	ioc	ioc
2B2	Other	1	2.70	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	1 379	277.50	0.35	1.94	1.70	0.00	1.40
2C1	Nitric Acid	243	0.00	0.00	1.94	1.70	0.00	0.00
2C2	Fertiliser Production	744	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	392	277.50	0.35	0.00	0.00	0.00	1.40
2D	Organic Chemicals	957	0.00	0.00	0.00	0.00	0.00	4.71
2D1	Adipic acid	na	na	na	na	na	na	na
2D2	Other	957	0.00	0.00	0.00	0.00	0.00	4.71
2E	Non-metallic Mineral Products	7 631	3 140.17	0.00	0.00	0.00	0.00	0.00
2E1	Cement	6 501	3 103.57	0.00	0.00	0.00	0.00	0.00
2E2	Lime	236	ioc	0.00	0.00	0.00	0.00	0.00
2E3	Other	894	36.60	0.00	0.00	0.00	0.00	0.00
2F	Other	10 655	0.01	0.00	0.00	2.74	0.00	11.43

Table A1, IIb - Industrial Processes, Emissions Factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	161.47	0.02	0.09	0.21	1.45	0.83
2A	Iron and Steel	1.37	0.00	0.00	0.06	54.41	0.09
2B	Non ferrous metals	2 573.88	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	-	-	-	-	-	-
2B2	Other	2 573.88	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	201.30	0.25	1.41	1.23	0.00	1.02
2C1	Nitric Acid	0.00	0.00	8.00	7.00	0.00	0.00
2C2	Fertilizer Production	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	708.65	0.90	0.00	0.00	0.00	3.59
2D	Organic Chemistry	0.00	0.00	0.00	0.00	0.00	4.92
2D1	Adiptic Acid	-	-	-	-	-	-
2D2	Other	0.00	0.00	0.00	0.00	0.00	4.92
2E	Non-metallic Mineral Products	411.51	0.00	0.00	0.00	0.00	0.00
2E1	Cement	477.41	0.00	0.00	0.00	0.00	0.00
2E2	Lime	-	-	-	-	-	-
2E3	Other	40.96	0.00	0.00	0.00	0.00	0.00
2F	Other	0.00	0.00	0.00	0.26	0.00	1.07

Table A1, III - Use of Solvents and Products containing NMVOC

SOURCE CATEGORIES		NMVOC (Gg)	CO2 (Gg)
3	Solvent and other Product Use	84.06	262
3A	Paint Application	29.26	91
3B	Degreasing and Dry Cleaning	3.77	12
3C	Chemical Products Manufacture/Processing	24	76
3D	Other	26.66	83

Table A1, IV - Agriculture

SOURCE CATEGORIES		ACTIVITY DATA		EMISSION FACTORS			
		NUMBER	UNIT	CH4(Gg)	N2O(Gg)	CH4(Mg/u)	N2O(g/u)
4	Agriculture		1000 animal	210.68	7.35	-	-
4A	Enteric fermentation	30 677	1000 animal	123.91	ne	4.039	-
4A1a	Cattle Dairy	403	1000 animal	40.30	ne	100.000	-
4A1b	Cattle Non-Dairy	972	1000 animal	46.66	ne	48.000	-
4A3	Sheep	3 360	1000 animal	26.88	ne	8.000	-
4A4	Goats	857	1000 animal	4.29	ne	5.000	-
4A6	Horses	36	1000 animal	0.65	ne	18.000	-
4A7	Asses and Mules	114	1000 animal	1.14	ne	10.000	-
4A8	Swine	2 664	1000 animal	4.00	ne	1.500	-
4A9	Poultry	22 271	1000 animal	0.00	ne	0.000	-
4B	Manure Management	30 677	1000 animal	67.80	ioc	2.210	-
4B1a	Cattle Dairy	403	1000 animal	17.73	ioc	44.000	-
4B1b	Cattle Non-Dairy	972	1000 animal	19.44	ioc	20.000	-
4B3	Sheep	3 360	1000 animal	1.02	ioc	0.303	-
4B4	Goats	857	1000 animal	0.16	ioc	0.189	-
4B6	Horses	36	1000 animal	0.07	ioc	2.080	-
4B7	Asses and Mules	114	1000 animal	0.13	ioc	1.140	-
4B8	Swine	2 664	1000 animal	26.64	ioc	10.000	-
4B9	Poultry	22 271	1000 animal	2.61	ioc	0.117	-
4C	Rice Cultivation	33 246	ha	18.97	0.00	0.571	0.000
4C1	Continuosly Flooded	33 246	ha	18.97	0.00	0.571	0.000
4C3	Other	0	ha	0.00	0.00	-	-
4D	Agricultural Soils	5 579 856	ha	ne	7.35	-	1.317
4D Fert	Application of Fertilisers	5 579 856	ha	ne	1.84	-	0.330
4D	Other Sources of Nitrogen	5 579 856	ha	ne	5.51	-	0.330
4E	Prescribed Burning of Savannas	na		na	na	-	-
4F	Field Burning of Agricultural Residues	ne		ne	ne	-	-

Table A1, Va - Land Use & Forestry, Changes in Forestry and other Woody Biomass Stocks

SOURCE AND SINK CATEGORIES		AREA (1000 ha)	CARBON RETENTION (Gg)	ABSORPTION FACTOR (Mg C/ha)
5A	Annual Growth Increment	3 346	3 914	1.17
5A2	Exploitation of temperate forest	3 346	3 914	1.17
		EXTRATED BIOMASS (1000 m3)	CARBON CONSUMPTION (Gg)	EMISSION FACTOR (Mg C/m3)
5A	Annual Removal	13 208	3 600	0.27
5A2	Exploitation of temperate forest	13 208	3 600	0.27

Table A1, Vb - Land-Use Change & Forestry Residues (Synthesis) Annual Harvest

SOURCE AND SINK CATEGORIES	CARBON (Gg)	CO2 (Gg)
Total Annual Growth	3 914	14 353
Total Annual Removal	3 600	13 201
Net Emission Net Removal	314	1 152

Table A1, VIa - Waste, Emissions of Pollutants

SOURCE CATEGORIES		ACTIVITY		EMISSIONS ESTIMATES (Gg)					
		NUMBER	UNIT	CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	7 317		0.00	578.32	2.93	0.03	0.55	7.33
6A	Solid Waste Disposal on Land	6 170	kton	0.00	493.09	0.00	0.00	0.53	6.21
6B	Wastewater Treatment	773	kton CBO	0.00	85.23	2.93	0.00	0.00	1.11
6B1	Industrial	171	kton CBO	0.00	9.95	0.65	0.00	0.00	0.25
6B2	Domestic and Commercial	602	kton CBO	0.00	75.28	2.28	0.00	0.00	0.87
6C	Waste Incineration	14	kton	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	360	kton	0.00	0.00	0.00	0.00	0.00	0.00

Table A1, VIb - Emissions Factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/UNIT)					
		CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	0	79.04	0.40	0.00	0.08	1.00
6A	Solid Waste Disposal on Land	0	79.91	0.00	0.00	0.09	1.01
6B	Wastewater Treatment	0	110.24	3.79	0.00	0.00	1.44
6B1	Industrial	0	58.23	3.79	0.00	0.00	1.44
6B2	Domestic and Commercial	0	125.00	3.79	0.00	0.00	1.44
6C	Waste Incineration	0	0.00	0.00	2.31	1.48	0.15
6D	Other	0	0.00	0.00	0.00	0.00	0.00

Table A1, VIIA - Summary of Emissions of Greenhouse Gases

SOURCE AND SINKS CATEGORIES		EMISSION ESTIMATES (Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
National Total (Net)		45 971	808.50	14.00	339.46	983.87	257.65
1	All Energy	43 440	19.15	1.78	334.95	952.52	148.67
1A	Fuel Combustion Activities	43 281	14.88	1.78	334.95	952.52	101.53
1A1	Energy Transform. Industries	17 015	1.28	0.25	71.06	7.05	2.15
1A2	Industry	7 225	1.55	0.18	18.16	25.29	7.63
1A3	Transport	14 060	4.78	0.53	196.90	646.71	66.72
1A4	Small Combustion	4 468	7.08	0.82	45.19	273.31	24.73
1A5	Other	512	0.19	0.01	3.64	0.16	0.31
Biomass		10 866	7.32	0.35	6.79	270.60	24.47
1B	Figitive Emissions from Fuels	159	4.27	na	na	na	47.14
1B1	Solid Fuels	9	3.14	na	na	na	0.00
1B2	Oil and Natural Gases	150	1.12	na	na	na	47.14
2	Industrial Processes	3 421.15	0.35	1.94	4.47	30.80	17.59
3	Solvent and other Product Use	262	na	na	na	na	84.06
4	Agriculture	ne	210.68	7.35	ne	ne	ne
4A	Enteric fermentation	na	123.91	ne	ne	na	na
4B	Manure management	na	67.80	ioc	ne	na	na
4C	Rice Cultivation	na	18.97	0.00	na	na	na
4D	Agricultural Soils	na	ne	7.35	ne	na	ne
4E	Prescribed Burning Savannas	na	na	na	-	-	0.00
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00

4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na
6	Waste	0.00	578.32	2.93	0.03	0.55	7.33
6A	Disposal on Land	0.00	493.09	0.00	0.00	0.53	6.21
6B	Wastewater Treatment	0.00	85.23	2.93	0.00	0.00	1.11
6C	Waste Incineration	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	0.00	0.00	0.00	0.00	0.00	0.00
7	Other	0	0.00	0.00	0.00	0.00	0.00
International Bunkers		2 062	2.08	0.04	36.52	2.44	0.11

Table A1, VIIB - Summary of Emissions of Greenhouse gases

		EMISSION ESTIMATES (Gg)						
SOURCE CATEGORIES		CO2	CH4	N2O	NOx	CO	NMVOC	GWP
National Total (Net)		45 971	808.50	14.00	339.46	983.87	257.65	67 444.59
1	All Energy	43 440	19.15	1.78	334.95	952.52	148.67	44 413.51
1A	Fuel Combustion Activities	43 281	14.88	1.78	334.95	952.52	101.53	44 165.29
1B	Fugitive Emissions from Fuels	159	4.27	na	na	na	47.14	248.22
2	Industrial Processes	3 421	0.35	1.94	4.47	30.80	17.59	4 052.76
3	Solvent and other Product Use	262	na	na	na	na	84.06	261.99
4	Agriculture	ne	210.68	7.35	ne	ne	ne	6 783.40
5	Land-Use Change and Foresty	-1 152	na	na	na	na	na	-1 151.99
6	Waste	0.00	578.32	2.93	0.03	0.55	7.33	13 084.93
7	Other	0	0.00	0.00	0.00	0.00	0.00	0.00
International Bunkers		2 062	2.08	0.04	36.52	2.44	0.11	2 118.74

Table A2, Ia - Energy (IA) Combustion Activities, Emissions of Pollutants

SOURCE CATEGORIES	FUEL	CONSUMPTION (PJ)	EMISSION ESTIMATES (Gg of Pollutant)					
			CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	679.95	56 279	15.15	1.84	349.93	1 009.80	107.58
1A Fuel Combustion Activities	Liquid	454.34	33 673	7.29	1.31	294.43	725.45	78.25
1A Fuel Combustion Activities	Solid	119.94	11 358	0.52	0.17	48.59	13.59	4.89
1A Fuel Combustion Activities	Biomass Traditional	71.82	7 694	6.53	0.31	4.87	267.50	23.64
1A Fuel Combustion Activities	Biomass (Other)	33.86	3 554	0.80	0.04	2.04	3.26	0.80
1A Fuel Combustion Activities	International Bunkers	27.90	2 068	2.11	0.04	36.95	2.43	0.11
1A1 Energy and Transform. Industries	Total	252.19	21 286	1.31	0.26	74.19	7.40	2.22
1A1 Energy and Transform. Industries	Liquid	124.37	8 891	0.39	0.08	28.97	2.45	0.85
1A1 Energy and Transform. Industries	Solid	93.34	8 766	0.11	0.13	43.31	1.22	0.41
1A1 Energy and Transform. Industries	Biomass Traditional	1.29	130	0.04	0.01	0.09	0.64	0.19
1A1 Energy and Transform. Industries	Biomass (Other)	33.20	3 499	0.77	0.04	1.81	3.09	0.77
1A1a Electricity and Heat Production	Total	225.44	19 459	1.23	0.23	69.09	6.42	2.14
1A1a Electricity and Heat Production	Liquid	98.36	7 135	0.31	0.06	23.97	1.48	0.77
1A1a Electricity and Heat Production	Solid	92.60	8 694	0.10	0.13	43.22	1.21	0.40
1A1a Electricity and Heat Production	Biomass Traditional	1.29	130	0.04	0.01	0.09	0.64	0.19
1A1a Electricity and Heat Production	Biomass (Other)	33.20	3 499	0.77	0.04	1.81	3.09	0.77
1Alb Petroleum Refining	Liquid	26.01	1 756	0.08	0.03	5.01	0.97	0.09
1Alc Solid Fuel Transformation (1)	Solid	0.74	71	0.00	0.00	0.09	0.01	0.00
1A2 Industry	Total	113.94	9 240	1.58	0.18	18.42	23.07	7.83
1A2 Industry	Liquid	67.67	4 667	0.57	0.05	11.59	1.01	0.46
1A2 Industry	Solid	26.54	2 585	0.41	0.04	5.27	12.35	4.48
1A2 Industry	Biomass Traditional	19.07	1 932	0.57	0.08	1.33	9.53	2.86
1A2 Industry	Biomass (Other)	0.66	55	0.03	0.00	0.22	0.17	0.03
1A3 Transport	Total	188.41	14 937	4.94	0.56	207.12	705.44	72.39
1A3ai International Aviation	Liquid	11.96	877	0.22	0.01	3.47	1.70	0.02
1A3aii National Aviation	Liquid	13.05	959	0.28	0.01	3.77	3.54	0.03
1A3b Road Transportation	Liquid	138.56	11 246	1.78	0.42	149.67	698.11	71.91
1A3c Railways	Liquid	2.50	185	0.01	0.07	3.29	1.06	0.29

1A3di International Navigation	Liquid	15.95	1 191	1.89	0.03	33.49	0.73	0.09
1A3dii National Navigation	Liquid	6.40	480	0.76	0.01	13.44	0.29	0.04
1A4 Small Combustion	Total	117.45	10 233	7.10	0.83	46.06	273.71	24.78
1A4 Small Combustion	Liquid	65.98	4 601	1.18	0.60	42.61	16.39	4.19
1A4 Small Combustion	Solid	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4 Small Combustion	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4a Commercial/Institutional	Total	10.95	766	0.18	0.01	3.54	0.33	0.30
1A4a Commercial/Institutional	Liquid	10.94	766	0.18	0.01	3.54	0.33	0.30
1A4a Commercial/Institutional	Solid	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4b Residential	Total	76.69	7 262	5.98	0.26	5.09	263.59	20.66
1A4b Residential	Liquid	25.23	1 630	0.07	0.04	1.64	6.26	0.07
1A4b Residential	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4c Agriculture/Foresty/Fishing	Liquid	29.81	2 205	0.94	0.55	37.43	9.80	3.82
1A5 Other (Civil Construction)	Total	7.96	582	0.22	0.01	4.15	0.18	0.36
1A5 Other (Civil Construction)	Liquid	7.90	576	0.21	0.01	4.14	0.16	0.35
1A5 Other (Civil Construction)	Solid	0.06	6	0.01	0.00	0.01	0.01	0.01

Table A2, Ib - Energy (IA) Combustion Activities, Emission Factors

		EMISSION FACTORS (t Pollutant/TJ)					
SOURCE CATEGORIES	FUEL	CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	83	0.022	0.0027	0.515	1.485	0.158
1A Fuel Combustion Activities	Liquid	74	0.016	0.0029	0.648	1.597	0.172
1A Fuel Combustion Activities	Solid	95	0.004	0.0015	0.405	0.113	0.041
1A Fuel Combustion Activities	Biomass Traditional	107	0.091	0.0043	0.068	3.725	0.329
1A Fuel Combustion Activities	Biomass (Other)	105	0.024	0.0012	0.060	0.096	0.024
1A Fuel Combustion Activities	International Bunkers	74	0.076	0.0015	1.324	0.087	0.004
1A1 Energy and Transform. Industries	Total	84	0.005	0.0010	0.294	0.029	0.009
1A1 Energy and Transform. Industries	Liquid	71	0.003	0.0007	0.233	0.020	0.007
1A1 Energy and Transform. Industries	Solid	94	0.001	0.0014	0.464	0.013	0.004
1A1 Energy and Transform. Industries	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1 Energy and Transform. Industries	Biomass (Other)	105	0.023	0.0012	0.055	0.093	0.023
1A1a Electricity and Heat Production	Total	86	0.005	0.0010	0.306	0.028	0.009
1A1a Electricity and Heat Production	Liquid	73	0.003	0.0006	0.244	0.015	0.008
1A1a Electricity and Heat Production	Solid	94	0.001	0.0014	0.467	0.013	0.004
1A1a Electricity and Heat Production	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1a Electricity and Heat Production	Biomass (Other)	105	0.023	0.0012	0.055	0.093	0.023
1Alb Petroleum refining	Liquid	67	0.003	0.0010	0.193	0.037	0.003
1Alc Soil Fuel Transformation (1)	Solid	96	0.003	0.0014	0.120	0.017	0.003

1A2	Industry	Total	81	0.014	0.0016	0.162	0.202	0.069
1A2	Industry	Liquid	69	0.008	0.0007	0.171	0.015	0.007
1A2	Industry	Solid	97	0.016	0.0016	0.198	0.466	0.169
1A2	Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A2	Industry	Biomass (Other)	83	0.044	0.0028	0.339	0.250	0.044
1A3	Transport	Total	79	0.026	0.0030	1.099	3.744	0.384
1A3ai	International Aviation	Liquid	73	0.019	0.0009	0.290	0.142	0.002
1A3aii	National Aviation	Liquid	74	0.022	0.0009	0.289	0.272	0.002
1A3b	Road Transportation	Liquid	81	0.013	0.0031	1.080	5.038	0.519
1A3c	Railways	Liquid	74	0.005	0.0286	1.315	0.425	0.117
1A3di	International Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A3dii	National Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A4	Small Combustion	Total	87	0.060	0.0070	0.392	2.330	0.211
1A4	Small Combustion	Liquid	70	0.018	0.0092	0.646	0.248	0.064
1A4	Small Combustion	Solid	101	0.100	0.0017	0.150	0.200	0.200
1A4	Small Combustion	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4a	Commercial/Institutional	Total	70	0.017	0.0012	0.323	0.030	0.028
1A4a	Commercial/Institutional	Liquid	70	0.017	0.0012	0.323	0.030	0.028
1A4a	Commercial/Institutional	Solid	101	0.100	0.0017	0.150	0.200	0.200
1A4b	Residential	Total	95	0.078	0.0033	0.066	3.437	0.269
1A4b	Residential	Liquid	65	0.003	0.0014	0.065	0.248	0.003
1A4b	Residential	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4c	Agriculture/Foresty/Fishing	Liquid	74	0.031	0.0186	1.256	0.329	0.128
1A5	Other (Civil Construction)	Total	73	0.027	0.0014	0.522	0.022	0.045
1A5	Other (Civil Construction)	Liquid	73	0.027	0.0014	0.524	0.021	0.044
1A5	Other (Civil Construction)	Solid	101	0.100	0.0016	0.213	0.200	0.120

Table A2, Ic - Energy (IB) fugitive Emissions from Fuels

SOURCE CATEGORIES		ACTIVITY DATA (Tg)	EMISSION ESTIMATES (Gg)			EMISSION FACTORS (Gg/Tg)		
			CH4	COVNM	CO2	CH4	NMVOC	CO2
1B	Fugitive Emissions from Fuels	-	4.081	44.153	149	-	-	-
1B1	Solid Fuels	0.27	3.043	0.000	8	11.258	0.000	30.959
1B2	Oil and Natural Gas	-	1.038	44.153	140	-	-	-
1B2a	Oil	-	1.038	44.153	140	-	-	-
1B2ai	Exploration	na	na	na	na	na	na	na
1B2aii	Production of Crude Oil	na	na	na	na	na	na	na
1B2aiii	Transport of Crude Oil	9.58	0.080	2.874	9	0.008	0.300	0.958
1B2aiv	Refining/Storage	9.58	0.958	35.297	113	0.100	3.685	11.760
1B2av	Distribution of Oil Products	1.56	0.000	5.983	19	0.000	3.828	11.930
1B2avi	Other	na	na	na	na	na	na	na
1B2b	Natural Gas	na	na	na	na	na	na	na
1B2c	Venting and flaring	ioc	ioc	ioc	ioc	ioc	ioc	ioc

Table A2, IIa - Industrial Processes, Emissions of Pollutants

SOURCE CATEGORIES		PROD. QUANT. (Gg)	EMISSION ESTIMATES (Gg)					
			CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	21 102	3 421.21	0.35	1.94	4.60	18.40	17.78
2A	Iron and Steel	397	0.83	0.00	0.00	0.02	18.40	0.03
2B	Non ferrous metals	1	2.70	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	ioc	ioc	ioc	ioc	ioc	ioc	ioc
2B2	Other	1	2.70	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	1 379	277.50	0.35	1.94	1.70	0.00	1.40
2C1	Nitric acid	243	0.00	0.00	1.94	1.70	0.00	0.00
2C2	Fertiliser Production	744	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	392	277.50	0.35	0.00	0.00	0.00	1.40
2D	Organic Chemicals	957	0.00	0.00	0.00	0.00	0.00	4.71
2D1	Adipic acid	na	na	na	na	na	na	na
2D2	Other	957	0.00	0.00	0.00	0.00	0.00	4.71
2E	Non-metallic Mineral Products	7 631	3 140.17	0.00	0.00	0.00	0.00	0.00
2E1	Cement	6 501	3 103.57	0.00	0.00	0.00	0.00	0.00
2E2	Lime	236	ioc	0.00	0.00	0.00	0.00	0.00
2E3	Other	894	36.60	0.00	0.00	0.00	0.00	0.00
2F	Other	10 738	0.01	0.00	0.00	2.88	0.00	11.64

Table A2, IIb - Industrial Processes, Emission Factors

SOURCE CATEGORIES		EMISSION FACTORS (kg/Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	162.12	0.02	0.09	0.22	0.87	0.84
2A	Iron and Steel	2.10	0.00	0.00	0.05	46.40	0.08
2B	Non-ferrous metals	2 573.88	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	-	-	-	-	-	-
2B2	Other	2 573.88	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	201.30	0.25	1.41	1.23	0.00	1.02
2C1	Nitric Acid	0.00	0.00	8.00	7.00	0.00	0.00
2C2	Fertilizer Production	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	708.65	0.90	0.00	0.00	0.00	3.59
2D	Organic Chemicals	0.00	0.00	0.00	0.00	0.00	4.92
2D1	Adipic acid	-	-	-	-	-	-
2D2	Other	0.00	0.00	0.00	0.00	0.00	4.92
2E	Non-metallic Mineral Products	411.51	0.00	0.00	0.00	0.00	0.00
2E1	Cement	477.41	0.00	0.00	0.00	0.00	0.00
2E2	Lime	0.00	0.00	0.00	0.00	0.00	0.00
2E3	Other	40.96	0.00	0.00	0.00	0.00	0.00
2F	Other	0.00	0.00	0.00	0.27	0.00	1.08

Table A2, III - Use of Solvents and Products containing NMVOC

SOURCE CATEGORIES		NMVOC (Gg)	CO2 (Gg)
3	Solvent and other Product Use	86.28	269
3A	Paint Application	29.87	93
3B	Degreasing and Dry Cleaning	3.77	12
3C	Chemical Products Manufacture/Processing	25	79
3D	Other	27.33	85

Table A2, IV - Agriculture

SOURCE CATEGORIES		ACTIVITY DATA		EMISSION FACTORS			
		NUMBER	UNIT	CH4(Gg)	N2O(Gg)	CH4(Mg/u)	N2O(g/u)
4	Agriculture	0	1000 animal	212.82	7.39	-	-
4A	Enteric Fermentation	30 663	1000 animal	126.06	ne	4.111	-
4A1a	Cattle Dairy	404	1000 animal	40.40	ne	100.000	-
4A1b	Cattle Non-Dairy	1 012	1000 animal	48.58	ne	48.000	-
4A3	Sheep	3 380	1000 animal	27.04	ne	8.000	-
4A4	Goats	882	1000 animal	4.41	ne	5.000	-
4A6	Horses	36	1000 animal	0.65	ne	18.000	-
4A7	Asses/Mules	114	1000 animal	1.14	ne	10.000	-
4A8	Swine	2 564	1000 animal	3.85	ne	1.500	-
4A9	Poultry	22 271	1000 animal	0.00	ne	0.000	-
4B	Manure Management	30 663	1000 animal	67.66	ioc	2.207	-
4B1a	Cattle Dairy	404	1000 animal	17.78	ioc	44.000	-
4B1b	Cattle Non-Dairy	1 012	1000 animal	20.24	ioc	20.000	-
4B3	Sheep	3 380	1000 animal	1.03	ioc	0.304	-
4B4	Goats	882	1000 animal	0.17	ioc	0.190	-
4B6	Horses	36	1000 animal	0.07	ioc	2.080	-
4B7	Asses/Mules	114	1000 animal	0.13	ioc	1.140	-
4B8	Swine	2 564	1000 animal	25.64	ioc	10.000	-
4B9	Poultry	22 271	1000 animal	2.61	ioc	0.117	-
4C	Rice Cultivation	33 466	ha	19.10	0.00	0.571	0.000
4C1	Continuously Flooded	33 466	ha	19.10	0.00	0.571	0.000
4C3	Other	0	ha	0.00	0.00	-	-
4D	Agricultural Soils	5 571 340	ha	ne	7.39	-	1.327
4D	Aplication of Fertilizers	5 571 340	ha	ne	1.84	-	0.330
4D	Other Sources of Nitrogen	5 571 340	ha	ne	5.55	-	0.997
4E	Prescribed Burning of Savannas	na		na	na	-	-
4F	Field Burning of Agricultural Residues	ne		ne	ne	-	-

Table A2, Va - Land-Use Change & Forestry, Changes in Forestry and other Woody Biomass Stocks

SOURCE AND SINK CATEGORIES		AREA (1000 ha)	CARBON RETENTION (Gg)	ABSORPTION FACTOR (Mg C/ha)
5A	Annual Growth	3 346	3 914	1.17
5A2	Exploitation of temperate forest	3 346	3 914	1.17
		Extracted Biomass (1000m3)	Carbon Consumption (Gg)	Emission Factor (Mg C/m3)
5A	Annual Removal	13 208	3 600	0.27
5A2	Exploitation of temperate forest	13 208	3 600	0.27

Table A2, Vb - Land-Use Change & Forestry Residues (Synthesis) Annual Harvest

SOURCE AND SINK CATEGORIES	CARBON (Gg)	CO2 (Gg)
Total Annual Growth	3 914	14 353
Total Annual Removal	3 600	13 201
Net Emission Net Removal	314	1 152

Table A2, VIa - Waste, Emissions of Pollutants

SOURCE CATEGORIES		ACTIVITY		EMISSION ESTIMATES (Gg)					
		NUMBER	UNIT	CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	7 442	-	0.00	587.11	2.93	0.03	0.56	7.44
6A	Solid Waste Disposal on Land	6 280	kton	0.00	501.88	0.00	0.00	0.54	6.32
6B	Wastewater Treatment	773	kton CBO	0.00	85.23	2.93	0.00	0.00	1.11
6B1	Industrial	171	kton CBO	0.00	9.95	0.65	0.00	0.00	0.25
6B2	Domestic and Commercial	602	kton CBO	0.00	75.28	2.28	0.00	0.00	0.87
6C	Waste Incineration	14	kton	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	375	kton	0.00	0.00	0.00	0.00	0.00	0.00

Table A2, VIb - Emissions Factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/UNIT)					
		CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	0	78.89	0.39	0.00	0.08	1.00
6A	Solid Waste Disposal on Land	0	79.91	0.00	0.00	0.09	1.01
6B	Wastewater Treatment	0	110.24	3.79	0.00	0.00	1.44
6B1	Industrial	0	58.23	3.79	0.00	0.00	1.44
6B2	Domestic and Commercial	0	125.00	3.79	0.00	0.00	1.44
6C	Waste Incineration	0	0.00	0.00	2.31	1.48	0.15
6D	Other	0	0.00	0.00	0.00	0.00	0.00

Table A2, VIIA - Summary of Emissions of Greenhouse Gases

SOURCE AND SINK CATEGORIES		EMISSION ESTIMATES (Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
National Total Net		47 717	819.51	14.10	354.57	1 028.76	263.23
1	All Energy	45 179	19.23	1.84	349.93	1 009.80	151.73
1A	Fuel Combustion Activities	45 030	15.15	1.84	349.93	1 009.80	107.58
1A1	Energy Transform. Industries	17 656	1.31	0.26	74.19	7.40	2.22
1A2	Industry	7 252	1.58	0.18	18.42	23.07	7.83
1A3	Transport	14 937	4.94	0.56	207.12	705.44	72.39
1A4	Small Combustion	4 602	7.10	0.83	46.06	273.71	24.78
1A5	Other	582	0.22	0.01	4.15	0.18	0.36
Biomass		11 249	7.33	0.35	6.91	270.76	24.44
1B	Fugitive Emissions from Fuels	149	4.08	na	na	na	44.15
1B1	Solid Fuel	8	3.04	na	na	na	0.00
1B2	Oil and Natural Gas	140	1.04	na	na	na	44.15
2	Industrial Processes	3 421.21	0.35	1.94	4.60	18.40	17.78
3	Solvent and other Product Use	269	na	na	na	na	86.28
4	Agriculture	ne	212.82	7.39	ne	ne	ne
4A	Enteric Fermentation	na	126.06	ne	ne	na	na
4B	Manure Management	na	67.66	ioc	ne	na	na
4C	Rice Cultivation	na	19.10	0.00	na	na	na
4D	Agricultural Soils	na	ne	7.39	ne	na	ne
4E	Prescribed Burning Savannas	na	na	na	-	-	0.00
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na
6	Waste	0.00	587.11	2.93	0.03	0.56	7.44
6A	Disposal on Land	0.00	501.88	0.00	0.00	0.54	6.32
6B	Wastewater Treatment	0.00	85.23	2.93	0.00	0.00	1.11
6C	Waste Incineration	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	0.00	0.00	0.00	0.00	0.00	0.00
7	Other	0	0.00	0.00	0.00	0.00	0.00
International Bunkers			2 068	2.11	0.04	36.95	2.43

Table A2, VIIB - Summary of Emissions of Greenhouse Gases

SOURCE CATEGORIES		EMISSION ESTIMATES (Gg) CO2	CH4	N2O	NOx	CO	NMVOC	GWP
National Total (Net)		47 717	819.51	14.10	354.57	1 028.76	263.23	69 453.38
1	All Energy	45 179	19.23	1.84	349.93	1 009.80	151.73	46 171.99
1A	Fuel Combustion Activities	45 030	15.15	1.84	349.93	1 009.80	107.58	45 937.46
1B	Fugitive Emissions from Fuels	149	4.08	na	na	na	44.15	234.53
2	Industrial Processes	3 421	0.35	1.94	4.60	18.40	17.78	4 052.82
3	Solvent and other Product Use	269	na	na	na	na	86.28	268.91
4	Agriculture	ne	212.82	7.39	ne	ne	ne	6 842.12
5	Land-Use Change	-1 152	na	na	na	na	na	-1 151.99
6	Waste	0.00	587.11	2.93	0.03	0.56	7.44	13 269.52
7	Other	0	0.00	0.00	0.00	0.00	0.00	0.00
International Bunkers		2 068	2.11	0.04	36.95	2.43	0.11	2 125.32

A.

INVENTORY OF EMISSIONS PORTUGAL A3 - YEAR 1992

Table A3, Ia - Energy (Ia) Combustion Activities, Emissions of Pollutants

SOURCE CATEGORIES		FUEL	CONSUMPTION (PJ)	EMISSION ESTIMATES (Gg of Pollutant) CO2	CH4	N2O	NOx	CO	NMVOC
1A	Fuel Combustion Activities	Total	732.94	60 498	15.37	1.90	371.42	1 093.47	114.91
1A	Fuel Combustion Activities	Liquid	502.17	37 252	7.53	1.37	314.19	804.10	85.91
1A	Fuel Combustion Activities	Solid	124.04	11 887	0.53	0.18	50.40	18.32	4.62
1A	Fuel Combustion Activities	Biomass Traditional	71.51	7 663	6.52	0.31	4.85	267.35	23.59
1A	Fuel Combustion Activities	Biomass (Other)	35.22	3 696	0.79	0.05	1.98	3.71	0.79
1A	Fuel Combustion Activities	International Bunkers	28.78	2 133	2.15	0.04	37.68	2.48	0.12
1A1	Energy and Transform. Industries	Total	289.02	24 149	1.37	0.29	83.35	8.47	2.37
1A1	Energy and Transform. Industries	Liquid	156.58	11 240	0.45	0.10	36.79	3.04	1.03
1A1	Energy and Transform. Industries	Solid	96.63	9 141	0.11	0.14	44.67	1.26	0.39
1A1	Energy and Transform. Industries	Biomass Traditional	1.27	128	0.04	0.01	0.09	0.63	0.19
1A1	Energy and Transform. Industries	Biomass (Other)	34.55	3 640	0.77	0.04	1.80	3.54	0.77

1A1a	Energy and Transform. Industries	Total	259.93	22 133	1.28	0.26	77.72	7.34	2.27
1A1a	Energy and Transform. Industries	Liquid	128.52	9 324	0.37	0.08	31.29	1.93	0.93
1A1a	Energy and Transform. Industries	Solid	95.58	9 041	0.11	0.13	44.54	1.24	0.39
1A1a	Energy and Transform. Industries	Biomass Traditional	1.27	128	0.04	0.01	0.09	0.63	0.19
1A1a	Energy and Transform. Industries	Biomass (Other)	34.55	3 640	0.77	0.04	1.80	3.54	0.77
1Alb	Petroleum Refining	Liquid	28.06	1 916	0.08	0.03	5.50	1.11	0.10
1Alc	Solid Fuel Transformation (1)	Solid	1.04	100	0.00	0.00	0.12	0.02	0.00
1A2	Industry	Total	114.56	9 355	1.60	0.18	18.93	27.63	7.54
1A2	Industry	Liquid	67.76	4 655	0.59	0.05	11.71	1.01	0.48
1A2	Industry	Solid	27.35	2 741	0.42	0.04	5.72	17.06	4.22
1A2	Industry	Biomass Traditional	18.78	1 903	0.56	0.08	1.31	9.39	2.82
1A2	Industry	Biomass (Other)	0.67	55	0.02	0.00	0.18	0.17	0.02
1A3	Transport	Total	202.02	16 056	5.14	0.60	219.67	783.19	79.84
1A3ai	International Aviation	Liquid	12.58	922	0.23	0.01	3.65	1.74	0.03
1A3a ii	National Aviation	Liquid	13.41	986	0.28	0.01	3.87	3.43	0.03
1A3b	Road Transportation	Liquid	151.14	12 289	1.96	0.46	161.84	775.93	79.36
1A3c	Railways	Liquid	2.51	185	0.01	0.07	3.30	1.06	0.29
1A3di	International Navigation	Liquid	16.21	1 210	1.92	0.03	34.03	0.74	0.09
1A3dii	National Navigation	Liquid	6.18	464	0.73	0.01	12.98	0.28	0.03
1A4	Small Combustion	Total	119.50	10 366	7.06	0.83	45.34	274.01	24.81
1A4	Small Combustion	Liquid	68.03	4 734	1.14	0.60	41.89	16.69	4.22
1A4	Small Combustion	Solid	0.00	0	0.00	0.00	0.00	0.00	0.00
1A4	Small Combustion	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4a	Commercial/Institutional	Total	12.87	904	0.23	0.02	4.47	0.38	0.38
1A4a	Commercial/Institutional	Liquid	12.87	904	0.23	0.02	4.47	0.38	0.38
1A4a	Commercial/Institutional	Solid	0.00	0	0.00	0.00	0.00	0.00	0.00
1A4b	Residential	Total	78.17	7 358	5.99	0.26	5.18	263.96	20.66
1A4b	Residential	Liquid	26.71	1 726	0.07	0.04	1.73	6.64	0.08
1A4b	Residential	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4c	Agriculture/Foresty/Fishing	Liquid	28.46	2 104	0.84	0.55	35.69	9.68	3.77
1A5	Other (Civil Construction)	Total	7.83	572	0.21	0.01	4.14	0.17	0.35
1A5	Other (Civil Construction)	Liquid	7.77	566	0.21	0.01	4.12	0.16	0.35
1A5	Other (Civil Construction)	Solid	0.06	6	0.01	0.00	0.01	0.01	0.01

Table A3, Ib - Energy (IA) Combustion Activities, Emission Factors

SOURCE CATEGORIES	FUEL	EMISSION FACTORS (t Pollutant/TJ)					
		CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	83	0.021	0.0026	0.507	1.492	0.157
1A Fuel Combustion Activities	Liquid	74	0.015	0.0027	0.626	1.601	0.171
1A Fuel Combustion Activities	Solid	96	0.004	0.0014	0.406	0.148	0.037
1A Fuel Combustion Activities	Biomass Traditional	107	0.091	0.0043	0.068	3.738	0.330
1A Fuel Combustion Activities	Biomass (Other)	105	0.022	0.0013	0.056	0.105	0.022
1A Fuel Combustion Activities	International Bunkers	74	0.075	0.0015	1.309	0.086	0.004
1A1 Energy and Transform. Industry	Total	84	0.005	0.0010	0.288	0.029	0.008
1A1 Energy and Transform. Industry	Liquid	72	0.003	0.0007	0.235	0.019	0.007
1A1 Energy and Transform. Industry	Solid	95	0.001	0.0014	0.462	0.013	0.004
1A1 Energy and Transform. Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1 Energy and Transform. Industry	Biomass (Other)	105	0.022	0.0013	0.052	0.103	0.022
1A1a Energy and Transform. Industry	Total	85	0.005	0.0010	0.299	0.028	0.009
1A1a Energy and Transform. Industry	Liquid	73	0.003	0.0006	0.243	0.015	0.007
1A1a Energy and Transform. Industry	Solid	95	0.001	0.0014	0.466	0.013	0.004
1A1a Energy and Transform. Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1a Energy and Transform. Industry	Biomass (Other)	105	0.022	0.0013	0.052	0.103	0.022
1A1b Petroleum Refining	Liquid	68	0.003	0.0010	0.196	0.040	0.003
1A1c Solid Fuel Transformation	Solid	96	0.003	0.0014	0.120	0.017	0.003
1A2 Industry	Total	82	0.014	0.0015	0.165	0.241	0.066
1A2 Industry	Liquid	69	0.009	0.0007	0.173	0.015	0.007
1A2 Industry	Solid	100	0.015	0.0016	0.209	0.624	0.154
1A2 Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A2 Industry	Biomass (Other)	83	0.036	0.0028	0.277	0.249	0.036
1A3 Transport	Total	79	0.025	0.0029	1.087	3.877	0.395
1A3ai International Aviation	Liquid	73	0.018	0.0009	0.290	0.138	0.002
1A3aii National Aviation	Liquid	74	0.021	0.0009	0.289	0.256	0.002
1A3b Road Transportation	Liquid	81	0.013	0.0030	1.071	5.134	0.525
1A3c Railways	Liquid	74	0.005	0.0286	1.315	0.425	0.117
1A3di International Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A3dii National Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A4 Small Combustion	Total	87	0.059	0.0069	0.379	2.293	0.208
1A4 Small Combustion	Liquid	70	0.017	0.0089	0.616	0.245	0.062
1A4 Small Combustion	Solid	98	0.100	0.0016	0.150	0.200	0.200
1A4 Small Combustion	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400

1A4a	Commercial/Institutional	Total	70	0.018	0.0013	0.347	0.029	0.030
1A4a	Commercial/Institutional	Liquid	70	0.018	0.0013	0.347	0.029	0.029
1A4a	Commercial/Institutional	Solid	98	0.100	0.0016	0.150	0.200	0.200
1A4b	Residential	Total	94	0.077	0.0033	0.066	3.377	0.264
1A4b	Residential	Liquid	65	0.003	0.0014	0.065	0.248	0.003
1A4b	Residential	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4c	Agriculture/Foresty/Fishing	Liquid	74	0.030	0.0193	1.254	0.340	0.132
1A5	Other (Civil Construction)	Total	73	0.027	0.0014	0.528	0.022	0.045
1A5	Other (Civil Construction)	Liquid	73	0.027	0.0014	0.531	0.021	0.045
1A5	Other (Civil Construction)	Solid	101	0.100	0.0015	0.239	0.200	0.088

Table A3, Ic - Energy (IB) Fugitive Emissions from Fuels

SOURCE CATEGORIES		ACTIVITY DATA (Tg)	EMISSION ESTIMATES (Gg)			EMISSION FACTORS (Gg/Tg)		
			CH4	NMVOC	CO2	CH4	NMVOC	CO2
1B	Fugitive Emissions from Fuel	-	4.051	51.613	172	-	-	-
1B1	Solid Fuels	0.22	2.836	0.000	8	12.839	0.000	35.306
1B2	Oil and Natural gas	-	1.215	51.613	164	-	-	-
1B2a	Oil	-	1.215	51.613	164	-	-	-
1B2ai	Exploration	na	na	na	na	na	na	na
1B2aii	Production of Crude Oil	na	na	na	na	na	na	na
1B2aiii	Transport of Crude Oil	11.27	0.088	3.380	11	0.008	0.300	0.956
1B2aiv	Refining/Storage	11.27	1.127	41.519	132	0.100	3.685	11.760
1B2av	Distribuction of Oil Products	1.75	0.000	6.715	21	0.000	3.826	11.925
1B2avi	Other	na	na	na	na	na	na	na
1B2b	Natural Gas	na	na	na	na	na	na	na
1B2c	Venting and flaring	ioc	ioc	ioc	ioc	ioc	ioc	ioc

Table A3, IIa - Industrial Processes, Emissions of Pollutants

SOURCE CATEGORIES		PROD. QUANT. (Gg)	EMISSION ESTIMATES (Gg)					
			CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	21 261	3 421.24	0.35	1.94	4.59	31.04	17.76
2A	Iron and Steel	565	0.86	0.00	0.00	0.03	31.04	0.05
2B	Non-ferrous metals	1	2.70	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	ioc	ioc	ioc	ioc	ioc	ioc	ioc
2B2	Other	1	2.70	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	1 379	277.50	0.35	1.94	1.70	0.00	1.40
2C1	Nitric Acid	243	0.00	0.00	1.94	1.70	0.00	0.00

2C2	Fertiliser Production	744	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	392	277.50	0.35	0.00	0.00	0.00	1.40
2D	Organic Chemicals	957	0.00	0.00	0.00	0.00	0.00	4.71
2D1	Adipic acid	na	na	na	na	na	na	na
2D2	Other	957	0.00	0.00	0.00	0.00	0.00	4.71
2E	Non-metallic Mineral Products	7 631	3 140.17	0.00	0.00	0.00	0.00	0.00
2E1	Cement	6 501	3 103.57	0.00	0.00	0.00	0.00	0.00
2E2	Lime	236	ioc	0.00	0.00	0.00	0.00	0.00
2E3	Other	894	36.60	0.00	0.00	0.00	0.00	0.00
2F	Other	10 729	0.01	0.00	0.00	2.86	0.00	11.60

Table A3, IIb - Industrial Processes, Emission Factors

		EMISSION FACTOR (kg/Gg)					
SOURCE CATEGORIES		CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	160.91	0.02	0.09	0.22	1.46	0.84
2A	Iron and Steel	1.53	0.00	0.00	0.06	54.97	0.09
2B	Non-ferrous metals	2 573.88	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	-	-	-	-	-	-
2B2	Other	2 573.88	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	201.30	0.25	1.41	1.23	0.00	1.02
2C1	Nitric Acid	0.00	0.00	8.00	7.00	0.00	0.00
2C2	Fertiliser Production	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	708.65	0.90	0.00	0.00	0.00	3.59
2D	Organic Chemicals	0.00	0.00	0.00	0.00	0.00	4.92
2D1	Adipic acid	-	-	-	-	-	-
2D2	Other	0.00	0.00	0.00	0.00	0.00	4.92
2E	Non-metallic Mineral Products	411.51	0.00	0.00	0.00	0.00	0.00
2E1	Cement	477.41	0.00	0.00	0.00	0.00	0.00
2E2	Lime	0.00	0.00	0.00	0.00	0.00	0.00
2E3	Other	40.96	0.00	0.00	0.00	0.00	0.00
2F	Other	0.00	0.00	0.00	0.27	0.00	1.08

Table A3, III - Use of Solvents and Products containing NMVOC

SOURCE CATEGORIES		NMVOC (Gg)	CO2 (Gg)
3	Solvent and other Product Use	85.21	266
3A	Paint Application	29.57	92
3B	Degreasing and Dry Cleaning	3.77	12
3C	Chemical Products Manufacture/Processing	25	77
3D	Other	27.03	84

Table A3, IV - Agriculture

SOURCE CATEGORIES		ACTIVITY DATA		EMISSION FACTORS			
		NUMBER	UNIT	CH4(Gg)	N2O(Gg)	CH4(Mg/u)	N2O(g/u)
4	Agriculture	0	1000 animal	198.61	7.20	-	-
4A	Enteric Fermentation	30 519	1000 animal	121.05	ne	3.967	-
4A1a	Cattle Dairy	381	1000 animal	38.10	ne	100.000	-
4A1b	Cattle Non-Dairy	964	1000 animal	46.27	ne	48.000	-
4A3	Sheep	3 348	1000 animal	26.78	ne	8.000	-
4A4	Goats	858	1000 animal	4.29	ne	5.000	-
4A6	Horses	36	1000 animal	0.65	ne	18.000	-
4A7	Asses/Mules	114	1000 animal	1.14	ne	10.000	-
4A8	Swine	2 547	1000 animal	3.82	ne	1.500	-
4A9	Poultry	22 271	1000 animal	0.00	ne	0.000	-
4B	Manure Management	30 519	1000 animal	65.50	ioc	2.146	-
4B1a	Cattle Dairy	381	1000 animal	16.76	ioc	44.000	-
4B1b	Cattle Non-Dairy	964	1000 animal	19.28	ioc	20.000	-
4B3	Sheep	3 348	1000 animal	1.02	ioc	0.303	-
4B4	Goats	858	1000 animal	0.16	ioc	0.189	-
4B6	Horses	36	1000 animal	0.07	ioc	2.080	-
4B7	Asses/Mules	114	1000 animal	0.13	ioc	1.140	-
4B8	Swine	2 547	1000 animal	25.47	ioc	10.000	-
4B9	Poultry	22 271	1000 animal	2.61	ioc	0.117	-
4C	Rice Cultivation	21 118	ha	12.05	0.00	0.571	0.000
4C1	Continuously Flooded	21 118	ha	12.05	0.00	0.571	0.000
4C3	Other	0	ha	0.00	0.00	-	-
4D	Agricultural Soils	5 455 823	ha	ne	7.20	-	1.320
4D	Application of fertilisers	5 455 823	ha	ne	1.84	-	0.337
4D	Other Sources of Nitrogen	5 455 823	ha	ne	5.36	-	0.983

4E	Prescribed Burning of Savannas	na	na	na	-	-
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-

Table A3, Va - Land-Use Change & Forestry, Changes in Foresty and other Woody Biomass Stocks

SOURCE AND SINK CATEGORIES		AREA (1000 ha)	CARBON RETENTION (Gg)	ABSORPTION FACTOR (Mg C/ha)
5A	Annual Growth Increment	3 346	3 914	1,17
5A2	Exploitation of temperate forest	3 346	3 914	1,17
		Extrated Biomass (1000 m3)	Carbon Consumption (Gg)	Emission Factor (Mg C/m3)
5A	Annual Removal	13 208	3 600	0,27
5A2	Exploitation of temperate forest	13 208	3 600	0,27

Table A3, Vb - Land-Use Change & Forestry Residues (Synthesis) Annual Harvest

SOURCE AND SINK CATEGORIES	CARBON (Gg)	CO2 (Gg)
Total Annual Growth	3 914	14 353
Total Annual Removal	3 600	13 201
Net Emission Net Removal	314	1 152

Table A3, VIa - Waste, Emissions of Pollutants

SOURCE CATEGORIES		ACTIVITY		EMISSION ESTIMATES (Gg)					
		NUMBER	UNIT	CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	7 567	-	0.00	595.90	2.93	0.03	0.57	7.55
6A	Solid Waste Disposal on Land	6 390	kton	0.00	510.67	0.00	0.00	0.55	6.44
6B	Wastewater Treatment	773	kton CBO	0.00	85.23	2.93	0.00	0.00	1.11
6B1	Industrial	171	kton CBO	0.00	9.95	0.65	0.00	0.00	0.25
6B2	Domestic and Commercial	602	kton CBO	0.00	75.28	2.28	0.00	0.00	0.87
6C	Waste Incineration	14	kton	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	390	kton	0.00	0.00	0.00	0.00	0.00	0.00

Table A3, VIb - Emissions Factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/UNIT)					
		CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	0	78.75	0.39	0.00	0.08	1.00
6A	Solid Waste Disposal on Land	0	79.91	0.00	0.00	0.09	1.01
6B	Wastewater Treatment	0	110.24	3.79	0.00	0.00	1.44
6B1	Industrial	0	58.23	3.79	0.00	0.00	1.44
6B2	Domestic and Commercial	0	125.00	3.79	0.00	0.00	1.44
6C	Waste Incineration	0	0.00	0.00	2.31	1.48	0.15
6D	Other	0	0.00	0.00	0.00	0.00	0.00

Table A3, VIIA - Summary of Emissions of Greenhouse Gases

SOURCE AND SINK CATEGORIES		EMISSION ESTIMATES (Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
National Total (Net)		51 846	814.28	13.97	376.04	1 125.09	277.05
1	All Energy	49 311	19.42	1.90	371.42	1 093.47	166.52
1A	Fuel Combustion Activities	49 139	15.37	1.90	371.42	1 093.47	114.91
1A1	Energy and Transform. Industries	20 381	1.37	0.29	83.35	8.47	2.37
1A2	Industry	7 396	1.60	0.18	18.93	27.63	7.54
1A3	Transport	16 056	5.14	0.60	219.67	783.19	79.84
1A4	Smal Combustion	4 734	7.06	0.83	45.34	274.01	24.81
1A5	Other	572	0.21	0.01	4.14	0.17	0.35
Biomass		11 359	7.31	0.35	6.83	271.06	24.38
1B	Fugitive Emissions from Fuels	172	4.05	na	na	na	51.61
1B1	Solid Fuels	8	2.84	na	na	na	0.00
1B2	Oil and Natural Gas	164	1.21	na	na	na	51.61
2	Industrial Processes	3 421.24	0.35	1.94	4.59	31.04	17.76
3	Solvent and other Product Use	266	na	na	na	na	85.21
4	Agriculture	ne	198.61	7.20	ne	ne	ne
4A	Enteric Fermentation	na	121.05	ne	ne	na	na
4B	Manure Management	na	65.50	ioc	ne	na	na
4C	Rice Cultivation	na	12.05	0.00	na	na	na
4D	Agricultural Soils	na	ne	7.20	ne	na	ne
4E	Prescribed Burning Savannas	na	na	na	-	-	0.00
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na
6	Waste	0.00	595.90	2.93	0.03	0.57	7.55
6A	Disposal on Land	0.00	510.67	0.00	0.00	0.55	6.44
6B	Wastewater Treatment	0.00	85.23	2.93	0.00	0.00	1.11
6C	Waste Incineration	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	0.00	0.00	0.00	0.00	0.00	0.00
7	Other	0	0.00	0.00	0.00	0.00	0.00
International Bunkers			2 133	2.15	0.04	37.68	2.48

Table A3, VIIB - Summary of Emissions of Greenhouse Gases

SOURCE CATEGORIES		EMISSION ESTIMATES (Gg) CO2	CH4	N2O	NOx	CO	NMVOC	GWP
National Total (Net)		51 846	814.28	13.97	376.04	1 125.09	277.05	73 431.48
1	All Energy	49 311	19.42	1.90	371.42	1 093.47	166.52	50 328.42
1A	Fuel Combustion Activities	49 139	15.37	1.90	371.42	1 093.47	114.91	50 071.35
1B	Fugitive Emissions from Fuels	172	4.05	na	na	na	51.61	257.07
2	Industrial Processes	3 421	0.35	1.94	4.59	31.04	17.76	4 052.85
3	Solvent and other Product Use	266	na	na	na	na	85.21	265.58
4	Agriculture	ne	198.61	7.20	ne	ne	ne	6 482.51
5	Land-Use Change	-1 152	na	na	na	na	na	-1 151.99
6	Waste	0.00	595.90	2.93	0.03	0.57	7.55	13 454.12
7	Other	0	0.00	0.00	0.00	0.00	0.00	0.00
International Bunkers		2 133	2.15	0.04	37.68	2.48	0.12	2 191.65

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INVENTORY OF EMISSIONS PORTUGAL A4 - YEAR 1993

Table A4, Ia - Energy (IA) Combustion Activities, Emissions of Pollutants

SOURCE CATEGORIES		FUEL	CONSUMPTION (PJ)	EMISSION ESTIMATES (Gg of Pollutant) CO2	CH4	N2O	NOx	CO	NMVOC
1A	Fuel Commbustion Activities	Total	709.59	57 668	14.85	1.96	359.73	1 131.84	118.42
1A	Fuel Commbustion Activities	Liquid	470.97	35 036	7.05	1.43	304.83	842.89	89.76
1A	Fuel Commbustion Activities	Solid	132.78	11 365	0.52	0.17	48.15	17.73	4.36
1A	Fuel Commbustion Activities	Biomass Traditional	71.11	7 623	6.51	0.31	4.82	267.15	23.53
1A	Fuel Commbustion Activities	Biomass (Other)	34.73	3 644	0.77	0.05	1.93	4.08	0.77
1A	Fuel Commbustion Activities	International Bunkers	24.95	1 848	1.78	0.04	31.15	2.18	0.10
1A1	Energy and Transform. Industries	Total	267.79	21 454	1.34	0.27	74.14	8.21	2.30
1A1	Energy and Transform. Industries	Liquid	126.32	9 053	0.45	0.08	29.80	2.49	1.00
1A1	Energy and Transform. Industries	Solid	106.16	8 686	0.10	0.13	42.50	1.19	0.37
1A1	Energy and Transform. Industries	Biomass Traditional	1.24	126	0.04	0.01	0.09	0.62	0.19
1A1	Energy and Transform. Industries	Biomass (Other)	34.07	3 589	0.75	0.05	1.75	3.91	0.75

1A1a	Energy and Transform. Industries	Total	239.19	19 469	1.26	0.24	68.58	7.19	2.20
1A1a	Energy and Transform. Industries	Liquid	98.54	7 146	0.37	0.06	24.34	1.48	0.90
1A1a	Energy and Transform. Industries	Solid	105.34	8 608	0.10	0.13	42.40	1.17	0.37
1A1a	Energy and Transform. Industries	Biomass Traditional	1.24	126	0.04	0.01	0.09	0.62	0.19
1A1a	Energy and Transform. Industries	Biomass (Other)	34.07	3 589	0.75	0.05	1.75	3.91	0.75
1Alb	Petroleum Refining	Liquid	27.78	1 907	0.08	0.03	5.46	1.01	0.09
1Alc	Solid Fuel Transformation (1)	Solid	0.82	79	0.00	0.00	0.10	0.01	0.00
1A2	Industry	Total	107.98	8 859	1.56	0.17	17.95	26.84	7.24
1A2	Industry	Liquid	62.34	4 264	0.58	0.05	10.83	0.93	0.46
1A2	Industry	Solid	26.58	2 675	0.41	0.04	5.65	16.54	3.99
1A2	Industry	Biomass Traditional	18.41	1 865	0.55	0.08	1.29	9.20	2.76
1A2	Industry	Biomass (Other)	0.66	55	0.02	0.00	0.18	0.17	0.02
1A3	Transport	Total	204.80	16 318	4.78	0.69	220.01	822.21	83.84
1A3ai	International Aviation	Liquid	11.74	861	0.22	0.01	3.40	1.57	0.02
1A3aii	National Aviation	Liquid	12.86	945	0.27	0.01	3.72	3.10	0.03
1A3b	Road Transportation	Liquid	158.60	12 898	2.00	0.57	169.34	815.68	83.41
1A3c	Railways	Liquid	2.29	169	0.01	0.07	3.01	0.97	0.27
1A3di	International Navigation	Liquid	13.21	987	1.56	0.03	27.74	0.61	0.07
1A3dii	National Navigation	Liquid	6.09	458	0.72	0.01	12.80	0.28	0.03
1A4	Small Combustion	Total	119.93	10 375	6.95	0.82	43.21	274.38	24.68
1A4	Small Combustion	Liquid	68.46	4 743	1.03	0.60	39.76	17.06	4.09
1A4	Small Combustion	Solid	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4	Small Combustion	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4a	Commercial/Institutional	Total	12.96	905	0.20	0.02	4.08	0.40	0.34
1A4a	Commercial/Institutional	Liquid	12.96	905	0.20	0.02	4.08	0.39	0.34
1A4a	Commercial/Institutional	Sólido	0.01	1	0.00	0.00	0.00	0.00	0.00
1A4b	Residential	Total	79.65	7 453	5.98	0.26	5.28	264.33	20.66
1A4b	Residential	Liquid	28.18	1 821	0.06	0.04	1.83	7.01	0.08
1A4b	Residential	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4c	Agriculture/Foresty/Fishing	Liquid	27.32	2 017	0.77	0.54	33.85	9.65	3.68
1A5	Other (Civil Construction)	Total	9.08	661	0.22	0.01	4.42	0.20	0.37
1A5	Other (Civil Construction)	Liquid	9.05	657	0.22	0.01	4.42	0.19	0.36
1A5	Other (Civil Construction)	Solid	0.03	3	0.00	0.00	0.00	0.01	0.01

Table A4, Ib - Energy (IA) Combustion Activities, Emission Factors

SOURCE CATEGORIES		FUEL	EMISSION FACTORS (t Pollutant/TJ)					
			CO2	CH4	N2O	NOx	CO	NMVOC
1A	Fuel Combustion Activities	Total	81	0.021	0.0028	0.507	1.595	0.167
1A	Fuel Combustion Activities	Liquid	74	0.015	0.0030	0.647	1.790	0.191
1A	Fuel Combustion Activities	Solid	86	0.004	0.0013	0.363	0.134	0.033
1A	Fuel Combustion Activities	Biomass Traditional	107	0.092	0.0043	0.068	3.757	0.331
1A	Fuel Combustion Activities	Biomass (Other)	105	0.022	0.0014	0.056	0.117	0.022
1A	Fuel Combustion Activities	International Bunkers	74	0.071	0.0015	1.248	0.087	0.004
1A1	Energy and Transform. Industries	Total	80	0.005	0.0010	0.277	0.031	0.009
1A1	Energy and Transform. Industries	Liquid	72	0.004	0.0007	0.236	0.020	0.008
1A1	Energy and Transform. Industries	Solid	82	0.001	0.0012	0.400	0.011	0.003
1A1	Energy and Transform. Industries	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1	Energy and Transform. Industries	Biomass (Other)	105	0.022	0.0014	0.051	0.115	0.022
1A1a	Electricity and Heat Production	Total	81	0.005	0.0010	0.287	0.030	0.009
1A1a	Electricity and Heat Production	Liquid	73	0.004	0.0006	0.247	0.015	0.009
1A1a	Electricity and Heat Production	Solid	82	0.001	0.0012	0.402	0.011	0.003
1A1a	Electricity and Heat Production	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1a	Electricity and Heat Production	Biomass (Other)	105	0.022	0.0014	0.051	0.115	0.022
1Alb	Petroleum Refining	Liquid	69	0.003	0.0010	0.197	0.036	0.003
1Alc	Solid Fuel Transformation (1)	Solid	96	0.003	0.0014	0.120	0.017	0.003
1A2	Industry	Total	82	0.014	0.0016	0.166	0.249	0.067
1A2	Industry	Liquid	68	0.009	0.0008	0.174	0.015	0.007
1A2	Industry	Solid	101	0.015	0.0016	0.213	0.622	0.150
1A2	Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A2	Industry	Biomass (Other)	83	0.035	0.0028	0.270	0.252	0.035
1A3	Transport	Total	80	0.023	0.0034	1.074	4.015	0.409
1A3ai	International Aviation	Liquid	73	0.018	0.0009	0.290	0.134	0.002
1A3aii	National Aviation	Liquid	73	0.021	0.0009	0.289	0.241	0.002
1A3b	Road Transportation	Liquid	81	0.013	0.0036	1.068	5.143	0.526
1A3c	Railways	Liquid	74	0.005	0.0286	1.315	0.425	0.117
1A3di	International Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A3dii	National Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A4	Small Combustion	Total	87	0.058	0.0068	0.360	2.288	0.206
1A4	Small Combustion	Liquid	69	0.015	0.0087	0.581	0.249	0.060
1A4	Small Combustion	Solid	101	0.100	0.0017	0.150	0.200	0.200
1A4	Small Combustion	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400

1A4a	Commercia/Institutional	Total	70	0.015	0.0013	0.315	0.031	0.026
1A4a	Commercia/Institutional	Liquid	70	0.015	0.0013	0.315	0.030	0.026
1A4a	Commercia/Institutional	Solid	101	0.100	0.0017	0.150	0.200	0.200
1A4b	Residential	Total	94	0.075	0.0033	0.066	3.319	0.259
1A4b	Residential	Liquid	65	0.002	0.0014	0.065	0.249	0.003
1A4b	Residential	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400
1A4c	Agriculture/Foresty/Fishing	Liquid	74	0.028	0.0198	1.239	0.353	0.135
1A5	Other (Civil Construction)	Total	73	0.024	0.0013	0.487	0.022	0.040
1A5	Other (Civil Construction)	Liquid	73	0.024	0.0013	0.488	0.022	0.040
1A5	Other (Civil Construction)	Solid	101	0.100	0.0017	0.150	0.200	0.200

Table A4, Ic - Energy (IB) Fugitive Emissions from Fuels

SOURCE CATEGORIES		ACTIVITY DATA (Tg)	EMISSION ESTIMATES (Gg)			EMISSION FACTORS (Gg/Tg)		
			CH4	NMVOC	CO2	CH4	NMVOC	CO2
1B	Fugitive Emissions from Fuel	-	3.801	50.185	167	-	-	-
1B1	Solid Fuels	0.20	2.637	0.000	7	13.367	0.000	36.758
1B2	Oil and Natural Gas	-	1.164	50.185	160	-	-	-
1B2a	Oil	-	1.164	50.185	160	-	-	-
1B2ai	Exploration	na	na	na	na	na	na	na
1B2aii	Prodution of Crude Oil	na	na	na	na	na	na	na
1B2aiii	Transport of Crude Oil	10.80	0.084	3.240	10	0.008	0.300	0.956
1B2aiv	Refining/Storage	10.80	1.080	39.801	127	0.100	3.685	11.760
1B2av	Distribution of Oil Products	1.88	0.000	7.144	22	0.000	3.801	11.848
1B2avi	Other	na	na	na	na	na	na	na
1B2b	Natural Gás	na	na	na	na	na	na	na
1B2c	Venting and flaring	ioc	ioc	ioc	ioc	ioc	ioc	ioc

Table A4, IIa - Industrial Processes, Emissions of Pollutants

SOURCE CATEGORIES		PROD. QUANT. (Gg)	EMISSION ESTIMATES (Gg) CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	21 258	3 421.22	0.35	1.94	4.59	30.87	17.76
2A	Iron and Steel	562	0.84	0.00	0.00	0.03	30.87	0.05
2B	Non-ferrous metals	1	2.70	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	ioc	ioc	ioc	ioc	ioc	ioc	ioc
2B2	Other	1	2.70	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	1 379	277.50	0.35	1.94	1.70	0.00	1.40
2C1	Nitric Acid	243	0.00	0.00	1.94	1.70	0.00	0.00
2C2	Fertiliser Production	744	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	392	277.50	0.35	0.00	0.00	0.00	1.40
2D	Organic Chemicals	957	0.00	0.00	0.00	0.00	0.00	4.71
2D1	Adipic acid	na	na	na	na	na	na	na
2D2	Other	957	0.00	0.00	0.00	0.00	0.00	4.71
2E	Non-metallic Mineral Products	7 631	3 140.17	0.00	0.00	0.00	0.00	0.00
2E1	Cement	6 501	3 103.57	0.00	0.00	0.00	0.00	0.00
2E2	Lime	236	ioc	0.00	0.00	0.00	0.00	0.00
2E3	Other	894	36.60	0.00	0.00	0.00	0.00	0.00
2F	Other	10 729	0.01	0.00	0.00	2.86	0.00	11.60

Table A4, IIb - Industrial Processes, Emission Factors

SOURCE CATEGORIES		EMISSION FACTORS (kg/Gg) CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	160.94	0.02	0.09	0.22	1.45	0.84
2A	Iron and Steel	1.50	0.00	0.00	0.06	54.97	0.09
2B	Non-ferrous metals	2 573.88	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	-	-	-	-	-	-
2B2	Other	2 573.88	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	201.30	0.25	1.41	1.23	0.00	1.02
2C1	Nitric Acid	0.00	0.00	8.00	7.00	0.00	0.00
2C2	Fertiliser Production	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	708.65	0.90	0.00	0.00	0.00	3.59
2D	Organic Chemicals	0.00	0.00	0.00	0.00	0.00	4.92
2D1	Adipic acid	-	-	-	-	-	-
2D2	Other	0.00	0.00	0.00	0.00	0.00	4.92

2E	Non-metallic Mineral Products	411.51	0.00	0.00	0.00	0.00	0.00
2E1	Cement	477.41	0.00	0.00	0.00	0.00	0.00
2E2	Lime	0.00	0.00	0.00	0.00	0.00	0.00
2E3	Other	40.96	0.00	0.00	0.00	0.00	0.00
2F	Other	0.00	0.00	0.00	0.27	0.00	1.08

Table A4, III - Use of Solvents and Products containing NMVOC

SOURCE CATEGORIES		NMVOC (Gg)	CO2 (Gg)
3	Solvent and other Product Use	85.21	266
3A	Paint Application	29.57	92
3B	Degreasing and Dry Cleaning	3.77	12
3C	Chemical Products Manufacture/Processing	25	77
3D	Other	27.03	84

Table A4, IV - Agriculture

SOURCE CATEGORIES		ACTIVITY DATA		EMISSION FACTORS			
		NUMBER	UNIT	CH4(Gg)	N2O(Gg)	CH4(Mg/u)	N2O(g/u)
4	Agriculture	0	1000 animal	188.41	7.08	-	-
4A	Enteric Fermentation	30 149	1000 animal	118.81	ne	3.941	-
4A1a	Cattle Dairy	375	1000 animal	37.50	ne	100.000	-
4A1b	Cattle Non-Dairy	948	1000 animal	45.50	ne	48.000	-
4A3	Sheep	3 305	1000 animal	26.44	ne	8.000	-
4A4	Goats	836	1000 animal	4.18	ne	5.000	-
4A6	Horses	36	1000 animal	0.65	ne	18.000	-
4A7	Asses/Mules	114	1000 animal	1.14	ne	10.000	-
4A8	Swine	2 264	1000 animal	3.40	ne	1.500	-
4A9	Poultry	22 271	1000 animal	0.00	ne	0.000	-
4B	Manure Management	30 149	1000 animal	62.07	ioc	2.059	-
4B1a	Cattle Dairy	375	1000 animal	16.50	ioc	44.000	-
4B1b	Cattle Non-Dairy	948	1000 animal	18.96	ioc	20.000	-
4B3	Sheep	3 305	1000 animal	1.00	ioc	0.303	-
4B4	Goats	836	1000 animal	0.16	ioc	0.189	-
4B6	Horses	36	1000 animal	0.07	ioc	2.080	-
4B7	Asses/Mules	114	1000 animal	0.13	ioc	1.140	-
4B8	Swine	2 264	1000 animal	22.64	ioc	10.000	-
4B9	Poultry	22 271	1000 animal	2.61	ioc	0.117	-

4C	Rice Cultivation	13 200	ha	7.53	0.00	0.571	0.000
4C1	Continuously Flooded	13 200	ha	7.53	0.00	0.571	0.000
4C3	Other	0	ha	0.00	0.00	-	-
4D	Agricultural Soils	5 423 307	ha	ne	7.08	-	1.305
4D	Application of Fertilisers	5 423 307	ha	ne	1.84	-	0.339
4D	Other Sources of Nitrogen	5 423 307	ha	ne	5.24	-	0.966
4E	Prescribed Burning of Savannas	na		na	na	-	-
4F	Field Burning of Agricultural Residues	ne		ne	ne	-	-

Table A4, Va - Land-Use Change & Forestry, Changes in Forest and other Woody Biomass Stocks

SOURCE AND SINK CATEGORIES		AREA (1000 ha)	CARBON RETENTION (Gg)	ABSORPTION FACTOR (Mg C/ha)
5A	Annual Growth Increment	3 346	3 914	1.17
5A2	Exploitation of temperate forest	3 346	3 914	1.17
		Extracted Biomass (1000 m3	Carbon Consumption)(Gg)	Emission Factor (Mg C/m3)
5A	Annual Removal	13 208	3 600	0.27
5A2	Exploitation of temperate forest	13 208	3 600	0.27

Table A4, Vb - Land-Use Change & Forestry Residues (syntesis) Annual Harvest

SOURCE AND SINK CATEGORIES	CARBON (Gg)	CO2 (Gg)
Total Annual Growth	3 914	14 353
total Annual Removal	3 600	13 201
Net Emission Net Removal	314	1 152

Table A4, VIa - Waste, Emissions of Pollutants

SOURCE CATEGORIES		ACTIVITY		EMISSION ESTIMATES (Gg)					
		NUMBER	UNIT	CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	7 692	-	0.00	604.69	2.93	0.03	0.58	7.66
6A	Solid Waste Disposal on Land	6 500	kton	0.00	519.46	0.00	0.00	0.56	6.55
6B	Wastewater Treatment	773	kton CBO	0.00	85.23	2.93	0.00	0.00	1.11
6B1	Industrial	171	kton CBO	0.00	9.95	0.65	0.00	0.00	0.25
6B2	Domestic and Commercial	602	kton CBO	0.00	75.28	2.28	0.00	0.00	0.87
6C	Waste Incineration	14	kton	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	405	kton	0.00	0.00	0.00	0.00	0.00	0.00

Table A4, VIb - Emissions Factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/UNIT)					
		CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	0	78.61	0.38	0.00	0.08	1.00
6A	Solid Waste Disposal on Land	0	79.91	0.00	0.00	0.09	1.01
6B	Wastewater Treatment	0	110.24	3.79	0.00	0.00	1.44
6B1	Industrial	0	58.23	3.79	0.00	0.00	1.44
6B2	Domestic and Commercial	0	125.00	3.79	0.00	0.00	1.44
6C	Waste Incineration	0	0.00	0.00	2.31	1.48	0.15
6D	Other	0	0.00	0.00	0.00	0.00	0.00

Table A4, VIIA - Summary of Emissions of Greenhouse Gases

SOURCE AND SINK CATEGORIES		EMISSION ESTIMATES (Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
National Total (Net)		49 103	812.10	13.91	364.36	1 163.29	279.25
1	All Energy	46 568	18.65	1.96	359.73	1 131.84	168.61
1A	Fuel Combustion Activities	46 401	14.85	1.96	359.73	1 131.84	118.42
1A1	Energy and Transform. Industries	17 740	1.34	0.27	74.14	8.21	2.30
1A2	Industry	6 939	1.56	0.17	17.95	26.84	7.24
1A3	Transport	16 318	4.78	0.69	220.01	822.21	83.84
1A4	Small Combustion	4 744	6.95	0.82	43.21	274.38	24.68
1A5	Other	661	0.22	0.01	4.42	0.20	0.37
Biomass		11 267	7.28	0.35	6.75	271.22	24.30
1B	Fugitive Emissions from Fuels	167	3.80	na	na	na	50.19
1B1	Solid Fuel	7	2.64	na	na	na	0.00
1B2	Oil and Natural Gas	160	1.16	na	na	na	50.19
2	Industrial Processes	3 421.22	0.35	1.94	4.59	30.87	17.76
3	Solvent and other Product Use	266	na	na	na	na	85.21
4	Agriculture	ne	188.41	7.08	ne	ne	ne
4A	Enteric Fermentation	na	118.81	ne	ne	na	na
4B	Manure Management	na	62.07	ioc	ne	na	na
4C	Rice Cultivation	na	7.53	0.00	na	na	na
4D	Agricultural Soils	na	ne	7.08	ne	na	ne
4E	Prescribed Burning Savannas	na	na	na	-	-	0.00
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na
6	Waste	0.00	604.69	2.93	0.03	0.58	7.66
6A	Disposal on Land	0.00	519.46	0.00	0.00	0.56	6.55
6B	Wastewater Treatment	0.00	85.23	2.93	0.00	0.00	1.11
6C	Waste Incineration	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	0.00	0.00	0.00	0.00	0.00	0.00
7	Other	0	0.00	0.00	0.00	0.00	0.00
International Bunkers			1 848	1.78	0.04	31.15	2.18

Table A4, VIIB - Summary of Emissions of Greenhouse Gases

SOURCE CATEGORIES		EMISSION ESTIMATES (Gg) CO2	CH4	N2O	NOx	CO	NMVOC	GWP
National Total (Net)		49 103	812.10	13.91	364.36	1 163.29	279.25	70 622.38
1	All Energy	46 568	18.65	1.96	359.73	1 131.84	168.61	47 587.97
1A	Fuel Combustion Activities	46 401	14.85	1.96	359.73	1 131.84	118.42	47 341.29
1B	Fugitive Emissions from Fuels	167	3.80	na	na	na	50.19	246.69
2	Industrial Processes	3 421	0.35	1.94	4.59	30.87	17.76	4 052.83
3	Solvent and other Product Use	266	na	na	na	na	85.21	265.58
4	Agriculture	ne	188.41	7.08	ne	ne	ne	6 229.28
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 151.99
6	Waste	0.00	604.69	2.93	0.03	0.58	7.66	13 638.71
7	Other	0	0.00	0.00	0.00	0.00	0.00	0.00
International Bunkers			1 848	1.78	0.04	31.15	2.18	0.10

A.

INVENTORY OF EMISSIONS PORTUGAL A5 - YEAR 1994

Table A5, Ia - Energy (Ia) Combustion Activities, Emission of Pollutants

SOURCE CATEGORIES		FUEL	CONSUMPTION (PJ)	EMISSION ESTIMATES (Gg of Pollutant) CO2	CH4	N2O	NOx	CO	NMVOC
1A	Fuel Combustion Activities	Total	716.02	58 005	14.96	2.07	367.86	1 158.54	122.17
1A	Fuel Combustion Activities	Liquid	471.73	35 104	7.10	1.55	311.17	868.95	92.96
1A	Fuel Combustion Activities	Solid	140.50	11 849	0.57	0.18	49.92	19.19	4.90
1A	Fuel Combustion Activities	Biomass Traditional	71.11	7 623	6.51	0.31	4.82	267.15	23.53
1A	Fuel Combustion Activities	Biomass (Other)	32.68	3 430	0.78	0.04	1.94	3.25	0.78
1A	Fuel Combustion Activities	International Bunkers	24.99	1 850	1.72	0.04	30.14	2.31	0.10
1A1	Energy and Transform. Industries	Total	259.31	20 650	1.30	0.26	71.71	7.48	2.17
1A1	Energy and Transform. Industries	Liquid	114.94	8 221	0.40	0.08	26.09	2.53	0.82
1A1	Energy and Transform. Industries	Solid	111.13	8 930	0.11	0.13	43.76	1.25	0.41
1A1	Energy and Transform. Industries	Biomass Traditional	1.24	126	0.04	0.01	0.09	0.62	0.19
1A1	Energy and Transform. Industries	Biomass (Other)	32.00	3 373	0.75	0.04	1.77	3.09	0.75

1A1a	Electicity and Heat Production	Total	223.84	18 198	1.20	0.22	64.82	6.14	2.05
1A1a	Electicity and Heat Production	Liquid	80.13	5 833	0.30	0.05	19.29	1.20	0.70
1A1a	Electicity and Heat Production	Solid	110.47	8 866	0.11	0.13	43.68	1.23	0.41
1A1a	Electicity and Heat Production	Biomass Traditional	1.24	126	0.04	0.01	0.09	0.62	0.19
1A1a	Electicity and Heat Production	Biomass (Other)	32.00	3 373	0.75	0.04	1.77	3.09	0.75
1Alb	Petroleum Refining	Liquid	34.81	2 388	0.10	0.03	6.81	1.32	0.12
1Alc	Solid Fuel Transformation (1)	Solid	0.66	64	0.00	0.00	0.08	0.01	0.00
1A2	Industry	Total	110.96	9 100	1.70	0.18	18.96	28.25	7.79
1A2	Industry	Liquid	62.51	4 260	0.67	0.05	11.34	0.94	0.52
1A2	Industry	Solid	29.36	2 919	0.46	0.05	6.17	17.94	4.49
1A2	Industry	Biomass Traditional	18.41	1 865	0.55	0.08	1.29	9.20	2.76
1A2	Industry	Biomass (Other)	0.68	56	0.02	0.00	0.17	0.17	0.02
1A3	Transport	Total	211.54	16 849	4.65	0.79	226.32	847.78	87.00
1A3ai	International Aviation	Liquid	12.35	905	0.23	0.01	3.58	1.73	0.03
1A3aii	National Aviation	Liquid	12.68	933	0.27	0.01	3.66	3.33	0.03
1A3b	Road Transportation	Liquid	166.41	13 509	2.03	0.67	178.67	840.94	86.58
1A3c	Railways	Liquid	2.27	168	0.01	0.07	2.99	0.97	0.27
1A3di	International Navigation	Liquid	12.65	944	1.50	0.02	26.56	0.58	0.07
1A3dii	National Navigation	Liquid	5.17	390	0.61	0.01	10.86	0.24	0.03
1A4	Small Combustion	Total	124.54	10 706	7.07	0.83	45.97	274.81	24.80
1A4	Small Combustion	Liquid	73.08	5 074	1.15	0.61	42.52	17.49	4.22
1A4	Small Combustion	Solid	0.00	0	0.00	0.00	0.00	0.00	0.00
1A4	Small Combustion	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4a	Commercial/Institutional	Total	15.11	1 063	0.24	0.02	5.11	0.43	0.40
1A4a	Commercial/Institutional	Liquid	15.11	1 063	0.24	0.02	5.11	0.43	0.40
1A4a	Commercial/Institutional	Solid	0.00	0	0.00	0.00	0.00	0.00	0.00
1A4b	Residential	Total	80.56	7 512	5.98	0.26	5.34	264.57	20.67
1A4b	Residential	Liquid	29.09	1 880	0.06	0.04	1.89	7.24	0.08
1A4b	Residential	Biomass Traditional	51.46	5 632	5.92	0.22	3.45	257.32	20.59
1A4c	Agriculture/Foresty/Fishing	Liquid	28.88	2 130	0.85	0.55	35.52	9.82	3.74
1A5	Other (Civil Construction)	Total	9.66	701	0.24	0.01	4.90	0.21	0.40
1A5	Other (Civil Construction)	Liquid	9.66	700	0.24	0.01	4.90	0.21	0.40
1A5	Other (Civil Construction)	Solid	0.00	0	0.00	0.00	0.00	0.00	0.00

Table A5, Ib - Energy (IA) Combustion Activities, Emission Factors

SOURCE CATEGORIES	FUEL	EMISSION FACTORS (t Pollutant/TJ)					
		CO2	CH4	N2O	NOx	CO	NMVOC
1A Fuel Combustion Activities	Total	81	0.021	0.0029	0.514	1.618	0.171
1A Fuel Combustion Activities	Liquid	74	0.015	0.0033	0.660	1.842	0.197
1A Fuel Combustion Activities	Solid	84	0.004	0.0013	0.355	0.137	0.035
1A Fuel Combustion Activities	Biomass Traditional	107	0.092	0.0043	0.068	3.757	0.331
1A Fuel Combustion Activities	Biomass (Other)	105	0.024	0.0013	0.059	0.100	0.024
1A Fuel Combustion Activities	International Bunkers	74	0.069	0.0014	1.206	0.092	0.004
1A1 Energy and Transform. Industries	Total	80	0.005	0.0010	0.277	0.029	0.008
1A1 Energy and Transform. Industries	Liquid	72	0.003	0.0007	0.227	0.022	0.007
1A1 Energy and Transform. Industries	Solid	80	0.001	0.0012	0.394	0.011	0.004
1A1 Energy and Transform. Industries	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1 Energy and Transform. Industries	Biomass (Other)	105	0.024	0.0012	0.055	0.096	0.024
1A1a Electricity and Heat Production	Total	81	0.005	0.0010	0.290	0.027	0.009
1A1a Electricity and Heat Production	Liquid	73	0.004	0.0006	0.241	0.015	0.009
1A1a Electricity and Heat Production	Solid	80	0.001	0.0012	0.395	0.011	0.004
1A1a Electricity and Heat Production	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A1a Electricity and Heat Production	Biomass (Other)	105	0.024	0.0012	0.055	0.096	0.024
1Alb Petroleum Refining	Liquid	69	0.003	0.0010	0.195	0.038	0.003
1Alc Solid Fuel Transformation (1)	Solid	96	0.003	0.0014	0.120	0.017	0.003
1A2 Industry	Total	82	0.015	0.0016	0.171	0.255	0.070
1A2 Industry	Liquid	68	0.011	0.0008	0.181	0.015	0.008
1A2 Industry	Solid	99	0.016	0.0016	0.210	0.611	0.153
1A2 Industry	Biomass Traditional	101	0.030	0.0043	0.070	0.500	0.150
1A2 Industry	Biomass (Other)	83	0.033	0.0027	0.255	0.245	0.033
1A3 Transport	Total	80	0.022	0.0038	1.070	4.008	0.411
1A3ai International Aviation	Liquid	73	0.019	0.0009	0.290	0.140	0.002
1A3aii National Aviation	Liquid	74	0.021	0.0009	0.289	0.262	0.002
1A3b Road Transportation	Liquid	81	0.012	0.0040	1.074	5.053	0.520
1A3c Railways	Liquid	74	0.005	0.0286	1.315	0.425	0.117
1A3di International Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A3dii National Navigation	Liquid	75	0.118	0.0019	2.100	0.046	0.006
1A4 Small Combustion	Total	86	0.057	0.0066	0.369	2.207	0.199
1A4 Small Combustion	Liquid	69	0.016	0.0083	0.582	0.239	0.058
1A4 Small Combustion	Solid	93	0.100	0.0014	0.150	0.200	0.200
1A4 Small Combustion	Biomass Traditional	109	0.115	0.0043	0.067	5.000	0.400

1A4a	Commercial/Institutional	Total	70	0.016	0.0012	0.338	0.028	0.027
1A4a	Commercial/Institutional	Liquid	70	0.016	0.0012	0.338	0.028	0.027
1A4a	Commercial/Institutional	Solid	93	0.100	0.0014	0.150	0.200	0.200
1A4b	Residential	Total	93	0.074	0.0033	0.066	3.284	0.257
1A4b	Residential	Líquido	65	0.002	0.0014	0.065	0.249	0.003
1A4b	Residential	Biomassa Tradicional	109	0.115	0.0043	0.067	5.000	0.400
1A4c	Agriculture/Foresty/Fishing	Liquid	74	0.029	0.0189	1.230	0.340	0.129
1A5	Other (Civil Construction)	Total	72	0.025	0.0014	0.507	0.022	0.042
1A5	Other (Civil Construction)	Liquid	72	0.025	0.0014	0.507	0.022	0.042
1A5	Other (Civil Construction)	Solid	93	0.100	0.0014	0.150	0.200	0.200

Table A5, Ic - Energy (IB) Fugitive Emissions from Fuels

SOURCE CATEGORIES		ACTIVITY DATA (Tg)	EMISSON ESTIMATES (Gg)			EMISSION FACTORS (Gg/Tj)		
			CH4	COVNM	CO2	CH4	NMVOC	CO2
1B	Fugitive Emissions from Fuels	-	3.393	61.532	201	-	-	-
1B1	Solid Fuels	0.15	1.967	0.000	5	13.367	0.000	36.758
1B2	Oil and Natural Gas	-	1.426	61.532	196	-	-	-
1B2a	Oil	-	1.426	61.532	196	-	-	-
1B2ai	Exploration of Crude Oil	na	na	na	na	na	na	na
1B2aii	Production of Crude Oil	na	na	na	na	na	na	na
1B2aiii	Transport	13.48	0.078	4.043	13	0.006	0.300	0.951
1B2aiv	Refining/Storage	13.48	1.348	49.665	158	0.100	3.685	11.760
1B2av	Distribution of Oil Products	2.38	0.000	7.824	24	0.000	3.286	10.240
1B2avi	Other	na	na	na	na	na	na	na
1B2b	Natural Gás	na	na	na	na	na	na	na
1B2c	Venting and flaring	ioc	ioc	ioc	ioc	ioc	ioc	ioc

Table A5, IIa - Industrial Processes, Emissions of Pollutants

SOURCE CATEGORIES		PROD. QUANT. (Gg)	EMISSION ESTIMATES (Gg)					
			CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	21 241	3 421.30	0.35	1.94	4.52	32.90	17.66
2A	Iron and Steel	603	0.92	0.00	0.00	0.03	32.90	0.05
2B	Non-ferrous metals	1	2.70	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium Production	ioc	ioc	ioc	ioc	ioc	ioc	ioc
2B2	Other	1	2.70	0.00	0.00	0.00	0.00	0.00

2C	Inorganic Chemicals	1 379	277.50	0.35	1.94	1.70	0.00	1.40
2C1	Nitric Acid	243	0.00	0.00	1.94	1.70	0.00	0.00
2C2	Fertiliser Production	744	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	392	277.50	0.35	0.00	0.00	0.00	1.40
2D	Organic Chemicals	957	0.00	0.00	0.00	0.00	0.00	4.71
2D1	Adipic acid	na	na	na	na	na	na	na
2D2	Other	957	0.00	0.00	0.00	0.00	0.00	4.71
2E	Non-metallic Mineral Products	7 631	3 140.17	0.00	0.00	0.00	0.00	0.00
2E1	Cement	6 501	3 103.57	0.00	0.00	0.00	0.00	0.00
2E2	Lime	236	ioc	0.00	0.00	0.00	0.00	0.00
2E3	Other	894	36.60	0.00	0.00	0.00	0.00	0.00
2F	Other	10 671	0.01	0.00	0.00	2.78	0.00	11.49

Table A5, IIb - Industrial Processes, Emission Factors

		EMISSION FACTORS (kg/Gg)					
SOURCE CATEGORIES		CO2	CH4	N2O	NOx	CO	NMVOC
2	Industrial Processes	161.07	0.02	0.09	0.21	1.55	0.83
2A	Iron and Steel	1.52	0.00	0.00	0.06	54.58	0.09
2B	Non-ferrous metals	2 573.88	0.00	0.00	0.00	0.00	0.00
2B1	Aluminium production	-	-	-	-	-	-
2B2	Other	2 573.88	0.00	0.00	0.00	0.00	0.00
2C	Inorganic Chemicals	201.30	0.25	1.41	1.23	0.00	1.02
2C1	Nitric Acid	0.00	0.00	8.00	7.00	0.00	0.00
2C2	Fertiliser Production	0.00	0.00	0.00	0.00	0.00	0.00
2C3	Other	708.65	0.90	0.00	0.00	0.00	3.59
2D	Organic Chemicals	0.00	0.00	0.00	0.00	0.00	4.92
2D1	Adipic acid	-	-	-	-	-	-
2D2	Other	0.00	0.00	0.00	0.00	0.00	4.92
2E	Non-metallic Mineral Products	411.51	0.00	0.00	0.00	0.00	0.00
2E1	Cement	477.41	0.00	0.00	0.00	0.00	0.00
2E2	Lime	0.00	0.00	0.00	0.00	0.00	0.00
2E3	Other	40.96	0.00	0.00	0.00	0.00	0.00
2F	Other	0.00	0.00	0.00	0.26	0.00	1.08

Table A5, III - Use of Solvents and Products containing NMVOC

SOURCE CATEGORIES		NMVOC (Gg)	CO2 (Gg)
3	Solvent and and other Product Use	85.21	266
3A	Paint Application	29.57	92
3B	Degreasing and Dry Cleaning	3.77	12
3C	Chemical Products Manufacture/Processing	25	77
3D	Other	27.03	84

Table A5, IV - Agriculture

SOURCE CATEGORIES		ACTIVITY DATA		EMISSION FACTORS			
		NUMBER	UNIT	CH4(Gg)	N2O(Gg)	CH4(Mg/u)	N2O(g/u)
4	Agriculture	0	1000 animal	194.80	7.16	-	-
4A	Enteric Fermentation	30 388	1000 animal	118.56	ne	3.901	-
4A1a	Cattle Dairy	356	1000 animal	35.60	ne	100.000	-
4A1b	Cattle Non-Dairy	961	1000 animal	46.13	ne	48.000	-
4 A3	Sheep	3 416	1000 animal	27.33	ne	8.000	-
4A4	Goats	818	1000 animal	4.09	ne	5.000	-
4A6	Horses	36	1000 animal	0.65	ne	18.000	-
4A7	Asses/Mules	114	1000 animal	1.14	ne	10.000	-
4A8	Swine	2 416	1000 animal	3.62	ne	1.500	-
4A9	Poultry	22 271	1000 animal	0.00	ne	0.000	-
4B	Manure Management	30 388	1000 animal	63.04	ioc	2.075	-
4B1a	Cattle Dairy	356	1000 animal	15.66	ioc	44.000	-
4B1b	Cattle Non-Dairy	961	1000 animal	19.22	ioc	20.000	-
4B3	Sheep	3 416	1000 animal	1.03	ioc	0.302	-
4B4	Goats	818	1000 animal	0.15	ioc	0.189	-
4B6	Horses	36	1000 animal	0.07	ioc	2.080	-
4B7	Asses/Mules	114	1000 animal	0.13	ioc	1.140	-
4B8	Swine	2 416	1000 animal	24.16	ioc	10.000	-
4B9	Poultry	22 271	1000 animal	2.61	ioc	0.117	-
4C	Rice Cultivation	23 132	ha	13.20	0.00	0.571	0.000
4C1	Continuously Flooded	23 132	ha	13.20	0.00	0.571	0.000
4C3	Other	0	ha	0.00	0.00	-	-
4D	Agricultural Soils	5 404 790	ha	ne	7.16	-	1.324
4D	Application of Fertilisers	5 404 790	ha	ne	1.84	-	0.340
4D	Other Sources of Nitrogen	5 404 790	ha	ne	5.32	-	0.984
4E	Prescribed Burning of Savannas	na		na	na	-	-
4F	Field Burning of Agricultural Residues	ne		ne	ne	-	-

Table A5, Va - Land-Use Change & Foresty, Changes in Forest and other Woody Biomass Stocks

SOURCE AND SINK CATEGORIES		AREA (1000 ha)	CARBON RETENTION (Gg)	ABSORPTION FACTOR (Mg C/ha)
5A	Annual Growth Increment	3 346	3 914	1.17
5A2	Exploitation of temperate forest	3 346	3 914	1.17
		Extracted Biomass (1000 m3)	Carbon Consumption (Gg)	Emission Factor (Mg C/m3)
5A	Annual Removal	13 208	3 600	0.27
5A2	Exploitation of temperate forest	13 208	3 600	0.27

Tabela A5, Vb - Land-Use Change & Foresty (synthesis) Annual Harvest

SOURCE AND SINK CATEGORIES	CARBON (Gg)	CO2 (Gg)
Total Annual Growth	3 914	14 353
Total Annual Removal	3 600	13 201
Net Emission Net Removal	314	1 152

Table A5, VIa - Waste, Emissions of Pollutants

SOURCE CATEGORIES		ACTIVITY		EMISSION ESTIMATES (Gg)					
		NUMBER	UNIT	CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	7 817	-	0.00	613.48	2.93	0.03	0.59	7.77
6A	Solid Waste Disposal on Land	6 610	kton	0.00	528.25	0.00	0.00	0.57	6.66
6B	Wastewater Treatment	773	kton CBO	0.00	85.23	2.93	0.00	0.00	1.11
6B1	Industrial	171	kton CBO	0.00	9.95	0.65	0.00	0.00	0.25
6B2	Domestic and Commercial	602	kton CBO	0.00	75.28	2.28	0.00	0.00	0.87
6C	Waste Incineration	14	kton	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	420	kton	0.00	0.00	0.00	0.00	0.00	0.00

Table A5, VIb - Emissions factors

SOURCE CATEGORIES		EMISSION FACTOR (kg/UNIT)					
		CO2	CH4	N2O	NOx	CO	NMVOC
6	Waste	0	78.48	0.37	0.00	0.08	0.99
6A	Solid Waste Disposal on Land	0	79.91	0.00	0.00	0.09	1.01
6B	Wastewater Treatment	0	110.24	3.79	0.00	0.00	1.44
6B1	Industrial	0	58.23	3.79	0.00	0.00	1.44
6B2	Domestic and Commercial	0	125.00	3.79	0.00	0.00	1.44
6C	Waste Incineration	0	0.00	0.00	2.31	1.48	0.15
6D	Other	0	0.00	0.00	0.00	0.00	0.00

Table A5, VIIA - Summary of Emissions of Greenhouse Gases

SOURCE AND SINK CATEGORIES		EMISSION ESTIMATES (Gg)					
		CO2	CH4	N2O	NOx	CO	NMVOC
National Total (Net)		49 689	826.98	14.10	372.41	1 192.02	294.35
1	All Energy	47 154	18.35	2.07	367.86	1 158.54	183.71
1A	Fuel Combustion Activities	46 953	14.96	2.07	367.86	1 158.54	122.17
1A1	Energy and Transform. Industries	17 150	1.30	0.26	71.71	7.48	2.17
1A2	Industry	7 178	1.70	0.18	18.96	28.25	7.79
1A3	Transport	16 849	4.65	0.79	226.32	847.78	87.00
1A4	Small Combustion	5 074	7.07	0.83	45.97	274.81	24.80
1A5	Other	701	0.24	0.01	4.90	0.21	0.40
Biomass		11 052	7.28	0.35	6.77	270.40	24.31
1B	Fugitive Emissions from Fuels	201	3.39	na	na	na	61.53
1B1	Solid Fuels	5	1.97	na	na	na	0.00
1B2	Oil and Natural Gas	196	1.43	na	na	na	61.53
2	Industrial Processes	3 421.30	0.35	1.94	4.52	32.90	17.66
3	Solvent and other Product Use	266	na	na	na	na	85.21
4	Agriculture	ne	194.80	7.16	ne	ne	ne
4A	Enteric Fermentation	na	118.56	ne	ne	na	na
4B	Manure Management	na	63.04	ioc	ne	na	na
4C	Rice Cultivation	na	13.20	0.00	na	na	na
4D	Agricultural Soils	na	ne	7.16	ne	na	ne
4E	Prescribed Burning Savannas	na	na	na	-	-	0.00
4F	Field Burning of Agricultural Residues	ne	ne	ne	-	-	0.00
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na
6	Waste	0.00	613.48	2.93	0.03	0.59	7.77
6A	Disposal on Land	0.00	528.25	0.00	0.00	0.57	6.66
6B	Wastewater Treatment	0.00	85.23	2.93	0.00	0.00	1.11
6C	Waste Incineration	0.00	0.00	0.00	0.03	0.02	0.00
6D	Other	0.00	0.00	0.00	0.00	0.00	0.00
7	Other	0	0.00	0.00	0.00	0.00	0.00
International Bunkers			1 850	1.72	0.04	30.14	2.31

Table A5, VIIB - Summary of Emissions of Greenhouse Gases

SOURCE CATEGORIES		EMISSION ESTIMATES (Gg)						
		CO2	CH4	N2O	NOx	CO	NMVOC	GWP
National Total (Net)		49 689	826.98	14.10	372.41	1 192.02	294.35	71 583.05
1	All Energy	47 154	18.35	2.07	367.86	1 158.54	183.71	48 204.57
1A	Fuel Combustion Activities	46 953	14.96	2.07	367.86	1 158.54	122.17	47 932.22
1B	Fugitive Emissions from Fuels	201	3.39	na	na	na	61.53	272.35
2	Industrial Processes	3 421	0.35	1.94	4.52	32.90	17.66	4 052.91
3	Solvent and other Product Use	266	na	na	na	na	85.21	265.58
4	Agriculture	ne	194.80	7.16	ne	ne	ne	6 388.68
5	Land-Use Change & Foresty	-1 152	na	na	na	na	na	-1 151.99
6	Wastes	0.00	613.48	2.93	0.03	0.59	7.77	13 823.31
7	Other	0	0.00	0.00	0.00	0.00	0.00	0.00
International Bunkers			1 850	1.72	0.04	30.14	2.31	0.10

Table A6, 1 - Overview table for National Greenhouse Gas Inventories

CATEGORY	CO2		CH4		N2O		NOx		CO		NMVOC			
	EST.	QUAL.	EST.	QUAL.	EST.	QUAL.	EST.	QUAL.	EST.	QUAL.	EST.	QUAL.	DOC.	DIVIS.
1A Fuel Combustion Act.	All	H	All	M	All	M	All	M	All	M	All	M	H	2
1B F. Emissions from Fuels	NA		Part	M	NA		NA		NA		Part	M	M	2
2 Industrial Processes	All	M	All	M	All	M	All	M	All	M	All	M	H	2
3 Solvent. Product Use	NA		NA		NA		NA		NA		Part	M	H	1
4 Agriculture									NA					
4A Enteric Fermentation	NA		All	M	NA		NA		NA		NA		M	1
4B Manure Management	NA		All	M	NA		NA		NA		NA		M	1
4C Rice Cultivation	NA		All	M	IE		NA		NA		NA		M	1
4D Agricultural Soils	NA		NA		Part	M	NA		NA		NA		M	1
4E P. Burning of Savannas	NA		NA		NA		NA		NA		NA			
4F F. Burn. Agric. Residues	NE		NE		NE		NE		NE		NE			
5 Land-Use C. & Foresty	NE		NA		NA		NA		NA		NA			
6 Waste	NA		All	L	NA		NA		NA		NA		M	1

Notation Key for Overview Table

ESTIMATES		QUALITY OF ESTIMATES		DOCUMENTATION		DIVISION	
COD.	MEANING	COD.	MEANING	COD.	MEANING	COD.	MEANING
Part	Partly Estimated	H	High confidence in estimation	H	All background inform. included	1	Total emissions estimated
All	Full estim. of all possible sources	M	Medium confidence in estimation	M	Some background inform. included	2	Sectoral split
NE	Not Estimated	L	Low confidence in estimation	L	Only emissions estimated included	3	Sub-sectoral split
E	Estimated but includ. elsewhere						
NO	Non occuring						
NA	Not applicable						

B.

PROJECTION OF EMISSIONS

Table B1 - Summary of Projections of Anthropogenic Emissions of CO2 (Gigagrams)

	1990	1995	2000	2005	2010
Combustion: Energy and Transformation Industries	15 790	20 020	20 960	24 230	27 140
Combustion: Industry	7 770	8 100	9 440	10 300	11 210
Combustion: Transport	9 620	12 790	14 040	15 750	17 130
Combustion: Other	4 080	4 800	5 690	6 320	7 040
Others (Biomass and International Bunkers: Aviation and Marine)	7 110	7 330	8 990	10 430	12 390
Total	44 370	53 040	59 120	67 030	74 910

Source: Directorate General for Energy

Table B2 - Summary of Projections of Anthropogenic Emissions of NOx (Gigagrams)

	1990	1995	2000	2005	2010	2020
NOx (1)	267.37	334.00	356.99	401.91	443.28	n.d.

Table B3, - Summary of key variables and assumptions used for projections

	Units	1990	1995	2000	2005	2010
International coal prices	US$ 1995/t	52	44	54	57	57
International oil prices	US$ 1995/bbl	24	17	23	28	28
Sales prices to final consumer:						
High octane petrol (c/Pb)	PTE/l	136.73	155.76			
Petrol (unleaded) (I.O.95)	PTE/l	131.42	153.76			
Diesel fuel	PTE/l	89.88	104.32			
LPG(Propane in bottles)	PTE/kg	83.95	138.38			
Fuel-oil (>1% S)	PTE/kg	27.87	26.84			
Electricity:						
Domestic/Services (LV)	PTE/kWh	20.98	27.09			
Industry (MV)	PTE/kWh	12.05	13.16			
Gross Domestic Product (GDP)	109 PTE 90	9.621	10.179	12.207	14.568	17.470
Population	million	9.9	9.8	10.1	10.3	10.3
Energy efficiency of existing vehicles						
Long distance passenger:						
Automobiles	l/100 km	9.2	9.1	8.7	8.3	7.8
Buses		34	34	33	32	31
Urban/sub-urban:						
Automobiles		11.7	11.7	11.5	11.1	10.8
Buses		50	50	50	50	50
Average use of private vehicles	km/year	9.700	10.250	10.500	10.300	10.000
Demand for primary energy	(Petajoules)	686.5	770.2	870.7	967.0	1084.2
Manufacturing industry production index	(1990=100)	100	95.5	103.1(a)	105(a)	108(a)
General industry production index	(1990=100)	100	99.1	103.2(a)	106(a)	109(a)
Other						

Source: Directorate General for Energy

(a) Evolution of index calculated on the basis of the estimate of the evolution of GVA for industry

C.

POLICIES AND MEASURES

Table C1 - Summary of policies and measures for energy sector

Policy/measure	Tipe of instrument	Objective and/or method of achieving reductions (including description of the form of the occurring effects)	Sector	State of implementation (program./implem.; legisl. approved or not state of incentives	Estimate of mitigating effects (Gg)			
					2000	2005	2010	2020
1. Energy diversification (introduction of natural gas)	- Financial incentives - Legislation - Cooperation	Difference between a scenario "only with existing measures" and a scenario "with existing plus additional methods"	Supply of energy	At implementation stage	3.400	5.600	11.200	n.d.
2. Promotion of renewable energies (Wind, mini-hydro, geothermal and biomass)	- Financial incentives - Fiscal incentives - Legislation	Difference between a scenario "only with existing measures" and a scenario "with existing plus additional methods"	Production of electricity and use as thermal source	Implemented and legislation approved	600	700	800	n.d.
3. Promotion of energy efficiency	- Financial Incentives - Legislation	Difference between a scenario "only with existing measures" and a scenario "with existing plus additional methods"	All sectors of activity	Implemented and legislation approved	500	1.000	1.200	n.d.
Total					4.500	7.300	13.200	n.d.

Source: Directorate General for Energy

Table C2 - Summary of policies and measures for road transport sector

Measures	Instruments	Objectives	Current situation	Progress
VEHICLES				
Control of exaust gases	Obligatory periodic inspections of vehicles	To detect, evaluate and correct exessive polluting exhaust emissions	In full operation	1.993 million vehicles inspected in 1996
	Approvals and reception of vehicles	To fulfill Community Directives to avoid licensing of vehicles which do not comply with limits	In full operation	3.011 approvals and extensions in 1996
Safe driving with tyres	Calibration of pressure pumps installed in filling stations	To diminish fuel consumption and improve road safety	In operation at 80 GALP filing stations	
Use of alternative fuels	Approval via inspection of electric and LPG vehicles	To lower emissions of polluting gases without reducing road safety levels	In full operation	More than 18.000 LPG powered vehicles on road
Safety of ADR vehicles	Daytime driving with headlights on medium beam	To improve visibility of vehicles	Legislation being prepared	
	Emergency plan for immediate action	To limit the effects of accidents with ADR vehicles	Action being developed in articulation with other bodies	
STRATEGIC				
Articulating of strategies	Creation of National Road Safety Council	To improve effectiveness of actions of different sector bodies	Coordinated by MAI - in full operation	Approval of PISER 97
	Integrated Road Safety Plan	To diminish road accident rate	Prepared and approved	More than 40% of proposed measures have been approved
INFRASTRUTURAL				
Traffic control	Implementation of CIRPOR, control and information of road traffic	To improve information to drivers	In operation	1st stage of project implemented
Limiting of accidents	Improvement of infrastructures with the instalation of crash barriers, suitable signalling and anti sleeping paints	To increase the visibility of road signs and diminish the effects of accidents	In operation in strategic zones	
Detecting of atmospheric conditions	Instalation of meteorological stations on motorways	Advance information on atmospheric conditions		

DRIVERS				
Training of young drivers	Creation of fixed driving schools	Increase awareness and training of young people	In operat. with assistance of local munic. and associations	
	Creation of pedagogical initiatives with associations and basic education establishments	Increase awareness and training of young people	In operation with support of ME	
	Setting up obstacle courses in different conditions	To evaluate the skills of drivers in different conditions	Start-up stage	10 obstacle courses to be set up

D.

ADDITIONAL ELEMENTS

Table D1 - Financial contributions for multilateral institutions (US dollars 10^6)

	1994	1995
Global Environment Facility	0.30	2.50
World Bank	1.01	0.00
International Finance Corporation	0.74	0.00
African Development Bank	0.30	0.00
Asian Development Bank	0.00	0.00
European Bank for Reconstruction and Development	3.00	3.36
Commission of the European Communities	50.06	41.35
European Development Fund	18.85	19.09
Inter-American Development Bank	0.00	0.51
UN Development Programme	1.21	1.00
UN Relief and Works Agency	0.00	0.05
World Food Programme	0.00	0.05
UN High Commissioner for Refugees	0.20	0.15
UN Children's Fund	0.04	0.00
UN Fund for Population	0.03	0.00

UN Industrial Development Organisation	0.29	0.00
World Health Organisation	0.62	0.82
World Intellectual Property Organisation	0.01	0.06
Food and Agriculture Organisation	0.38	0.72
International Labour Office	0.07	0.57
UN Educational. Scientific and Cultural Organisation	0.20	0.94
United Nations University	0.23	0.00
World Meteorological Organisation	0.09	0.10

Table D2 - Public Development Aid (PDA)
Programmes and projects in the environment area and other projects with an environmental component

BENEFICIARY	PROGRAMME/PROJECT/ACTION	PDA COSTS (US dollars)
Mozambique	Environmental Education Programme	11 072
Mozambique	Technical Assistance for PDUS Station	25 032
Mozambique	Training actions under PCI/WMO/IM Programme Programme	39 352
Guinea-Bissau	National Conference and Roundtable on Environmental	1 260
Guinea-Bissau	Class III Meteorological Staff Training Project	21 850
Guinea-Bissau	Protection of Parks and Natural Reserves	7 283
São Tomé and Príncipe	Institutional and Juridical Support Programme to Office of the Environment	18 942
São Tomé and Príncipe	Training actions actions under PCI/WMO/IM Programme	33 549
Angola	Training actions actions under PCI/WMO/IM Programme	42 687
Angola	Integrated Use of Hydro Reserves of River Cunene basin Plan	359 434
Cape Verde	Training actions actions under PCI/WMO/IM Programme	33 749
Other and non specified	Sending of CNUAD documentation and international conventions for the five Portuguese speaking countries	1 120

Source: Portuguese Cooperation Institute

TECHNICAL FILE

GENERAL COORDINATION:

Directorate General for Multilateral Affair

TECHNICAL COORDINATION:

Institute of Meteorology

PREPARATION:

Ministry of Foreign Affairs

Institute of Cooperation

Ministry of Finance

Directorate for the Treasury

Ministry of Internal Administration

Directorate General for Road Transport

Ministry of Infrastrutures, Planning and Territorial Administration

Directorate General for Territorial Planning and Urban Administration

Ministry of Economy

Directorate General for Energy

Directorate General for Industry

National Engineering and Industrial T. Institute

Ministry of Agriculture, Rural

Development and Fisheries

Secretariat General

Directorate General for Forests

Institute of Agrarian Strutures and Rural Development

Office of Planning and

Agro-Food Policy (GPPAA)

Ministry of Education

Secretariat General

Ministry of the Environment

DGA - Office of Community Affairs and Cooperation

Water Institute

Institut of Meteorology

Institut of Environmental Promotion

Institut of Nature Conservation

Ministry of Science and Technology

National Board for Scientific and Technological Research

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