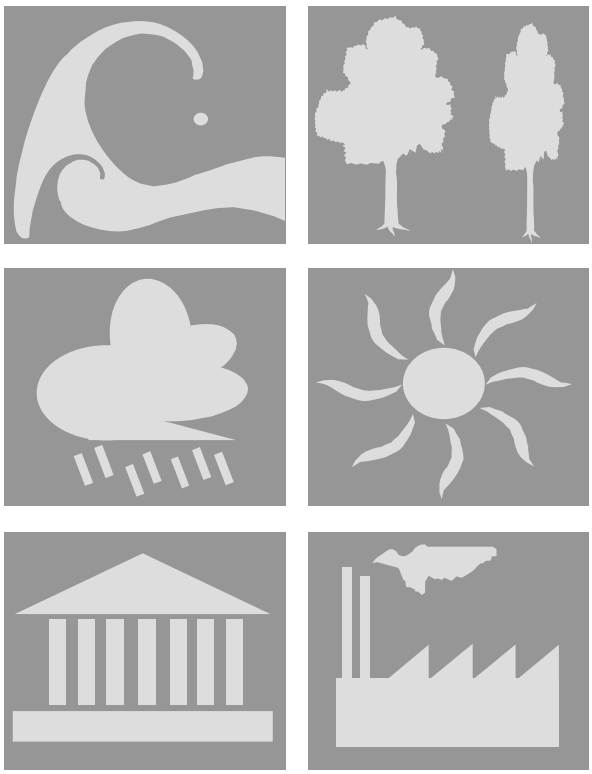
HELLENIC REPUBLIC

MINISTRY OF ENVIRONMENT AND ENERGY



SECOND BIENNIAL REPORT UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

MARCH 2016

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1 Introduction

This report and its accompanying tabular information (**BR CTF Tables**) constitute the second Biennial Report of Greece, as required under Decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC). This report was prepared by the Ministry of Environment and Energy, with the external consultancy assistance of the National Technical University of Athens (School of Chemical Engineering) and an independent LULUCF expert.

In accordance with the UNFCCC biennial reporting guidelines for developed country Parties, the information is structured into:

- Information on greenhouse gases (GHG) emissions and trends and the GHG inventory including information on national inventory system;
- Quantified economy-wide emission reduction target;
- Progress in achievement of the quantified economy-wide emission reduction targets;
- Projections; and
- Provision of financial, technological and capacity building support to developing countries.

2 Information on GHG emissions and trends

2.1 Summary information on GHG emissions and trends

In this chapter summary information on greenhouse gas (GHG) emissions in Greece for the period 1990-2013 is presented, consistently with the most recently submitted annual GHG national inventory (2015 inventory submission of Greece)[1].

Emissions estimates were calculated in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. It is noted that according to the UNFCCC inventory reporting guidelines[2], emissions estimates for international marine and aviation bunkers were not included in the national totals, however they are reported separately as memo items.

In 2013, GHG emissions (without LULUCF) amounted to 105.11 Mt CO2 eq showing a decrease of 2.55% compared to base year emissions and a minor increase of 0.1% compared to 1990 levels. If emissions / removals from LULUCF were to be included then the decrease would be 0.81 % (from 102.62 Mt CO2 eq in 1990 to 101.79 Mt CO2 eq in 2013).

Carbon dioxide emissions accounted for 78.9% of total GHG emissions in 2013 (without LULUCF) and decreased by approximately 0.46% from 1990. Methane emissions accounted for 11.1% of total GHG emissions in 2013 and decreased by 9.44% from 1990, while nitrous oxide emissions accounted for 4.4% of the total GHG emissions in 2013 and decreased by 37.01% from 1990. Finally, f-gases emissions (from production and consumption) that accounted for 5.6% of total GHG emissions in 2013 were increased by 37.9% from 1995 (base year for F-gases for KP accounting).

An overview of total GHG emissions for the time period 1990 – 2013, along with the contribution of each sector to the total GHG emissions are presented below in ***Figure 1***. Detailed information on total GHG emissions and the share of each sector are presented in the **CTF Tables 1s, 1(a), 1(b), 1(c) and 1(d)**.

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[1] http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php

[2] Decision 24/CP.19.

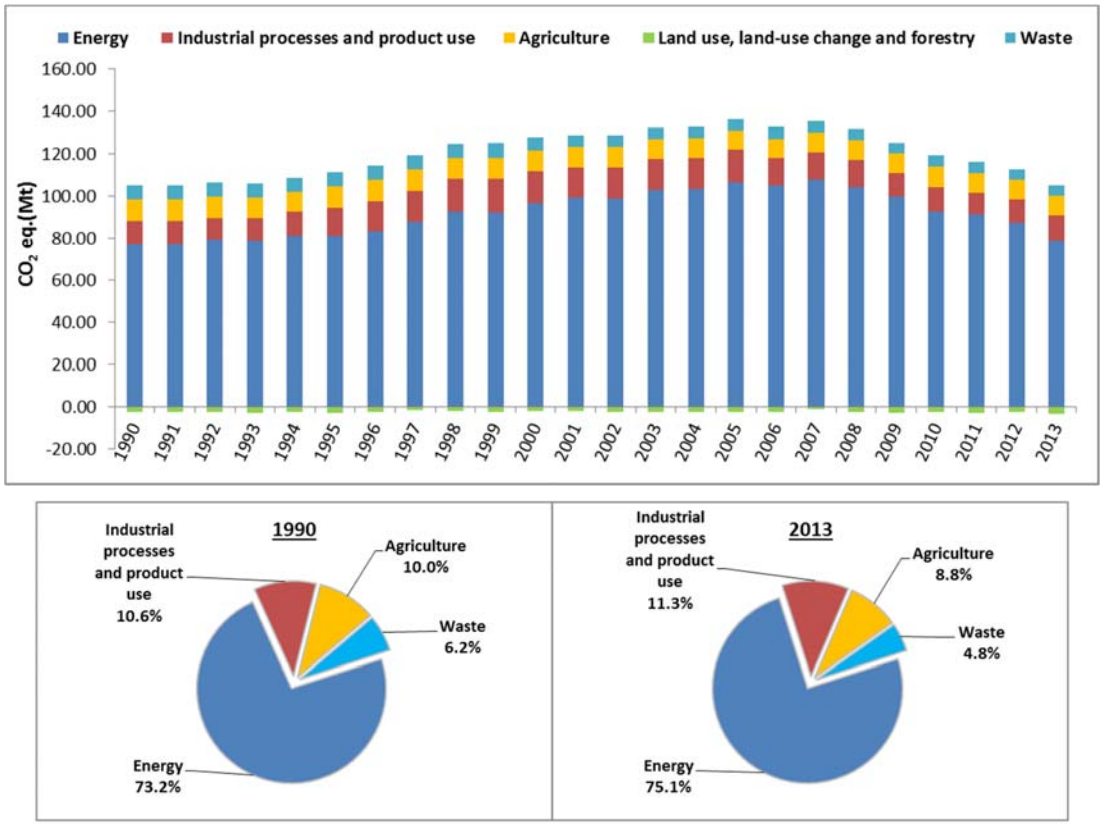


Figure 1. Trend of total GHG emissions for the period 1990-2013, and the share of each sector.

Emissions from **Energy** in 2013 accounted for 75.11% of total GHG emissions (without LULUCF) and increased by approximately 2.65% compared to 1990 levels.

The living standards improvement, due to the economic growth, the important growth of the services sector and the introduction of natural gas in the Greek energy system represent the basic factors affecting emissions trends from Energy for the period 1990 – 2007. For the period 2008 - 2013, the emissions have a decreasing trend.

The living standards improvement resulted in an increase of energy consumption and particularly electricity consumption (mainly in the residential – tertiary sector), passenger cars ownership and transportation activity. The increase of electricity consumption led not only to the increase of direct emissions (due to combustion for electricity generation) but also of fugitive methane emissions from lignite mining. At the same time total CO2 emissions per electricity produced have decreased mainly as a result of the introduction of the natural gas and RES into the electricity system. It should be mentioned that the availability of hydropower has a significant effect to emissions trends. For

instance, the significant increase of electricity demand in 1999 was not followed by a similar increase of emissions because of the penetration of natural gas and the high availability of hydropower.

The decreasing trend of emissions in all sectors of energy of the years 2008-2013 is attributed among others (i.e. RES, use of biomass in the residential sector, energy efficiency measures, road infrastructure and public transportation improvements, etc) to the economic recession that the country is facing.

The majority of GHG emissions of energy sector (62.5%) in 2013 derived from energy industries, while the contribution of transport, manufacturing industries and construction and other sectors is estimated at 22.7%, 6.7% and 6.4%, respectively. The rest 1.6% of total GHG emissions from Energy derived from fugitive emissions from fuels. Within the fuel combustion activities, the sector with the greatest increase of emissions since 1990 is transport, showing an increase of 23.4%, followed by energy industries with a 14.1% increase compared to 1990, respectively. Emissions from manufacturing industries and construction emissions and other sectors (i.e. residential, tertiary and agriculture sectors) had decreased by around 43.7% and 40.2%, respectively, compared to 1990. The decrease in the other sectors is noticeable during the recent years. Finally, fugitive emissions from fuels increased by 5.8% for the period 1990 – 2013.

In 2013, GHG emissions from **Industrial Processes and Product Use** account for 11.30% of total emissions (excluding LULUCF) and have decreased by 14.96% compared to base year emissions and increased by 6.81% compared to the emissions of 1990, while the average annual rate of increase is estimated at 0.59% for the period 1990 – 2013. Emissions from this sector are characterized by intense fluctuations during the period 1990 – 2013 reaching a minimum value of 10.23 Mt CO2 eq in 2011 and a maximum value of 16.29 Mt CO2 eq in 1999. The low value for 2013 is directly related to the effects of the economic recession whereas the maximum value is attributed to changes in industrial production and especially in HCFC-22 production. It should be noted that had it not been for the consumption of f-gases subcategory, the decrease of the recent years would have been much deeper. A second higher value of emissions can be observed for 2005, also being related to HCFC-22 production, since in the next year the respective plant ceased its operation. Significant changes can be observed in this sector compared to the last inventory which can be attributed to the changes in GWP values.

Emissions from **Agriculture** that accounted for 8.8% of total emissions in 2013 (without LULUCF), decreased by approximately 11.48% compared to 1990 levels. Emissions reduction is mainly due to the reduction of N2O emissions from agricultural soils, because of the reduction in the use of synthetic nitrogen fertilizers. The decrease in the use of synthetic nitrogen fertilizers is attributed to the increase of organic farming, the high price of fertilizers and the impact of initiatives to promote

good practice in fertilizer use. The changes of the rest determining parameters of GHG emissions from the sector (e.g. animal population, crops production etc.) have a minor effect on GHG emissions trend.

Emissions from the **Waste Sector** (4.76% of the total emissions, without LULUCF), decreased by approximately 22.96% from 1990. Living standards improvement resulted in an increase of the generated waste and thus of emissions. However, the increase of recycling along with the exploitation of the biogas produced limits the increase of methane emissions. At the same time, emissions from wastewater handling have considerably decreased, due to the continuous increase of the population served by aerobic wastewater handling facilities.

The **Land Use, Land Use Change and Forestry sector** was a net sink of greenhouse gases during the period 1990 – 2013. During this period, the LULUCF sector offset on average 2.16% (0.80-3.16%) of the total national emissions (without LULUCF). The sink capacity of the LULUCF sector fluctuates between 1.08 Mt CO_2 eq. and 3.3 Mt CO_2 eq. This is the result of the decrease of the sink capacity of the Cropland category on the one hand, and the increase of the sink capacity of the Forest Land category on the other.

Further information about GHG emissions and trends can be found in the respective chapters of the Greek National Inventory Report 2015[3].

2.2 Summary information on national inventory arrangements in accordance with the reporting requirements related to national inventory arrangements contained in the UNFCCC Annex I inventory reporting guidelines

The Ministry of Environment and Energy, MEE is the governmental body responsible for the development and implementation of environmental policy in Greece, as well as for the provision of information concerning the state of the environment in Greece in compliance with relevant requirements defined in international conventions, protocols and agreements. Moreover, the MEE is responsible for the co-ordination of all involved ministries, as well as any relevant public or private organization, in relation to the implementation of the provisions of the Kyoto Protocol, according to the Law 3017/2002 with which Greece ratified the Kyoto Protocol.

3 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php

In this context, the MEE has the overall responsibility for the national GHG inventory, and the official consideration and approval of the inventory prior to its submission. (Contact person: Kyriakos Psychas, Address: Patission 147, Athens, Greece, e-mail: k.psychas@prv.ypeka.gr, tel.: +30210 8665938).

Figure 2 provides an overview of the organizational structure of the National Inventory System. The entities participating in it are:

- The **MEE** designated as the national entity responsible for the national inventory, which keeps the overall responsibility, but also plays an active role in the inventory planning, preparation and management.

- The **National Technical University of Athens (NTUA) / School of Chemical Engineering**, which has the technical and scientific responsibility for the compilation of the annual inventory for all sectors except LULUCF sector. The inventory of LULUCF sector has been assigned, on a contract basis, to an independent consultant by MEE.

- **Governmental ministries and agencies** through their appointed focal persons, ensure the data provision

International or national associations, along with individual public or private industrial companies contribute to data providing and development of methodological issues as appropriate.

The legal framework defining the roles-responsibilities and the co-operation between the MEE Climate team, the Inventory team and the designated contact points of the competent Ministries was formalized by circular 918/21-4-08 released by MEE entitled "Structure and operation of the National Greenhouse Gases Inventory System- Roles and Responsibilities". The above-mentioned circular includes a description of each entity's responsibilities, concerning the inventory preparation, data providing or other relative information. This formal framework has improved the collaboration between the entities involved, assuring the timely collection and quality of the activity data required and solving data access restriction problems raised due to confidentiality issues.

According to the Presidential Decree No 189 dated 5th November 2009 the Ministry of Environment and, Energy and Climate Change retained the responsibilities regarding the Environment, and Physical Planning of the former Ministry for the Environment, Physical Planning and Public Works. Furthermore, the General Directorate of Energy and Natural Resources, previously belonging to the Ministry of Development as well as the General Directorate of Forest Development and Protection and Natural Resources, previously belonging to the Ministry of Rural Development and Food, were transferred to the Ministry of Environment, Energy and Climate Change. In 2015 the Ministry of Environment, Energy and Climate Change (the name of which for a short period was Ministry of

Environment, Energy and Production Reconstruction) was named Ministry of Environment & Energy (MEE).

More information about the national inventory arrangements can be found on chapter 1.2 of the NIR of Greece.[4]

Concerning the changes of the national arrangements of Greece since the 1st Biennial Report, the following changes were performed:

1. It has been confirmed in writing to the UNFCCC Executive Secretary that the National UNFCCC Focal Points in the MEE have changed, as follows:
   - ✓ The previous NFP (Ms Irini Nikolaou) has been replaced by Mr Kyriakos Psychas (Address: Patission 147, Athens, Greece, e-mail: k.psychas@prv.ypeka.gr, tel.: +30210 8665938)
   - ✓ The previous Alternate NFP (Ms Aikaterini Pelekasi) has been replaced by Mr Yiannis Markoudakis (Address: Patission 147, Athens, Greece, e-mail: j.markoudakis@prv.ypeka.gr, tel.: + 210 864 7008)
2. With regard to the LULUCF consultancy the change from the previous year is:

   Until the 2015 GHG inventory submission, the compilation of the LULUCF inventory (UNFCCC and KP LULUCF) was a responsibility of the National Technical University of Athens (NTUA). For the 2016 submission, the responsibility for the compilation of the LULUCF inventory (UNFCCC and KP LULUCF) is assigned to Mr Iordanis Tzamtzis, which is an independent consultant.

4 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php

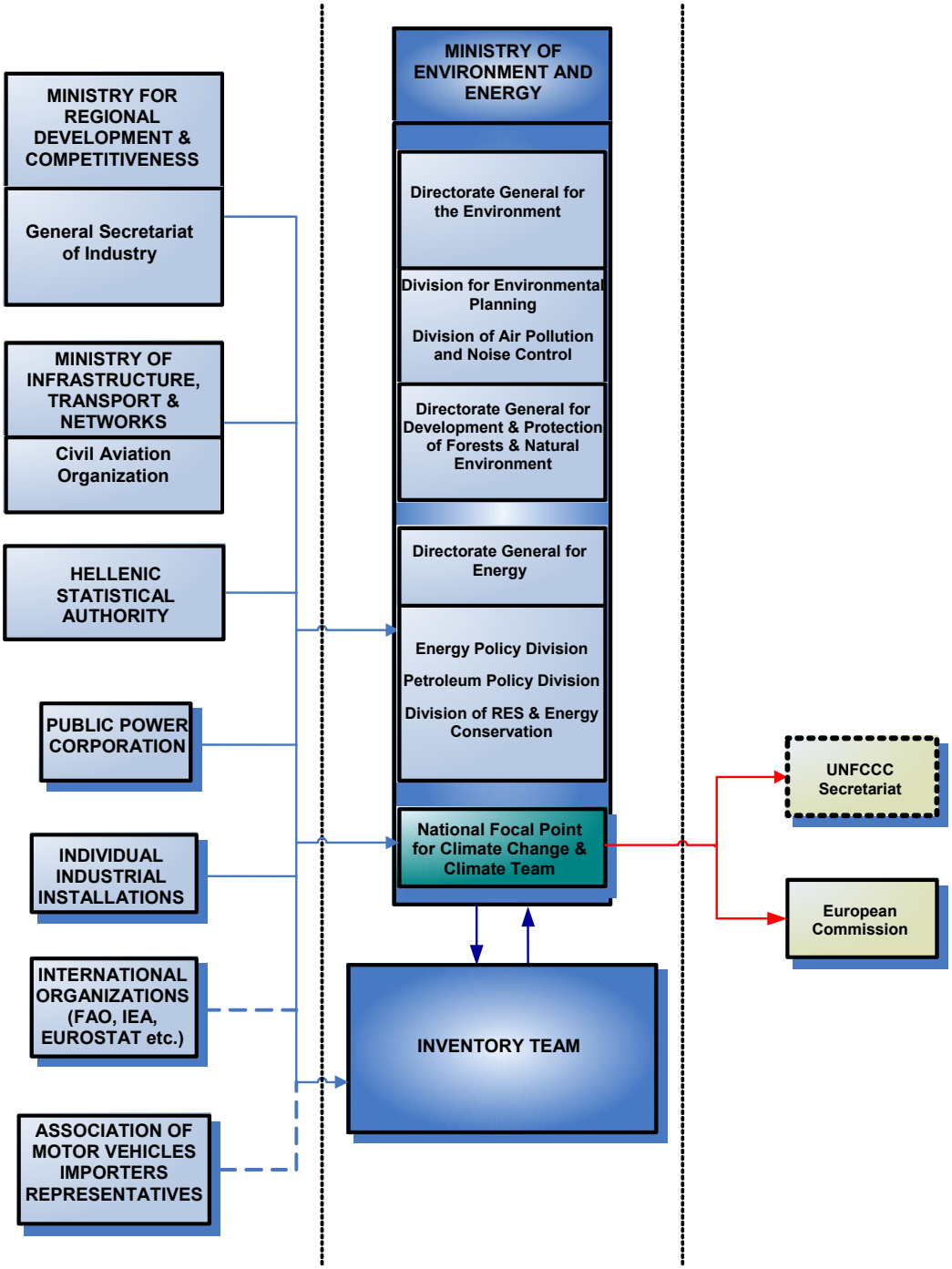


Figure 2. Organizational Structure of the National Inventory System.

3 Quantified economy-wide emission reduction target (QEERT)

3.1 Description of the 2020 EU pledge (QEERT)

Greece, as a Member State of EU, is under the joint quantified economy-wide emission reduction target of EU and its Member States. This section explains this target and the target compliance architecture set up within the EU in order to meet that target.

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilize GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system', or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization (FCCC/CP/2010/7/Add.1). The EU is also committed to raising this target to a 30 % emission reduction by 2020 compared with 1990 levels, provided that other developed countries also commit to achieving comparable emission reductions, and that developing countries contribute adequately, according to their responsibilities and respective capabilities. This offer was reiterated in the submission to the UNFCCC by the EU-28 and Iceland on 30 April 2014.[5]

The definition of the Convention target for 2020 (QEERT) is documented in the revised note provided by the UNFCCC Secretariat on the 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention' (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011). In addition, the EU provided additional information relating to its quantified economy-wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012 (FCCC/AWGLCA/2012/MISC.1).

The EU clarified that the accounting rules for the target under the UNFCCC are more ambitious than the current rules under the Kyoto Protocol, for example, including international aviation, adding an annual compliance cycle for emissions under the Effort Sharing Decision or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions Trading System (EU ETS) (FCCC/TP/2013/7). Accordingly, the following assumptions and conditions apply to the EU's 20 % target under the UNFCCC (QEERT):

[5] European Union, its Member States and Iceland submission pursuant to par 9 of decision 1/CMP.8' http://ec.europa.eu/clima/policies/international/negotiations/docs/eu_submission_20140430_en.pdf

- ✓ The EU Convention pledge does not include emissions/removals from Land Use, Land Use Change and Forestry, but it is estimated to be a net sink over the relevant period. EU inventories also include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the Kyoto Protocol.
- ✓ The target covers the gases CO2, CH4, N2O, HFCs, PFCs and SF6.
- ✓ The target refers to 1990 as a single base year for all covered gases and all Member States.
- ✓ Emissions from international aviation to the extent it is included in the EU ETS are included in the target.[6]
- ✓ A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target: in the ETS, the use of international credits is capped (up to 50 % of the reduction required from EU ETS sectors by 2020). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the ESD sectors, the annual use of international credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions.
- ✓ The Global Warming Potentials (GWPs) used to aggregate GHG emissions up to 2020 are from AR4 consistent with the UNFCCC reporting guidelines for GHG inventories.

The QEERT target is also described in **CTF Tables 2(a-f)**.

3.2 The EU target compliance architecture

3.2.1 The 2020 climate and energy package

In 2009 the EU established internal rules under its "2020 climate and energy package"7 – these underpin the EU implementation of the target under the Convention. The package introduced a clear

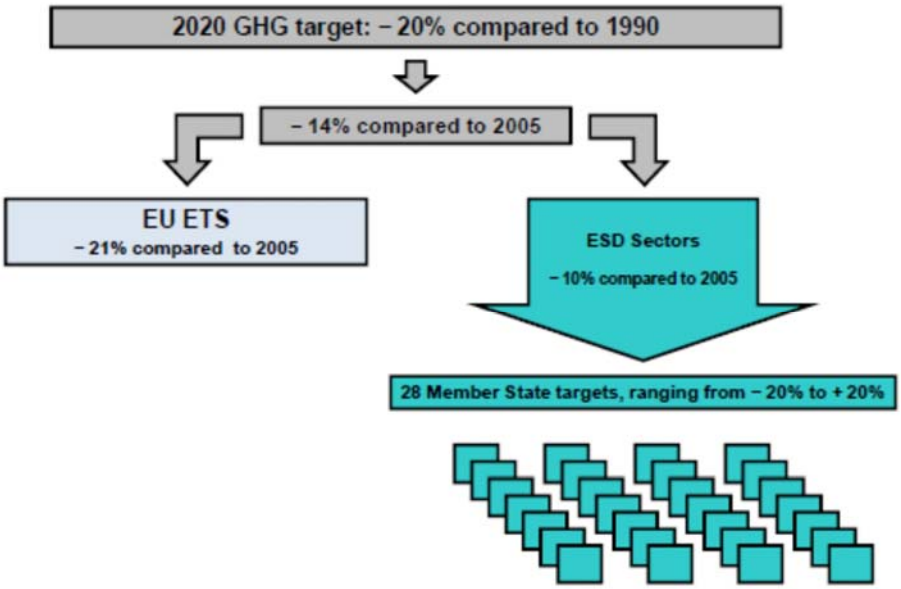
[6] In the EU, the sum of emissions covered by category 1.A.3.a 'domestic aviation' and memo item 'international bunkers - aviation' go beyond the scope of the EU target, as emissions from international aviation are included in the EU Climate and Energy Package and the EU target under the UNFCCC **to the extent to which aviation is part of the EU ETS**.

[7] http://ec.europa.eu/clima/policies/package/index_en.htm

approach to achieving the 20 % reduction of total GHG emissions from 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels. This 14 % reduction objective is divided between the ETS and ESD sectors. These two sub-targets are:

- ✓ a 21 % reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation);
- ✓ a 10 % reduction target compared to 2005 for ESD sectors, shared between the 28 Member States (MS) through individual national GHG targets.

The distribution of the total target across the ETS and ESD is shown in ***Figure 3***.



Source: European Commission

Figure 3. GHG targets under the 2020 climate and energy package

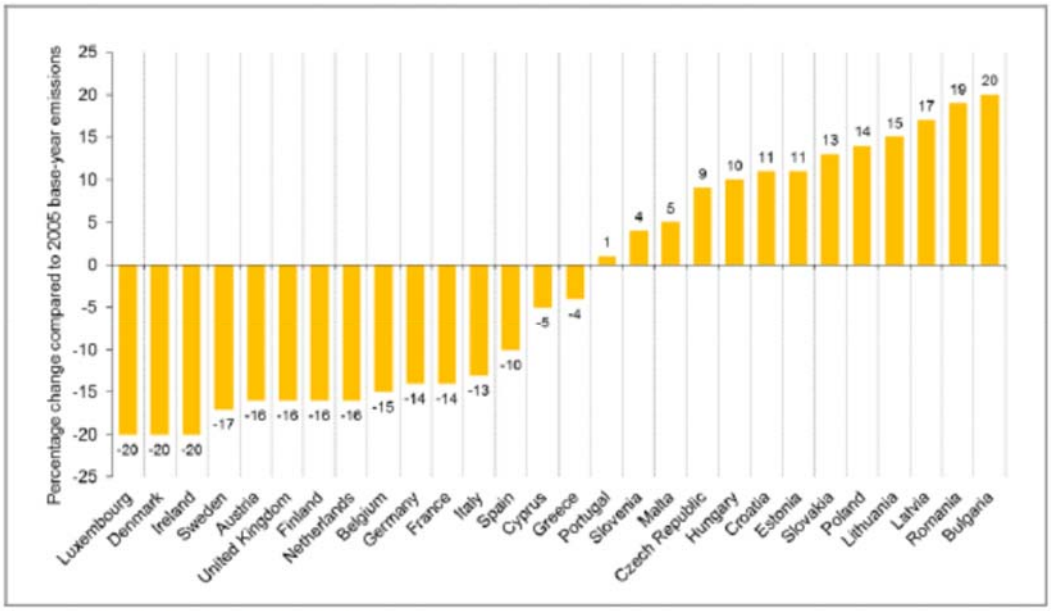
Under the revised EU ETS Directive (Directive 2009/29/EC), a single ETS cap covers the EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), i.e. there are no further individual caps by country. Allowances allocated in the EU ETS from 2013 to 2020 decrease by 1.74 % annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012).

The three non-EU countries participating in EU ETS (Norway, Iceland and Liechtenstein) are also subject to a similarly defined cap and the same annual decrease in allowance allocation. For further additional information on recent changes in the EU ETS see section 4.

The vast majority of emissions within the EU which fall outside the scope of the EU ETS are addressed under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for emissions from domestic and international aviation (which were included in the EU ETS from 1 January 2012), international maritime, and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: transport (cars, trucks), buildings (in particular heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, agriculture and waste. Such sources currently account for about 60 % of total GHG emissions in the EU.

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was divided into national targets to be achieved individually by each Member State (see ***Figure 4***). Under the Effort Sharing Decision, national emission targets for 2020 are set, expressed as percentage changes from 2005 levels. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020 (Commission Decisions 2013/162/EU and 2013/634/EU), denominated in Annual Emission Allocations (AEAs). At country level, 2020 targets under the ESD range from -20 % to +20 %, compared to 2005 levels. ESD targets for 2020 for each EU Member State are shown in Figure 4.

The target levels have been set on the basis of Member States' relative Gross Domestic Product per capita. In addition, different levels of development in the EU-28 are taken into account by the provision of several flexibility options. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, transfers of AEAs between Member States and the use of international credits (credits from Joint Implementation and the Clean Development Mechanism). Nevertheless ESD targets are designed in a strict manner: Every year, once MS emissions are reviewed according to strict criteria (described in Chapter III of the Commission Implementing Regulation 749/2014), the European Commission issues an implementing decision on MS ESD emissions in the given year. MS exceeding their annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face inter alia a penalty – a deduction from their emission allocation of the following year (excess emissions, multiplied by 1.08).



Source: EU Decision No 406/2009/EC, Annex 2

Figure 4. National 2020 GHG emission limits under the ESD, relative to 2005 emissions levels

The 2020 ESD target of Greece is to reduce emissions by 4% compared to 2005 levels. The binding quantified annual reduction targets for the period from 2013 to 2020, or the Annual Emission Allocations (AEAs) of Greece are presented in Table 1.

Table 1. Annual Emission Allocations (AEAs) of Greece for the year 2013 to 2020 calculated applying global warming potential values from the fourth IPCC assessment report

Year	AEAs (t CO2eq)
2013	58,955,025
2014	59,281,845
2015	59,608,666
2016	59,935,486
2017	60,262,306
2018	60,589,126
2019	60,915,946
2020	61,242,766

3.2.2 Accounting for Market-based Mechanisms under the 2020 QEERT target

In general, in the EU the use of flexible mechanisms can take place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets.

The amended EU ETS Directive 2009/29/EC (Article 11a(8)) sets the upper limit for credit use for the period from 2008 to 2020 at a maximum of 50 % of the reduction effort below 2005 levels. This is further specified into installation-level limits in the Commission Regulation on international credit entitlements (RICE) (EU No 1123/2013). Since some entitlements are expressed as a percentage of verified emissions over the entire period, the exact overall maximum amount will only be known at the end of the third trading period (2013-2020). **For example, the majority of EU ETS emissions in Greece comes from operators of a stationary installation which have received a free allocation or an entitlement to use international credits in the period from 2008 to 2012. These operators (in case that they have not implement a significant capacity extension) shall be entitled to use international credits during the period 2008 to 2020 up to an amount corresponding to a maximum of 11 % of their allocation in the period from 2008 to 2012. Therefore, these operators are permitted to use up to about 34.7 million carbon credits during the period 2008 to 2020.**

Since 2013, it is no longer possible to track the use of flexible mechanisms in the EU ETS directly via information on EUTL public website because CERs and ERUs are no longer surrendered directly but are exchanged into EUAs. These exchanges will become public on installation level after three years, with the first information reflecting the use in 2013 available in 2016.

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations. In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005. Member States that do not use their 3 % limit for the use of international credits in any specific year can transfer the unused part of their limit to another Member State or bank it for their own use until 2020. Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in Least Developed Countries (LDCs) and Small Island Developing States (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are not bankable and transferable.

Moreover, higher CDM quality standards apply to the use of CERs for compliance with the EU's target under the Convention.

According to the latest official GHG emission projections of Greece, Greece is expected to meet its annual ESD target without the use of international carbon credits, on the basis of the domestic policies and measures.

4 Progress in achievement of quantified economy-wide emission reduction targets and relevant information

4.1 Mitigation actions and their effects

4.1.1 Overarching and cross-cutting supporting Policies for the restriction of GHG emissions

In this chapter a short overview of the most important overarching and cross-cutting supporting policies and tools which are related with the implementation of measures for the restriction of GHG emissions in Greece is presented. Emphasis is given to the 2nd National Climate Change Program which aims in the restriction of emissions in the time horizon of 2010, the European Common and Coordinated policies and measures framework, the establishment of emissions trading system since 2005, and the financing mechanisms and fiscal measures that have been developed to support the implementation of projects which inter alia also contribute to the restriction of GHG emissions. The individual sectoral policies and measures with a direct – quantifiable mitigation effect are presented in Section 4.1.2.

4.1.1.1 2nd National Climate Change Program

The 2nd National Climate Change Programme, that was elaborated and adopted in 2002 (approved by Act of the Ministerial Council 5/27.02.2003, Official Journal of the Hellenic Republic A' 58 – 05.03.2003) defines the additional policies and measures necessary for Greece to meet its Kyoto target, i.e., restricting the increase of GHG emissions to 25% over the time period 2008–2012, compared to base year emissions.

The 2nd National Program has been presented in detail in the 3rd and 4th National Communication on Climate Change. The main actions foreseen include:

- Further penetration of natural gas in all final demand energy sectors as well as in power generation, including co-generation.
- Promotion of renewable energy sources (RES) for electricity and heat production.
- Promotion of energy saving measures in industry and in the residential – tertiary sectors.

- Promotion of energy efficient appliances and energy equipment in the residential – tertiary sectors.
- Structural changes in agriculture and in chemical industry.
- Emission reduction actions in transport and waste management sectors.

4.1.1.2 European common and coordinated policies and measures

The European common and coordinated policies and measures (CCPM) constitute a legislative framework that supports and set the targets of the respective national policies for the restriction of GHG emissions. A list of CCPM is presented in ***Table 2***. Additional to what presented in Table 2, in January 2008 the European Commission proposed binding legislation to implement the 20-20-20 targets. These targets, known as the "20-20-20" targets, set three key objectives for 2020:

1. A 20% reduction in EU greenhouse gas emissions from 1990 levels. The EU is also offering to increase its emissions reduction to 30% by 2020 if other major economies in the developed and developing worlds commit to undertake their fair share of a global emissions reduction effort;
2. Raising the share of EU energy consumption produced from renewable resources to 20%;
3. A 20% improvement in the EU's energy efficiency.

This 'climate and energy package' was agreed by the European Parliament and Council in December 2008 and became law in June 2009. The core of the package comprises four pieces of complementary legislation:

- A revision and strengthening of the Emissions Trading System (ETS), the EU's key tool for cutting emissions cost-effectively. A single EU-wide cap on emission allowances will apply from 2013 and will be cut annually, reducing the number of allowances available to businesses to 21% below the 2005 level in 2020. The free allocation of allowances will be progressively replaced by auctioning, and the sectors and gases covered by the system will be somewhat expanded.
- An 'Effort Sharing Decision' governing emissions from sectors not covered by the EU ETS, such as transport, housing, agriculture and waste. Under the Decision each Member State has agreed to a binding national emissions limitation target for 2020 which reflects its relative wealth. The targets range from an emissions reduction of 20% by the richest Member States to an increase in emissions of 20% by the poorest. These national targets

will cut the EU's overall emissions from the non-ETS sectors by 10% by 2020 compared with 2005 levels.

- Binding national targets for renewable energy which collectively will lift the average renewable share across the EU to 20% by 2020 (more than double the 2006 level of 9.2%). The national targets range from a renewables share of 10% in Malta to 49% in Sweden. The targets will contribute to decreasing the EU's dependence on imported energy and to reducing greenhouse gas emissions.
- A legal framework to promote the development and safe use of carbon capture and storage (CCS). CCS is a promising family of technologies that capture the carbon dioxide emitted by industrial processes and store it in underground geological formations where it cannot contribute to global warming. Although the different components of CCS are already deployed at commercial scale, the technical and economic viability of its use as an integrated system has yet to be shown. The EU therefore plans to set up a network of CCS demonstration plants by 2020 to test its viability, with the aim of commercial update of CCS by around 2030. Revised EU guidelines on state aid for environmental protection, issued at the same time as the legislative package was proposed, enable governments to provide financial support for CCS pilot plants.

The climate and energy package does not address the energy efficiency target directly. This is being done through the 2011 Energy Efficiency Plan and the Energy Efficiency Directive. On 25 October 2012, the EU adopted the Directive 2012/27/EU on energy efficiency. This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. It lays down rules designed to remove barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy, and provides for the establishment of indicative national energy efficiency targets for 2020.

Moreover, pursuant to the energy end-use efficiency and energy services directive 2006/32/EC, an Energy Efficiency National Action Plan (EEAP) is required. This plan constitutes a valuable supporting policy and tool for the restriction of GHG emissions, which illustrates the policies and measures that need to be implemented in order to fulfill the targets set by the directive, namely reduction of 9% of end-use energy consumption for the period 2008-2016 compared to the average of 2001-2005.

The first Greek action plan pursuant to 2006/32/EC was issued in December 2007, while the second and third in September 2011 and December 2014, respectively. These plans describe and evaluate

all the measures that have been, are being or are planned to be implemented to energy end-use sectors in Greece. Moreover, they include an extensive description of the energy savings achieved through energy efficiency improvement measures. They also present the progress in meeting the interim target for energy savings in 2010 based on data and estimates, and make a forecast on energy savings for 2016. Finally, they describe the national strategies related to the forecasts and targets for primary energy savings.

The Greek action plans are comprised of horizontal, intersectoral and measures focusing to the residential, tertiary (public and private), non-ETS industry and transport sector. These measures are presented in ***Table 3***.

According to the EU climate and energy package (20-20-20) Greece has the following targets:

- ✓ RES: 18% of final energy consumption mandatory until 2020 (Directive 2009/28/EC).
- ✓ Mandatory target 10% until 2020 for biofuels. The use of food-based biofuels to meet the 10% renewable energy target of the Renewable Energy Directive will be limited to 5%.
- ✓ Primary energy saving of 20% until 2020.
- ✓ Focus on auctioning – Electric Power will not be granted any free emission allowances (after 2013).
- ✓ For sectors not falling under 2003/87/EC (non-ETS sectors, 4% reduction of 2005 emissions by 2020).

The allowed GHG emissions will start by the mean value of the period 2008-2010 for industries that are included in the ETS and will be decreased by 1.74 % annually until 2020. By this way, In 2020, emissions from sectors covered by the EU ETS will be 21% lower than in 2005.

Electricity generation plants will have to buy their allowances to emit from auctions, whereas the rest of industries included in the ETS will be able to receive free allowances, which will be decreased in the period 2013-2020. Plants that participate in the ETS will be also able to obtain allowances to emit from their activity in the Clean Development Mechanism and Joint Implementation.

As regards to the Renewable Energy Sources (RES), assessment of their penetration will be implemented in final consumption (not in primary energy). The national target was increased from the 18% set out in EU regulation Directive 2009/28/EC to 20% penetration in the final consumption by 2020, by L3851/2010 (OG A/85/4th June 2010) "Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC".

As far as the energy end use efficiency is concerned, pursuant to Law 3855/2010 (Directive 2006/32/EC has been transposed to Greek Legislation by this Law), the national final energy savings

target was set at 9% by 2016 (16.46 TWh), as compared to average final energy consumption for the period 2001-2005 (the ETS industries are excluded). This objective remains in place and progress towards it is being monitored through the National Energy Efficiency Action Plans (EEAP). However, in order to ensure that the target of 20% primary energy savings in the EU by 2020 is met, the European Commission adopted Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. The indicative national target of Greece for 2020 under Directive 2012/27/EU is 24.7 Mtoe primary energy consumption[8].

Table 2. Key recent European common and coordinated policies and measures (CCPM)

CCPM
EU ETS directive 2003/87/EC as amended by Directive 2008/101/EC and Directive 2009/29/EC and implementing legislation, in particular 2010/2/EU, 2011/278/EU and 2011/638/EU
Effort Sharing Decision 406/2009/EC and RES directive 2009/28/EC
Regulation on CO2 from cars and vans (2009/443/EC and no. 510/2011)
Recast of the Energy Performance of Buildings Directive (Directive 2010/31/EU)
Eco-design framework directive 2005/32/EC and its implementing regulations, combined with Labelling Directive 2003/66/EC and 2010/30/EC • Stand-by Regulation 2008/1275/EC • Simple Set-to boxes regulation 2009/107/EC • Office/street lighting regulations 2009/245/EC, No 859/2009 and No 347/2010 • Household lighting regulation 2009/244/EC • External power supplies regulation 2009/278/EC • TVs (+labelling) Regulation No 642/2009, 1062/2010 • Electric motors Regulation No 640/2009 • Circulators Regulation No 641/2009 • Freezers/refrigerators (+labelling) Regulation No 643/2009, 1060/2010 • Household washing machines (+ labelling) Regulation No 1015/2010, 1061/2010 • Household dishwashers (+labelling) Regulation No 1016/2010, 1059/2010 • Industrial fans Regulation No 327/2011 • Air conditioning and comfort fans (Regulation No 206/2012, 392/2012) • Labelling for tyres Regulations No 1222/2009, 228/2011 and 1235/2011

[8] means gross inland consumption, excluding non-energy uses

Other measures

- New F-gas Regulation 517/2014/EU, which repeals 2006/842/EC
- Motor Vehicles Directive 2006/40/EC
- Directive on the geological storage of CO2 2009/31/EC
- Cogeneration Directive 2004/8/EC
- Directive 2006/32/EC on end-use energy efficiency and energy services
- Energy Star Program
- Completion of the internal energy market (including provisions of the 3rd package)
- Energy Taxation Directive 2003/96/EC
- Industrial emissions Directive 2010/75/EU (Recast of IPPC Directive 2008/1/EC and Large Combustion Plant Directive 2001/80/EC)
- Directive on national emissions' ceilings for certain pollutants 2001/81/EC
- Water Framework Directive 2000/60/EC
- Regulation EURO 5 and 6 2007/715/EC
- Regulation Euro VI for heavy duty vehicles 2009/595/EC
- Fuel Quality Directive 2009/30/EC
- Biofuels directive 2003/30/EC
- Landfill Directive 1999/31/EC
- Waste Directive 2006/12/EC
- Waste Management Framework Directive 2008/98/EC
- Nitrate Directive 1991/676/EEC
- Common Agricultural Policy (CAP) Reform 2006/144/EC
- CAP "Health Check" 2008 and the "Set aside" regulation 73/2009
- Eurovignette Directive on road infrastructure charging 2011/76/EU
- Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC

Table 3. Energy Efficiency National Action Plan Measures

Horizontal Measures
H1. Information system for monitoring energy efficiency improvement and energy savings achievement
H2. Targeted education campaigns, provision of information and rewarding of "good practices"
H3. Programmes to provide financial support for investment in energy-saving technologies and research
H4. Tax exemptions of energy savings interventions
H5. Financing of Environmental Interventions-Establishment of Green Fund
Intersectoral Measures
I1. Energy performance of buildings
I2. Energy labelling of appliances and minimum energy efficiency requirements
I3. Implementation of an energy management system (EMS) in the tertiary and public sectors
I4. Energy upgrading of existing buildings through Energy Services Companies under Energy Performance Contracts (EPC)
I5. Installation of electronic and intelligent metering of electricity and natural gas consumers
I6. Promotion of cogeneration of high-efficiency heat and power (CHP) and district heating systems
I7. "Building the Future" Project

Residential Sector
R1. "Energy saving at home" programme – Energy upgrading of residential building envelopes - Financial aid for the upgrading of heating system boilers / burner units in existing buildings
R2. Compulsory installation of central solar thermal systems in new residential buildings and financial incentives for further penetration of small-scale solar thermal systems in residential buildings
R3. “Changing my old air-conditioner" action.
R4. Energy upgrading of social housing buildings-“Green Neighbourhood” programme.
Tertiary Private Sector
T1. Compulsory installation of central solar thermal systems in the buildings of the tertiary sector
Tertiary Public Sector
PS1. Compulsory installation of central solar thermal systems to meet domestic hot water requirements
PS2. Compulsory procurement procedures with respect to public buildings (green procurement – energy-efficient and RES technologies)
PS3. Integrated energy planning by municipalities – "ENERGY EFFICIENCY" (ΕΞΟΙΚΟΝΟΜΩ) Programme
PS4. Compulsory replacement of all light fittings with low energy efficiency in the public sector and the wider public sector
PS5. Implementation of Green Roofs to public buildings
PS6. Programme of Bioclimatic Urban Reformation
PS7. Installation of high-efficiency cogeneration of heat and power (CHP) systems with natural gas in hospitals
PS8. Interventions for improving energy efficiency in school buildings
PS9. Energy saving interventions in public buildings
Industry
I1. Creating “Green Business Parks" – Enhancing investment projects in Industrial and Business Areas & Innovation Zones
Transport Sector
T1. Reshaping of the public transport system
T2. Transport infrastructure projects
T3. Development of urban mobility plans
T4. Promotion of economical, safe and eco-driving.
T5. Incentives for the replacement of old vehicles
T6. Incentives for the replacement of private vehicles and to promote the use of energy-efficient vehicles (vehicles fuelled by natural gas and biofuels and hybrid vehicles)
T7. Eco-labelling – Energy label for cars
T8. Compulsory quotas of vehicles with greater energy efficiency in the fleets of the public services and of public bodies
T9. Linking of vehicle taxation to energy efficiency and CO2 emissions

4.1.1.3 Emissions trading system

In 2005 the European CO2 emissions trading system (EU-ETS) started operating. It covers a number of industrial and energy sector installations which exceed specific capacity limits set by Community

Directive 2003/87/EC. The major objective of EU-ETS is to help the EU Member States to achieve their obligations in the frame of the Kyoto Protocol in terms of economic efficiency.

In brief, the basic functional characteristics of the emissions trading system include: (a) the determination of a number of emissions allowances which are allocated a priori in the liable installations based on specific rules, while the above mentioned installations are obliged to hand over emissions allowances in annual base equal to the CO2 emissions that emitted in the previous year , (b) the total number of allowances for distribution is lower than the emissions that the indebted installations would emit if the trading system did not exist, so that the created closeness of allowances constitutes an incentive for emissions reductions, (c) in the first and second implementation period (2005-2007 & 2008-2012) the trading of allowances is limited to CO2 and in installations of specific industrial sectors which exceed the predetermined capacity limits (in the future according to Directive 29/2009/EC amending Directive 2003/87/EC the system will include also other gases and sectors), (d) the distribution of emissions allowances is made on the basis of a National allocation plan which is formulated, placed on consultation and is completed before the beginning of the trading period, (e) a strict framework for monitoring and compliance enforcement of the liable installations is put in place which provides for substantial fines in case on non-compliance, and (f) all the transactions of emissions allowances are recorded in national and interconnected community-wide Registries.

In Greece, the trading system for the period 2008-2012 comprises 140 industrial installations (power plants, refineries, cement plants etc). An allowance reserve is also created which is intended to cover possible unknown new entrants in the period. According to the 2nd National Allocation Plan (NAP), the allowances of CO2 emissions that are to be allocated to installations included in the EU-ETS (including the reserve) were fixed to 341.547.710 t CO2, which requires a considerable decrease of emissions by the enterprises that participate in the system. It is estimated that this decrease of emissions or, with other words, the effect of ETS supporting policy is a 16.7% reduction or 69.2 Mt of CO2 emissions of ETS installations for the period 2008-2012. Since ETS is a supporting policy, the emissions reduction target is implemented by applying other policies and measures as NG use, RES, CHP etc. So, its effect is not additional to the sum of the other policies and measures.

In 2013, the EU ETS is now in its third phase, running from 2013 to 2020. A major revision in order to strengthen the system means the third phase is significantly different from phases one and two and is based on rules which are far more harmonized than before. The main changes are:

- ✓ A single, EU-wide cap on emissions applies in place of the previous system of 27 national caps of each EU Member State;

- ✓ Auctioning, not free allocation, is now the default method for allocating allowances. In 2013 more than 40% of allowances will be auctioned, and this share will rise progressively each year. In Greece no free allowances will be allocated to the power sector;
- ✓ For those allowances still given away for free, harmonised allocation rules apply which are based on ambitious EU-wide benchmarks of emissions performance. Manufacturing industry will receive 80% of its allowances for free in 2013, a proportion that will decrease in linear fashion each year to 30% in 2020. Sectors facing carbon leakage will receive higher share of free allowances. According to "Benchmarking Decision" 2011/278/EU), installations that meet the benchmarks, i.e. they are among the most efficient in the EU, will in principle receive all the allowances they need. Those that do not reach the benchmarks will receive fewer allowances than they need. These installations will therefore have to reduce their emissions, or buy additional allowances or credits to cover their emissions, or combine these two options. The continued provision of some free allowances limits costs for EU industries in relation to international competitors. Sectors and sub-sectors facing competition from industries outside the EU which are not subject to comparable climate legislation will receive a higher share of free allowances than those which are not at risk of such "carbon leakage."
- ✓ Some more sectors and gases are included, as nitrous oxide emissions from the production of certain acids (i.e. nitric, adipic, glyoxal and glyoxlic acids) and emissions of perfluorocarbons from aluminum production.
- ✓ Monitoring and reporting: the reform to the EU ETS in Phase III has resulted in important changes with regards to domestic institutional arrangements for the monitoring and reporting of GHG emissions under the EU ETS. EU ETS MRV will be required to comply with two new Commission Regulations from the Phase III of the EU ETS onwards, one specific to monitoring and reporting and the other to verification and accreditation . The latter introduces a framework of rules for the accreditation of verifiers to ensure that the verification of operator's or aircraft operator's reports in the framework of the Union's greenhouse gas emission allowance trading scheme is carried out by verifiers that possess the technical competence to perform the entrusted task in an independent and impartial manner and in conformity with the requirements and principles set out in this Regulation. These regulations have direct legal effect in the Member States as there is no need to transpose and implement in national legislation since the provisions apply directly to operators or aircraft operators, verifiers, and accreditation parties. The regulations provide clarity on the roles and responsibilities of all parties (i.e. industrial installations and aircraft

operators are required to have an approved monitoring plan) which will strengthen the compliance chain.

As concerns emissions from aviation, since the beginning of 2012, emissions from all flights from, to and within the European Economic Area (EEA) (i.e. the 28 EU Member States, plus Iceland, Liechtenstein and Norway) are included in the EU Emissions Trading System (EU ETS). The legislation, adopted in 2008, applies to EU and non-EU airlines alike. Like industrial installations covered by the EU ETS, airlines receive tradable allowances covering a certain level of CO2 emissions from their flights per year.

In April 2013 the EU decided to temporarily suspend enforcement of the EU ETS requirements for flights in 2012 to and from non-European countries. For the period 2013-2016 the legislation has also been amended so that only emissions from flights within the EEA fall under the EU ETS. Exemptions for operators with low emissions have also been introduced. The EU took this initiative to allow time for the International Civil Aviation Organization (ICAO) Assembly to reach a global agreement to tackle aviation emissions. This agreement followed years of pressure from the EU for global action.

In October 2013 the EU's hard work paid off when the ICAO Assembly agreed to develop by 2016 a global market-based mechanism (MBM) addressing international aviation emissions and apply it by 2020. Until then countries or groups of countries, such as the EU, can implement interim measures.

Concerning international maritime transport, Greece in line with the European Union has a strong preference for a global approach to reducing GHG emissions from international shipping led by the International Maritime Organization (IMO).

In June 2013, the European Commission adopted a Communication setting out a strategy for progressively including greenhouse gas emissions from maritime transport in the EU's policy for reducing its overall emissions. The strategy consists of the following consecutive steps:

- Establishing a system for monitoring, reporting and verifying (MRV) of CO2 emissions;
- Setting reduction targets for the maritime transport sector;
- Applying further measures, including market-based instruments, in the medium to long term.

Relating to the first of these three steps, the Regulation (EU) No 2015/757 has been adopted on 29th April 2015 establishing an EU-wide MRV system for large ships. This system covers all ships over 5,000 gross tons that use EU ports, irrespective of where the ships are registered.

According to the aforementioned Regulation, ship owners will have to monitor and report the verified amount of CO2 emitted by their ships on voyages to, from and between EU ports. Owners will also have to provide certain other information, such as data to determine the ships' energy efficiency.

4.1.1.4 Financing mechanisms

The funding for the support of policies that either straightforward or inter alia contributes in the restriction of GHG emissions is drew from financing mechanisms that in a big extent have been developed in the frame of the Community Support Frameworks.

The Operational Programme for Energy (OPE), managed by the Ministry of Development, drew funds from the 2nd Community Support Framework which ended on December 31, 2002, to grant public aid to projects with a total budget of Euro 1.061 billion. The European Regional Development Fund provided 33.8 per cent of that amount and national resources 45.2 percent (including the PPC's funds) whereas private capital flows made up the remaining 21 percent. A part of the sub-programme 3 addressed the issue of RES promotion.

The Operational Programme Competitiveness (OPC) of the Ministry of Development, which comes under the 3rd Community Support Framework for the period 2000-2006, constitutes one of the major tools for the promotion of interventions that may lead to GHG emissions reduction. The total budget OPC amounts to €6.6 billion, of which the community contribution is 2.06 billion €, the Greek public spending €1.29 billion and the private funding €3.32 billion.

The OPC includes 9 priority sectors with 41 measures, which in turn comprise a total of 134 actions. These actions are designed to implement the corresponding policies in the Programme's areas of intervention. A central feature of the Operational Programme is to support entrepreneurship in such areas as new technologies, the liberalized energy markets, environment, tourism but also to fund actions for business modernization, especially addressed to small and medium-sized enterprises engaged in manufacturing-processing, tourism and the service sectors. Under the OPC, projects are promoted to upgrade industrial regions, the national quality assurance system, energy infrastructures and regional structures providing information, consultation, education and management support to businesses.

As reported analytically below, the OPC aims to finance or co-finance the further development of infrastructure for the penetration of natural gas (through interconnections with networks of natural gas of neighboring countries, further development of local networks, etc.) and RES into the

electricity system (through the development of special energy infrastructures, interconnection of island grids, upgrading of electric transmission networks, etc.). It also finances specific investments for energy savings, installation of co-generation systems, installation of RES systems, etc. The total cost of measures in the OPC that aim at the further penetration of natural gas and RES as well as in the implementation of measures for energy saving amounts to €2.27 billion (34% of the total budget of the program), of which the public expenditure is €0.54 billion.

The Operational Programme Environment (OPE), which also comes under the 3rd Community Support Framework, promotes inter alia special actions for the reduction of atmospheric pollution, particularly for the regions of Athens and Thessalonica. It also finances or co-finances actions for the reinforcement of infrastructure for monitoring the quality of atmospheric environment and developing information management systems that support measures for the reduction of atmospheric pollution, as specified in relevant European Legislation. The fulfillment of climate change obligations constitutes a priority sector of OPE.

Specifically, it includes measures, actions and interventions aiming at:

- Fulfilling the country's commitments that arise from the relative Directives of the EU and international conventions.
- Interventions in the sources of atmospheric pollution.
- Actions for the fulfillment of obligations which arise from international Treaties and Conventions concerning climate change issues and protection of the ozone layer.
- Traffic management in the big urban centres of the country.
- Reducing noise in urban and tourist developed regions.

The total budget for OPE is €21.47 million and the implementation of its actions is expected to contribute to the restriction of GHG emissions.

Furthermore, a considerable funding tool for RES and energy saving investments is the so called development law 3299/2004, as in force today, following its amendment by virtue of article 37 of law 3522/2006. Specifically, the Greek territory is divided into three (3) zones where the capital grants are as high as 20, 30 and 40 percent respectively of the eligible investment cost, the connection cost to the grid being also included in the case of large scale enterprises. The grant is increased up to 10 percent for medium-scale enterprises and up to 20 percent for the small ones. In particular, for investments in power generation using solar and wind energy, the grant intensity along with the above markup amounts to 40 percent.

The current funding tools that Greece utilizes are summarized below.

The **Green Fund** is a financial instrument established by Law 3889/2010 and aims to allocate funds for the environmental actions. More specifically, this fund aims to enhance development through environmental protection, enhancement and restoration of the environment, climate change and support of the national environmental policy. The Green Fund introduced the first Program Guide in October 2011 and the total commitments-absorptions in 2011 amounted to EUR 60 million, while funding programs of the Green Fund for the year 2012 amounted to EUR 72 million. Based on these decisions the program is progressing, according to the timetable, towards the implementation of medium-term program funding activities and projects of the Green Fund of EUR 400 million for the period 2011-2014.

The **Operational Programme "Environment and Sustainable Development 2007-2013"** is the Sectoral Program of the National Strategic Reference Framework 2007 - 2013 (NSRF) for Environment and Sustainable Development. The strategic objective of the program is the protection, enhancement and sustainable management of the environment. The program will contribute to economic growth through more efficient use of resources, such as reuse, recycling and recovery of waste. After the implementation of the Program, major environmental issues of the country will be effectively addressed, such as tackling climate change, with significant interventions for saving energy, use of renewable energy sources and promotion of clean urban public transport. The budget of the program amounts to 2,117.6 million €.

Specifically, the objectives of the program relating to the protection of the Atmospheric Environment & Urban Transport, Tackling Climate Change and Renewable Energy Sources are summarized as follows:

- ✓ Energy savings in the public and broader public sector
- ✓ Encourage the use and dissemination of renewable energy standards through demonstration projects
- ✓ Promotion of sustainable regional development by using local energy resources
- ✓ Reduction of energy consumption in selected organizations, having a high energy cost function
- ✓ Support of autonomy and security of energy supply of Mount Athos with the use of RES
- ✓ Promoting sustainable solutions for urban transport in Thessaloniki
- ✓ Reduction of air pollution
- ✓ Reduction of greenhouse gases that cause climate change
- ✓ Monitoring the implementation and adaptations of Emissions Trading System to tackle climate change
- ✓ Mapping of noise based on the requirements of legislation

- ✓ Protecting public health by enhancing atmospheric environment
- ✓ Optimize energy performance of buildings

The LIFE program is a financial instrument of the European Union and its main goal is to contribute to the implementation, updating and development of Community environmental policy and legislation, including the integration of the environment into other policies, thereby contributing to the promotion of sustainable development. The programme consists of two sub-programmes one for Environment and one for Climate Action and finances measures and projects with European added value for the Member States.

The **National Strategic Plan for Rural Development** defines the priorities of Greece for the period 2007-2013, in accordance with Article 11 of Regulation (EC) 1698/2005 on the support of rural development by the European Agricultural Fund for Rural Development (EAFRD), which stipulates that the national rural development strategy will be implemented through the Rural Development Programme (RDP) 2007-2013. Rural Development policy 2007-2013 for Greece focuses on three main areas: A. Improving the competitiveness of agriculture and forestry, B. Improving the environment and countryside and C. Improving the quality of life in rural areas and diversification of rural economy.

For the period 2007 - 2013, the shaft on the actions related to climate change is Axis 2 ("Environmental protection and sustainable management of natural resources"). Axis Interventions aimed mainly at protecting soil and water resources, to mitigate the impacts of climate change, protection of biodiversity, protection and preservation of the rural landscape and improve the ecological stability of forests.

The **Operational Programme for Competitiveness and Entrepreneurship (OPCE II)** aims to improve the competitiveness and internationalization of business and manufacturing, with an emphasis on the aspect of innovativeness. A key component of the Plan is to protect the environment and sustainable development.

More specifically the project aims to ensure the energy supply of the country in pursuit of environmental goals, supporting energy market liberalization and integration of the country in major international transmission networks of electricity and natural gas.

Indicative Actions are:

- ➢ The penetration of natural gas in new areas.
- ➢ The expansion of the National Natural Gas Transmission System.

- The completion of the infrastructure required for Liquefied Natural Gas.
- Interconnection of islands with the National Electricity Transmission System.
- The construction of High Voltage Centers.
- To promote energy-saving actions in households and local authorities.
- Strengthening and expansion of the transmission system and electricity grid.
- Investment for the Production of Energy from Renewable Energy Sources (RES).
- The rational management of natural resources.

Moreover, the **Program for the Development of Interventions**, for the period 2010 to 2015, is a product of government's efforts to implement a sustainable response to the challenges the country is facing both in environmental, energy and spatial level and in terms of ensuring long-term economic growth and exit from the economic crisis, setting a solid foundation for future generations.

The Pillars of the Program for the Development of Interventions are:

Addressing climate change by switching to a competitive, low-carbon economy

This pillar incorporates a number of policies that focus on improving energy efficiency, increasing the country's energy potential of Renewable Energy Sources (RES) and natural gas, ensuring energy supply, providing reliable energy products and services to consumers and promote environmentally sound production and consumption patterns through the "Green Procurement". The total budget of investments included under this pillar is € 31.8 billion and it is expected to create over 169,000 jobs.

Sustainable management and protection of natural resources

This pillar gathers actions aimed at protection and enhancement of biodiversity, management and protection of water resources and forests, as well as design for the prompt response to environmental risks and crises. Achieving these objectives is approached by undergoing development investment in technical projects and projects utilizing natural resources, as well as the restoration of natural landscapes. The total budget of the investments included under this pillar is the € 2.3 billion and it is expected to create over 11,000 jobs.

Quality of life enhancement, with respect to the environment

The actions of the third pillar aim to the improvement of the quality of life through the promotion of sustainable development, establishing the productive and social cohesion, while ensuring environmental protection. Under this Pillar important actions are included in order to improve the urban environment, such as reducing noise and pollution and the development of sustainable mobility. In addition, significant investments in recycling and waste management are promoted. The

total budget of the investments included under this pillar is the € 9.5 billion and is expected to create about 30,000 jobs.

Strengthening of mechanisms and principles of environmental governance

The fourth pillar of the program aims to the strengthening of the environmental governance through a set of actions which are key pillars to promote the mechanisms and principles of environmental governance, institutional interventions and investments to enhance physical and human resources. At the same time, public access to environmental information is promoted in the context of the relevant European Directive (INSPIRE), as well as the principle of volunteering is supported through awareness-raising actions and through organizing volunteer and financial assistance actions. The total budget of investments included under this pillar is € 846.7 million and is expected to create more than 2,400 jobs.

Finally, concerning **the European Structural and Investment Funds (ESIF) for the period 2014-2020**, on 7-8 February 2013, and based on a Commission proposal, the European Council concluded that climate action objectives will represent at least 20 % of EU spending in the period 2014-2020 and therefore be reflected in the appropriate instruments to ensure that they contribute to strengthen energy security, building a low-carbon, resource-efficient and climate resilient economy that will enhance Europe's competitiveness and create more and greener jobs. The European Structural and Investment Funds (ESIF) comprise:

- ✓ The European Regional Development Fund (ERDF) including also the goal on European Territorial Cooperation (ETC);
- ✓ The European Social Fund (ESF);
- ✓ The Cohesion Fund (CF);
- ✓ The European Agricultural Fund for Rural Development (EAFRD);
- ✓ The European Maritime and Fisheries Fund (EMFF).

Therefore, 20% of the ESIF funds that Greece will receive for the period 2014-2020 have to be invested in mitigation and adaptation policies and measures, according to the new Operational Programmes that will be prepared for that period.

4.1.1.5 Fiscal measures

4.1.1.5.1 Taxation of energy products

Energy taxes are levied within the framework of the 2003 EU Energy Taxation Directive (Directive 2003/96/EC of the Council of 27 October 2003 for restructuring the European Community framework on the taxation of energy products and electricity); the Directive has been transposed

into Greek legislation with Law 3336/2005, in combination with the provisions of the National Customs Code (Law 2960/2001). Tax rates are generally significantly higher than the minimum levels prescribed in the Directive.

Major reforms were introduced in the energy taxation since 2010:

- ✓ Increases in the excise duties on oil products (Laws 3828/2010, 3833/2010 and 3845/2010; s. the table below). The excise duty rate on unleaded petrol was gradually increased from EUR 410/1000 lt on 1 January 2010 to EUR 670/1000 lt on 3 May 2010, which still applies.
- ✓ Law 3833/2010 introduced the excise duty on electricity starting from May 2010. Law 3899/2010, with effect from 17 December 2010 imposed a slightly higher rate for business use than for residential use:
  - ➢ Business Use: High Voltage: EUR 2.5/MWh. Medium - Low Voltage: EUR 5/MWh
  - ➢ Non Business Use: Household Use: EUR 2.2/MWh. Other Use: EUR 5/MWh

Electricity used in agriculture is exempt (Law 3899/2010). Law 3833/2010 specifies which renewable energy sources (wind, solar, tidal power etc.) are exempted from excise duties, when they are used for the generation of electricity for private purposes only. Fuels used for the purpose of electricity generation are also taxed, with the exception of coal and coke.

- ✓ In 2011 an excise duty was introduced in natural gas (Law 3986/2011), amounting to 1.50 Euro per gigajoule. Natural gas used as propellant is exempt.
- ✓ Starting from 15 October 2012 (Law 4092/2012) a uniform rate of 330 EUR/1000 lt applies for gas oil (diesel) for transport, heating and other use, as well as biodiesel and kerosene for transport, heating and other use. Since 15 October 2012 the reduced excise duty rate for heating gas oil and kerosene which applied during the winter season (from 15 October to 30 April of each year), was abolished .

The excise duty rate applicable to hard coal, lignite and coke is € 0.3/gigajoule. Reliefs are provided for the use of these products for mineralogical processing, exclusively for the generation of electric power, for chemical reduction, electrolytic and metallurgical processing.

The following table depicts the excise duty rates for specified products according to the National Customs Code.

Table 4. Excise duty rates for specified products

Excise duties (euro)									
Energy products	2006	2007	2008	2009	2010	2011	2012	2013	Imposition Unit
Kerosene propellant for transport	260	302	320	330	440	440	330	330	1000 lt
Leaded Petrol	360	384	409	421	681	681	681	681	1000 lt
Unleaded Petrol – LRP	342	347	352	359	670	670	670	670	1000 lt
Unleaded Petrol – up to 96.5 octanes	313	331	350	359	670	670	670	670	1000 lt
Unleaded petrol – more than 96.5 octanes	327	338	349	359	670	670	670	670	1000 lt
Gas oil (diesel) for transport	260	276	293	302	412	412	330	330	1000lt
Liquid petroleum gas (LPG) for propellant use	100	125	125	125	125	200	330	330	1000 kg
Coal & coke	0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	gigajoule
Biodiesel	260	276	293	302	412	412	330	330	1000 lt
Electricity	0	0	0	0	2.2/ 2.5/ 5	2.2/ 2.5/ 5	2.2/ 2.5/ 5	2.2/ 2.5/ 5	MWh
Natural gas	0	0	0	0	0	1.5	1.5	1.5	gigajoule

4.1.1.5.2 Car registration tax

According to the National Customs Code (Law 2960/2001, Article 121), motor vehicles for private use which are imported to Greece, in order to be registered and circulate with Greek plates, are subject to registration tax. The relevant rates are determined on the basis of the cylinder capacity and the anti-pollutant technology of the vehicle. The passenger motor vehicles which are imported in the country and comply with the specifications of the recent Regulations 715/2007 and 692/2008 are subject to registration tax rates ranging from 5% to 50% (Euro 5), while those complying with the specifications of Directive 98/69/EC under phase B are subject to rates from 14% to 142% (Euro 4); finally, motor vehicles which comply with the specifications of Directive 98/69/EC under phase A and previous Directives (94/12/EC, 91/441/EEC, 89/458/EEC and 88/76/EEC) are subject to rates from 24% to 334% (Euro 1, 2 and 3). Motor vehicles of conventional technology are subject to rates from 37% to 346% (s. table below).

Hybrid cars in compliance with the applicable provisions for anti-pollutant technology of Directive 94/12/EC, as well as electric cars are not subject to registration tax.

In addition to registration tax, the customs authorities collect the luxury tax, introduced with Law 3833/2010 starting from 4 March 2010, for cars with a cylinder capacity higher than 2000 cc. However, a recent change with Law 4211/2013, provides that EU cars, registered in another EU Member State prior to the above date of entry into force of the luxury tax, shall not be subject to the luxury tax.

Table 5. Registration tax rates

Cylinder capacity	**EURO 5** Specifications of Regulations 715/2007 and 692/2008	**EURO 4** Specifications of Directive 98/69/EC phase B	**EURO 1, 2 & 3** Specifications of Directives 98/69/EC phase A, 94/12/EC, 91/441/EEC, 89/458/EEC & 88/76/EEC	**Conventional Technology**
Up to 900 cc	5%	14%	24%	37%
901-1400 cc	12%	27%	49%	66%
1401-1600 cc	20%	45%	95%	128%
1601-1800 cc	30%	56%	129%	148%
1801-2000 cc	40%	83%	216%	266%
2001 cc and above	50%	142%	334%	346%

4.1.1.5.3 Motor vehicle circulation fee (road tax)

Owners of motor vehicles and motorcycles using public roads are subject to an annual road tax, paid one-off every year from 1 November until 31 December in advance for next year. The vignette (sticker) was abolished since 2013 (Law 4093/2012). Tax rates, tax base and reliefs are determined by the Ministry of Finance. Motor vehicles are categorized to vehicles for private and public use and within each category to passenger cars, lorries and trucks, buses, trailers and other vehicles. The tax assessment basis is cylinder capacity for private cars, gross weight for lorries and number of passenger seats for buses.

Under the reform which applied only for the year 2010, the road tax was specified on the basis on the cylinder capacity (cc) of the car motor and the age of the car according to four categories, namely Euro V-IV, Euro III, Euro II and Euro I, as follows:

Table 6. Road tax in 2010 (in euros)

Engine size	786-1357	1358-1928	1929-2357	>2357
Euro V-IV (from 1/1/2005)	94	184	428	562
Euro III (from(1/1/2000)	137	252	521	680
Euro II (from 1/1/1996)	162	302	596	780
Euro I (from 31/12/1995)	187	352	671	880
Annual road tax 2009	112	202	446	580

For 2010, cars registered before 1 January 1996 (Euro I) and from 1 January 1996 to 1 January 1999 (Euro II), with engine size more than 2,500 cc, were subject to an additional tax ranging between EUR 250 and 650.

The current system, which was introduced with Law 3986/2011, distinguishes between cars that were registered before and after 31st October 2010.

All passenger cars which have been registered for the first time in Greece until 31 October 2010, as well as motorcycles, regardless of their registration date, shall be subject to the following road tax, based on their cylinder capacity:

Table 7. Road tax for passenger cars registered for the first time in Greece until 31 October 2010, and motorcycles, regardless of their registration date

Category	Cylinder capacity (in cc)	Annual road tax
A	Up to 300	€ 22
B	301-785	€ 55
C	786-1,071	€ 120
D	1,072-1,357	€ 135
E	1,358-1,548	€ 240
F	1,549-1,738	€ 265
G	1,739-1,928	€ 300
H	1,929-2,357	€ 660
I	2,358-3,000	€ 880
J	3,001-4,000	€ 1,100
K	4,001 and above	€ 1,320

Passenger cars that have been registered in Greece for the first time after 1 November 2010, are subject to road tax exclusively on the basis of their CO2 emissions as follows:

Table 8. Road tax for passenger cars registered for the first time in Greece after 1 November 2010

CO_2 emissions	Annual road tax per gr of CO_2 emissions
0-100	0
101-120	0.90
121-140	1.10
141-160	1.70
161-180	2.25
181-200	2.55
201-250	2.80
Above 251	3.40

Hybrid cars up to 1,929 cc and electric private vehicles, as well as private vehicles registered for the first time after 1 November 2010 with CO2 emissions below 100 gr/km are exempt from road tax. Hybrid cars with a cylinder capacity more than 1,929 cc, are subject to the 50% of the road tax corresponding to a car of conventional technology.

The annual road tax applicable to trucks and lorries for private use ranges from EUR 75 to EUR 1,490 and for buses for private use from EUR 210 to EUR 520, whereas the respective tax in the category for public use ranges for lorries from EUR 125 to EUR 1,460 and from EUR 210 to EUR 595 for public buses. Taxis registered until 31 October 2010 are subject to an annual road tax of EUR 290, whereas those registered after that date are taxed according to their CO2 emissions: (i) from 0-100 gr CO2 per km, no tax is due; (ii) from 101-150, the tax is EUR 2.25 per CO2 gr and (iii) above 151, EUR 2.80/gr CO2.

4.1.1.5.4 Corporate income taxation

Enterprises participating in a collective alternative system for the disposal of waste in accordance with the provisions of Law 2939/2001, may deduct from their gross income the fees paid for their participation, as provided in the Circular 1106/2008 of the Minister of Finance. The collective alternative disposal system is defined as the mandatory organization on a collective basis, under any legal form, of the collection works, including the warranty, transport, re-use and exploitation of used packaging or packaging waste and other products (e.g. batteries, appliances, telecommunication material etc.). For the approval of such system the manager has to pay a fee to the National Organization of Alternative Disposal for Packaging, which is subsequently borne by the enterprises participating in such system.

Moreover, the Income Tax Code (Article 6 of Law 2238/1994, as amended by Article 36 of law 3775/2009) prescribes that revenues from the sale of electric energy produced by solar panels to the

Public Power Company are exempt from taxation. This applies for solar systems up to 10 KW, with respect to households and small businesses.

4.1.1.5.5 VAT

The VAT rate applicable to motor vehicle fuels is 23% (standard rate), whereas the reduced rate of 13% applies to electricity, natural gas and district heating.

4.1.2 Sectoral mitigation actions

The individual sectoral policies and measures with a direct – quantifiable mitigation effect are presented in **CTF Table 3**. More information about these mitigation actions can be found in the NC6 / chapter 4.3.2. It should be noted that at the moment there is no need for additional mitigation actions ("planned" mitigation actions according to UNFCCC terminology) linked to the 2020 target (QEERT), since this target is expected to be met by the implemented and adopted policies and measures. However, the amplification of the already implemented and adopted mitigation actions is being planned, along with the introduction of new mitigation actions, in order to meet Greece's longer term targets than the 2020 target (e.g. INDC).

4.1.2.1 Mitigation actions related to LULUCF sector

The targets of the Greek policy regarding the "Land Use, Land Use Change and Forestry" sector are the conservation and the protection of existing forest land, its gradual increase, as well as the improvement of the degraded forest lands. The sustainable management of the forest land was early legislated (Presidential Decree 19-11-1928) while the sustainability of the significant multi-functioning role of forests (e.g. erosion protection, regulation of the water budget, conservation of biodiversity) has been ensured through the directive 958/1953.

The measures for the LULUCF sector arise from rural development actions and other financial mechanisms. In the overall Greek fiscal deficiency, policies already implemented, adopted and measures taken aim for the above mentioned targets achievement, contributing to the mitigation of the climate change. Those policies and measures are presented divided into the following broad categories:

- Public Investment Program (the following actions have been settled since the last quarter of 2014):
  - «Maintaining the health and vitality of forest ecosystems-Effective application of the Community plant health regime». The aim is to promote appropriate actions to take adequate measures to combat insects and fungi, and all pathogen-causes under the obligations arising from the Community legislation for plant health inspections, and from the Commission's implementing decisions on taking urgent measures with regard to the spread of pests.
  - «Forest studies». Forest Services will be funded for the preparation or updating of forest studies of public forests and forested areas with the aim of organizing forestry, ensuring the conservation and maintenance of forests, the landscape protection, the biodiversity conservation and the sustainable extraction of forest products. Furthermore one of the main responsibilities of the Greek Forest Services is the forest management through the development and implementation of the Forest Management Plans. For that purposes, financial and human resources are allocated in order either to update the Forest Management Plans that have been expired or to develop new ones.
  - «Fire protection of public forests and forested areas». A series of actions such as preventive forestry actions (e.g. forestry works for the reduction of fuel biomass), forestry work interventions (logging, etc.) in coniferous forests to remove combustible biomass for forest fire protection and in general preventive works and measures to tackle forest fires in accordance with «Fire protection plans for the management of forest fires» will be funded.
  - «Management of public forest nurseries, seeds gathering and management of seed-production stands and seed-production gardens», in order to ensure high quality planting material that will substantially contribute to successful reforestation works.
  - «Management of Public Forests» with actions such as:
  - ✓ Transformation of public degraded coppice broadleaved forests to high forests by taking appropriate actions.
  - ✓ Recovery/restoration of the structure and composition of forest ecosystems with a view to approaching, where possible, the structures of natural mixed forests.
  - ✓ Encouraging protection and regeneration.
  - ✓ Installation, maintenance and improvement of permanent sample plots on forest ecosystems for monitoring ecological parameters, biotic and abiotic factors affecting the forest management, in order to take the necessary adaptation management measures (adaptive management) and the design and adoption of appropriate management measures in the future.

- ✓ Actions that promote the regeneration and species diversity to enhance biodiversity and increase resilience to climate change.
- ✓ Creation of a permanent monitoring plots network of biotic and abiotic parameters for assessing the impact of climate change on forests.
- ✓ Introduction of drought resistant species and understorey development from species of trees or shrubs that are tolerant to drought.

➢ Under the Rural Development Regulation, 5th Programming Period 2014-2020, the following sub-measures have been approved:

- Measure 4 «Investments in tangible assets»
- ✓ sub-measure 4.3.3 «Opening and improvement of forest road network, with budget 45,307,545.14€.
- Measure 8 «Investing in the development of forest areas and the improvement of forest sustainability»
- ✓ sub-measure 8.1 «support for afforestation/creation of forested areas», with budget 119,333,333.33 €.
- ✓ sub-measure 8.2. «Aid for agroforestry systems", with budget 21,333,333.33 €
- ✓ sub-measure 8.3 «Support for the prevention of damage to forests from forest fires, natural disasters and catastrophic events», with budget 68,669,881.62 €
- ✓ sub-measure 8.4 «Support to repair damage to forests from forest fires, natural disasters and catastrophic events», with budget 103,025,652.13 €. The sub-measure includes reforestation actions for restoring forest potential damaged by fires, natural disasters and catastrophic events or degradation from other causes such as soil erosion. It also comprises the mountainous corrosion and flood protection projects. Restoration of forestry infrastructures or forestry investments from damages as a result of other than the above mentioned causes may be done according to the specifics of the forest area or the management regime.
- ✓ sub-measure 8.6 «support for investment in forestry technologies and in processing, distribution and marketing of forest products», with budget 27,181,342.54 €
- Measure 12 «Aid under the Natura 2000 framework and the framework directive on water»
- ✓ sub-measure 12.2 «compensation for forest areas of Natura 2000 network», with budget 10,000,000.00 €.

➢ Annually the General Directorate of Development and Protection of Forests and Agricultural Environment develops a special «Forestry Financing Program under the Green Fund». The actions are specified in Priority Axes and submitted for approval by the Minister of Environment and Energy, following a decision of the Board the Green Fund. The budget for 2016 is 11,500,000.00 €. Indicative actions and measures include:

- Preventive measures for fire protection of public forests and forested areas.
- Improving infrastructures related to the prevention of illegal logging.
- Restoration of forest potential.
- Management of forest nursery – seed gathering.
- Biological control of ulcer chestnut to chestnut forests and chestnut cropping areas of the country.
- Support of forest protection.
- Applied research.

➢ Other projects

- The Greek Ministry of Environment and Energy has the overall responsibility for the elaboration and development of policy measures in the context of national Forest Map project under the national Cadastre Survey. The development of Forest Maps involves the delineation and recording of forest lands that fall under the protective provisions of Greek forest legislation in an accurate, transparent and definitive way.

All the above actions primarily aim at protecting forests and forested areas, their sustainable management, conservation and enhancement of their multifunctional role, contributing among other things in mitigating climate change.

4.1.3 Information on changes in domestic institutional arrangements, including institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress towards its economy-wide emission reduction target.

In 2014 the Implementing Regulation (EU No 749/2014) and Delegated Regulation (EU No 666/2014) were adopted to enable the implementation of the Monitoring Mechanism Regulation (Regulation No 525/2013, see section 2.2.2.1) in several of its provisions, specifying in more detail the structure of the information, reporting formats, and submission procedures. However, no new institutions were set up in that context. There are no other changes since the NC6 / chapter 4.2 and 4.2.1.

4.1.4 Assessment of the economic and social consequences of response measures

The formulation of climate policy in Greece follows EU policy. To ensure that all relevant possible impacts are taken into account, the EU has established processes that assess the economic and social consequences of climate policy measures.

For the development of new policy initiatives through legislative proposals by the European Commission, an impact assessment system has been established in which all proposals are examined before any legislation is passed. It is based on an integrated approach which analyses both benefits and costs, and addresses all significant economic, social and environmental impacts of possible new initiatives (for details please refer to section 4.10 of the EU BR1 as well as chapter 15 of the EU National Inventory Report 2014).

Beyond this internal impact assessment system, procedures for assessing the impacts of EU (climate change) policies on external countries have also been established. Even though there is no explicit dialogue on response measures, the impacts of policy measures implemented by the EU are naturally being discussed within the framework of bilateral and regional cooperation. Such processes are included in various EU cooperation policies and agreements with third countries on a sectoral level, such as for trade agreements, as well as on an overarching political level in regional cooperation with Africa, Asia and Latin America as well as in bilateral relations. This way, it is ensured that the effects of such policies on non-EU countries are taken into account.

The free Trade Agreements that have been concluded between the EU and third countries provide pertinent examples. For instance, the Deep and Comprehensive Free Trade Area (DCFTA) signed between the EU and Ukraine on 27 June 2014 sets out various processes which enable concerned stakeholders to get in contact with the EU on potential impacts of policies and regulations under the Trade Agreement.[9] These include provisions that allow interested parties to comment on proposed regulations under the agreement. Furthermore, enquiry or contact points are established to respond to questions arising from the application of regulations included in the agreement. Negotiations of similar agreements are taking place between the EU and Morocco, Tunisia, Jordan and Georgia, among others.

Furthermore, dialogues on impacts of EU policies on third countries take place in the context of the European Neighborhood Policy (ENP). As the basis for cooperation between the EU and a neighboring country an Association Agreement is negotiated bilaterally between the two partners.

[9] For more information see http://ec.europa.eu/trade/policy/countries-and-regions/countries/ukraine/.

In such an agreement, specific political priorities are set for the country concerned. Following the agreement, actions plans are negotiated between the EU and the respective neighboring country which include priority areas for cooperation and a specific focus of action for each of these areas for three to five years.

In the negotiations of an action plan, the country is able to raise specific issues of concern with the EU. Additionally, in technical discussions within sub-committees established through the Association Agreement (particularly on energy, transport and the environment), targeted exchanges on policy issues and directions for future cooperation at bilateral level take place. Partner countries can ask questions about planned EU initiatives and legislatives at such meetings to technical experts.[10]

An example of an initiative to address the impacts of EU climate change policies on third countries is currently being prepared under the regional Union for the Mediterranean. Under this NAMA initiative, technical assistance will be provided to project development in key sectors, including tourism. This assistance will help stakeholders from individual countries to develop mitigation actions with easier access to climate finance. The initiative, suggested by Egypt, will focus on renewable energy and energy efficiency, and target key vulnerabilities of Mediterranean countries regarding strong fossil fuel reliance and fossil fuel subsidies.[11]

4.2 Estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry activities

Emissions / removals from LULUCF sector are not part of the 2020 target under UNFCCC (QEERT).

Greece will not use any units from market-based mechanisms in relation to its ESD target. The use of units from market-based mechanisms from EU-ETS operators is described in section 3.2.2 of this report.

[10] For further information on the ENP see http://eeas.europa.eu/enp/.

[11] See http://ufmsecretariat.org/informal-ufm-high-level-conference-on-climate-change/.

4.2.1 LULUCF under the Kyoto Protocol

The **CTF Table 4(a)II** has not been reported as there had not been made an official submission in the context of Kyoto Protocol for the year 2015, due to pending problems in the functionality of the CRF Reporter 5.0.0, and according to the Decision 13/CP.20 of the Conference of the Parties to the UNFCCC.

For the second commitment period of the Kyoto Protocol Greece has not elected any of the electable activities under Article 3, para 4 of the Kyoto Protocol. Therefore, Greece will account for the mandatory activities Afforestation/Reforestation and Deforestation (Article 3, para 3) and Forest Management (Article 3, para 4). Furthermore Greece has decided to account for Article 3.3. and 3.4 of the Kyoto Protocol activities at the end of the commitment period. The supplementary information required under article 7.1 of the Kyoto Protocol has not officially submitted in 2015.

The forest management reference level for Greece is inscribed in the appendix to the annex to decision 2/CMP.7, which is equal to -1.830 Mt CO_2 per year assuming instantaneous oxidation of HWP. Greece will submit a revised Forest Management Reference Level, both assuming instantaneous oxidation, and applying the First Order Decay Function for Harvested Wood Products, by providing also all the necessary information with regard to the Technical Correction, with its first official national inventory submission under the Kyoto Protocol in CP2.

With regard to the activity of Afforestation/Reforestation under article 3.3 this includes only cropland areas that have been planting in the context of EEC Regulations.

In Article 3.4 Forest Management activity, only those forests that are managed with a forest management plan started in 1990 or later are included. These forests cover approximately 36% of the total forest land of Greece.

5 Projections

5.1 Overview

This Chapter describes a "with measures" (WM) or "with existing measures" (WEM) scenario concerning the national projections of greenhouse gas emissions by sources and their removal by sinks for the years 2015, 2020, 2025 and 2030. The "with measures" scenario assumes that no additional emission reduction policies and measures are adopted than the existing ones (implemented and adopted). The GHG emission projections presented in this chapter are based on the latest official energy projection scenarios that are developed by the Ministry of Environment and Energy.

The projections of GHG emissions in the "with measures" scenario disaggregated by sector and by gas are presented in **CTF Table 6(a)**. In ***Table 9***, a split of the projections of the GHG emissions is presented between the sectors covered and not covered by the EU ETS. In ***Figure 5***, the evolution of GHG emissions (national total, EU-ETS and non ETS) and their projections till year 2030, along with the ESD target of Greece are presented.

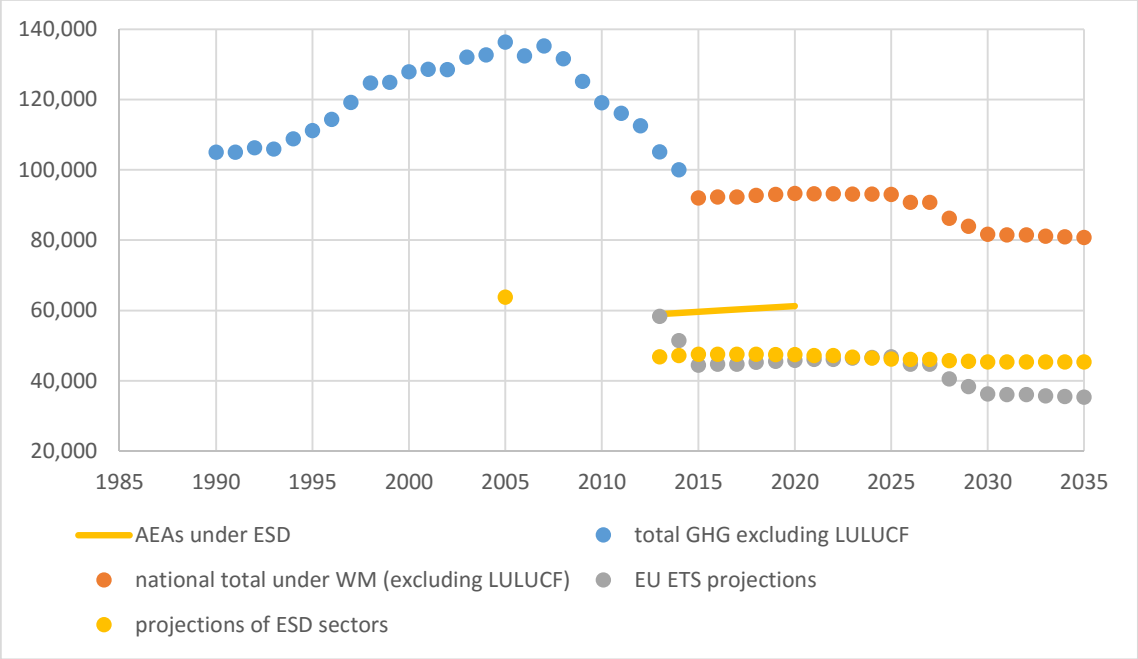


Figure 5. Projections of total national GHG emissions (excluding LULUCF), EU ETS and ESD sectors (in ktCO2eq)

Table 9. Projections of total national GHG emissions (excluding LULUCF), EU ETS and ESD sectors (in ktCO2eq)

year	National emissions excl LULUCF	EU ETS	ESD
2013	105,111	58,345	46,761
2015	92,007	44,480	47,527
2020	93,271	45,824	47,447
2025	93,030	46,839	46,191
2030	81,656	36,271	45,384
2035	80,734	35,389	45,345

Concerning the 2020 non-ETS target (ESD target) of Greece pursuant to European legislation (2013/162/EU and its amendment 2013/634/EU), by comparing the annual emissions allocation for the years 2013-2020 (Table 1) with the projected emissions from ESD sectors (Figure 5), it is concluded that it is anticipated that Greece will meet this target, on the basis of the domestic policies and measures. It should be mentioned that this conclusion is based on the comparison of projections and annual emissions allocation calculated by applying global warming potential values from the fourth IPCC assessment report.

5.2 Methodology used for the presented GHG emission projections

For scenario development and projections two main procedures have been used:

- The projections of energy sector are based on the official energy planning (projections of energy production and consumption data) provided by the MEE (Directorate of Energy Policy and Energy Efficiency). These data were “translated” to GHG emissions based on the spreadsheet models used for the estimation of annual GHG inventory.
- Spreadsheet models for the non-energy sectors, in which future changes in activity data are mainly derived from statistical analysis, while emission factors are derived from expert assessments based on the 2006 IPCC guidelines and country specific information.

Emissions for all sectors were projected using the same models that were used for the NC6 and BR1, updated to:

- include improvements in inventory reporting;
- include emissions for 2012 and 2013, as reported in the 2015 NIR submission;
- apply the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC guidelines);

- use Global Warming Potentials (GWPs) from the IPCC Fourth Assessment Report (AR4); and
- update of key assumptions, in order to reflect in the projections the current economic situation, and the most recent forecasts of macroeconomic parameters (e.g. GDP, fuel and carbon prices).

5.2.1 Energy Sector

The energy planning is performed by the MEE (Directorate of Energy Policy and Energy Efficiency). It is based on the execution of energy planning models, which was performed by the Center for Renewable Energy Sources / Energy Systems Analysis Lab.

In order to simulate the Greek energy system and to project its future structure, the Integrated MARKAL-EFOM System (TIMES)[12] in combination with PropSim[13] were used.

The main input data for TIMES are: GDP and population forecasts, import prices of energy commodities, CO2 prices, costs of energy technologies, and potential of indigenous energy sources (conventional and renewable). The main input data for PropSim are chronological curves of customer load and production of non-dispatchable power plants, expansion plan of power system (energy technology capacities, investments on power plants), and electricity demand.

The use of these models leads to the conduction of analytical quantitative targets per technology, such as the demanded power for wind turbines, small - scale hydro or biomass or the quantification of energy savings in the industrial and residential sectors, etc.

The evaluation of policies has been performed using the TIMES energy model. TIMES constitutes a tool that simulates and optimizes the energy market. It is being continuously developed in the context of the Energy Technology Systems Analysis Programme (ETSAP) of the International Energy Agency (IEA), in which Greece participates as a Member State. The TIMES model is driven by the predicted useful energy demand. By determining the evolution of the useful energy demand (i.e. heating, ventilating and air conditioning, lighting), in the input of the model, and combining it with the course of techno-economical parameters of various energy technologies, the model optimizes the energy technology and fuel

[12] http://www.iea-etsap.org/web/Times.asp

[13] Probabilistic Production Simulation:

http://www.sciencedirect.com/science/article/pii/S1364032114008247

combination that satisfies the energy demand and the targets set by energy strategies (concerning emissions, energy conservation, etc.).

The basic components in TIMES model are specific types of energy or emission control technology. Each is represented quantitatively by a set of performance and cost characteristics. A menu of both existing and future technologies is input to the model. Both the supply and demand sides are integrated, so that one side responds automatically to changes in the other. The model selects the combination of technologies that minimizes total energy system cost.

Thus, unlike some "bottom-up" technical-economic models, TIMES does not require - or permit - an a priori ranking of greenhouse gas abatement measures as an input to the model. The model chooses the preferred technologies and provides the ranking as a result. Indeed, the choice of abatement measures often depends upon the degree of future abatement that is required.

In order to improve the simulation of the electricity system, the PropSim model has been used. Using PropSim enables the identification of the best possible electricity generation system that satisfies the given energy demand. The model simulates the operation of the generation system derived and calculates the peak load capacity required, the balancing units capacity required to cover the residual load hourly variations and the storage capacity required to restrict energy curtailment.

The level of emissions estimated in WM scenario depends on assumptions regarding main parameters, such as population, economic growth, energy prices etc. It also depends on the specific policies incorporated into the scenario. Implemented and adopted policies and measures, which were presented in chapter 4, are incorporated in the “with measures” scenario. The main assumptions made for the projection of GHG emissions in WM scenario are presented in **CTF Table 5**. The projections of energy production and consumption data were converted to GHG emissions by following the 2006 IPCC Guidelines, in line with the national GHG inventory submissions. Emission factors are derived from expert assessments based on the 2006 IPCC guidelines and country specific information.

The “with measures” scenario (WM) encompasses currently implemented and adopted policies and measures. It assumes an emissions allowance cost and the international fuel prices of CTF Table 5, while RES penetration and measures for energy efficiency according to the current rate. Electricity demand is estimated to be 53.3 TWh in 2020. Decommissioning of old public electricity plants and commissioning of new ones is taken into account and the operation of interconnections of the islands to the mainland grid is simulated. The use of lignite is simulated according to the operation schedule of the Public Power Corporation (PPC). The installed power of lignite plants will be decreased from 4.7GW in year 2010 to

3.4GW in year 2020. In 2020, it is anticipated that natural gas plants will be about 5.2GW and RES are being exploited as follows: 3.8 GW of wind farms, 3.6 GW of hydros, 0.1 GW of biogas/biomass and 2.9 GW of photovoltaics. The following national targets will be achieved by the WM scenario:

- ✓ 20% RES target (instead of 18% from the Renewable Energy Directive)
- ✓ Simulation of ETS operation assuming a cost of CO2 emissions for ETS industries indicated in CTF Table 5.
- ✓ 10% Biofuels in transport.
- ✓ Non ETS sectors reduction target -4% (from 2005 level)
- ✓ Energy Efficiency targets according to Directive 2006/32/EC (national final energy savings 9% by 2016). Additionally, the energy conservation of primary energy will evolve according to European target of 20%, as it is defined in Directive 2012/27/EU (primary energy consumption in 2020 will be 24.7 Mtoe).

Concerning energy efficiency, the WM scenario contains the mitigation effect of the energy saving measures from National Energy Efficiency Action Plans included in ***Table 10***.

Table 10. Energy efficiency measures according to the submitted National Energy Efficiency Action Plans (Scenario: With Measures)

Title of measure	Implementation
High efficient appliances and minimum energy efficiency requirements The measure targets to the promotion of high efficient electrical and electronics appliances either through the provision of the appropriate financial incentives or through the imposition of minimum energy efficiency requirements contributing to the significant reduction of both energy and environmental costs incurred by consumers. Moreover, energy labeling will increase the effectiveness of the specific measure informing the consumers about the electricity consumption and the energy efficiency rating of the appliances.	Residential and tertiary sectors
Promotion of high efficient CHP and district heating units in order to cover the increased heating demand from district heating in 2020 in comparison with 2011 in specific areas The measure foresees the installation of new high efficiency CHP and district heating systems in order to satisfy the increased electricity and thermal demand for heating, domestic hot water and thermal processes in residential, tertiary and industrial sectors resulting in primary energy savings. Moreover, the modernization and the extension of the existing CHP and district heating systems can also be implemented within the framework of the specific measure contributing to the achievement of energy savings.	Tertiary, industrial and residential sectors
Compulsory replacement of all low energy efficiency light fittings in the public sector and the wider public sector until 2020 The measure focuses on the replacement of filament lamps with compact fluorescent lamps or other low-consumption lamps, which consume 80% less energy and have a	Public sector

lifespan almost ten times longer. Moreover, the replacement of low energy efficiency lighting units with high efficiency units (such as ballasts, reflectors, etc.), the annual recording/reporting of energy interventions and redetermination of the target for further improvement are considered crucial actions increasing the effectiveness of the measure.	
Replacing old public and private light and heavy trucks with new high efficient The measure aims at the replacement of old public and private light and heavy trucks fulfilling EURO III standards with new vehicles fulfilling EURO V standards through the partial or full exemption from the specific registration fee.	Transport sector
Replacement of private vehicles and to promote the use of energy-efficient vehicles (vehicles fuelled by biofuels and hybrid vehicles) The measure provides specific financial and tax incentives for the replacement of the old energy-intensive vehicles with new high energy efficient vehicles. The provision of the incentives can facilitate the market penetration of private passenger vehicles fuelled by alternative fuels such as biofuels, compressed natural gas or liquefied petroleum gas. Moreover, the replacement of public and private old passenger vehicles fulfilling EURO III standards with new vehicles fulfilling EURO V standards will be promoted through the partial or full exemption from the specific registration fee.	Transport sector
Energy upgrade of building in residential and tertiary sector The measure focuses on the provision of energy-saving interventions in buildings in order to reduce the heating and cooling demand. Indicatively, the proposed interventions, which can be implemented in buildings of the residential and tertiary and public sector, includes the energy upgrade of the building envelope through interventions, such as the installation of exterior and interior insulation including the roof and the pilotis, the replacement of glazing and window frames, the installation of shadow systems including roofing, awnings and special coatings etc.	Residential, tertiary and public sectors
Energy upgrade of electro-mechanical heating and cooling installations The measure promotes the implementation of energy-saving interventions in the installed electro-mechanical equipment of the building sector so as to meet the heating and cooling demand. Indicatively, the proposed interventions, which can be implemented in buildings of the residential and tertiary and public sector, includes the installation of new high efficient thermal and cooling systems, the modernization of the existing heating and cooling systems including the relative distribution systems and the installation of heating and cooling systems utilizing alternative systems such as biomass, natural gas, solar energy etc.	Residential, tertiary and public sectors
Installation of solar thermal systems to cover part of hot water demand. The measure foresees the further penetration of solar thermal energy in order to satisfy part of hot water demand in new and existing buildings of the residential, tertiary and public sectors. Specifically, the solar thermal systems will replace 50%-100% of the conventional fuels and electricity, depending on the climatic conditions in each area, the load and the position of the building.	Residential, tertiary and public sectors
Implementation of the Regulation on the Energy Performance of Buildings in order to result in lower thermal and cooling demand of the new buildings in comparison with the existing The measure aims at the implementation of the regulation on the energy performance of buildings, which introduces an integrated energy design in the sector of buildings for the improvement of the energy efficiency of buildings, energy savings and environmental protection through specific actions such as the preparation of a study	Cross-sectoral

on the Energy Performance of Buildings, the establishment of minimum requirements for energy efficiency in buildings and the Energy Rating of Buildings through the Energy Performance Certificate. The measure will be implemented either during the construction of new buildings or during the upgrade of existing buildings regardless of the sector.	

The estimation of the GHG emissions is based on the formation of analytical energy balances for the years 2015, 2020, 2025 and 2030 and the computation of emissions per fuel and technology in every sector. ***Tables 11*** includes the projections of emissions from the energy sector for the 'with measures' scenario.

Table 11. GHG emissions from the energy sector (in ktCO2eq) for 'with measures' scenario of projections

Sector / Year	2015	2020	2025	2030	2035
Energy Industries	36,836	37,562	38,033	26,273	24,803
Fugitives emissions	930	944	1,040	589	586
Man Industry and Construction	5,023	5,600	6,100	6,712	7,101
Transport	17,192	17,677	17,074	16,321	15,655
Tertiary	885	1,211	1,438	1,651	1,879
Residential	4,032	3,683	2,865	2,800	2,704
Agriculture	1,557	1,678	1,724	1,775	1,813
TOTAL	**66,455**	**68,355**	**68,275**	**56,122**	**54,541**

5.2.2 Non-energy sectors

5.2.2.1 Methodology

GHG emissions in the non-energy sectors are calculated using spreadsheet models that calculate emissions based on activity data, emission factors and sector specific assumptions, according to the following general equation:

$$E_{g,t} = \sum_{j=1}^{J} A_{0,j} \cdot \left(1 + r(x_i)\right)^t \cdot C_{g,j}$$

where,

j : An activity, which constitutes a source of GHG emissions (source)

Eg,t : Projection of emissions of g-greenhouse gas in year-t

A0,j : Activity data of the j-source of emissions in base year

r(xi) : Growth rate of activity data for j-source based on the changes of the determinant parameter x

Cg,j : Emission factor of the g-greenhouse gas for the j-source consistent to the latest GHG inventory submission and 2006 IPCC Guidelines.

The growth factor accounts for changes (increases or decreases) in the emission-generating activity. In estimating the growth factor, time-series analysis and/or regression analysis using appropriate determinant parameters of the available activity data is used. Potential determinant parameters include population, value added, product output, etc.

5.2.2.2 Industrial processes and product use sector

Projected emissions from industrial processes are based mainly on the analysis (a) of the activity data of the respective industrial branches and (b) the apparent consumption of refrigeration and air-conditioning appliances. The emission factors used are similar to those reported in the latest inventory, according to 2006 IPCC guidelines and country specific data..

The main assumptions that were adopted in the context of the present analysis in order to evaluate the future development of GHG emissions from the industrial processes sector are presented in ***Table 12***. The economic recession of our times is taken into consideration.

Table 12. Main assumptions for the "with measures" scenario in IPPU sector.

Process	Projections
Mineral products (Mt)	The energy projected to be consumed in cement plants by Times model was used as a driver for the estimation of emissions of the whole category.
Metal production (Mt)	The energy projected to be consumed in metal production plants by Times model was used as a driver for the estimation of emissions of the whole category.
Chemical industry	One Nitric acid production unit will be in operation from 2007 and afterwards.
Production of F-gases	HCFC-22 production has been stopped since 2006.
Consumption of F-gases	The mitigation effect of EU Regulation 517/2014 was reflected in the projections.

The projections of GHG from IPPU sector show a decrease compared with 1990 levels (***Table 13***). Key highlights include:

- ✓ CO2 emissions are expected to be increased from 2015 due to recovery of the economy. The CO2 emissions in 2020 are expected to be increased by around 6.5% compared to 2013.
- ✓ PFCs emissions from aluminium production have a decreasing trend till 2010 as the production of aluminium was decreased due to the economic recession, while in 2020 are expected to be increased by around 3% compared to 2013.
- ✓ HFCs emissions from HCFC-22 manufacture does not occur since 2006, because the HCFC-22 production unit ceased operation.
- ✓ HFCs emissions due to the use of refrigeration and air-conditioning equipment decrease with a rate of about 14% per annum for the period 2013 – 2020. This decrease is attributed to the implementation of the new EU Regulation of the European Parliament and of the Council of 16 April 2014 (No 517/2014) on fluorinated greenhouse gases. In specific, the reduction in the emissions is expected due to the prevention of leakages and emissions (emission prevention and leak checks, end of life treatment of products and equipment, training and qualification, information for users (labelling, product infos)) and the control of use of F-gases (ban on new applications, ban on uses, phase-down of HFC supply). Directive 2006/40 of the European Parliament and of the Council of 17 May 2006 relating to emissions from air-conditioning systems in motor vehicles amending Council 70/156/EEC is also anticipating reducing F-gases emissions from MACs.

Table 13. Projections of GHG emissions from the IPPU sector (in kt CO_2eq)

Year	2015	2020	2025	2030	2035
Mineral products	3,823	3,997	4,225	4,603	4,848
Chemical industry	749	797	845	893	920
Metal production	942	1,092	1,208	1,343	1,411
Other product manufacture and use	151	153	179	209	238
Product uses as substitutes for ODS	5,845	4,952	4,406	4,514	4,714
Total	11,510	10,992	10,863	11,562	12,132

5.2.2.3 Waste sector

Solid waste disposal on land is the major source of GHG emissions from the waste sector. For the projection of emissions from solid waste, the generation rate of quantities of solid waste was considered as shown in ***Table 14***, based on the analysis of the trends observed in the previous decade and data provided by Ministry of Environment and Energy.

In order to estimate the composition of MSW generated on an annual basis, the assumptions presented in the last National Inventory Report (2015) were used. It was assumed that the share of putrescibles decreases by 0.3% annually, the share of metals and glass decreases annually by 0.1% and 0.02% respectively, the share of paper and plastics increases by 0.2% annually and the share of wood and textiles remains constant 1% and 3.25%, respectively.

Finally, the quantities of the solid waste end out at disposal sites were estimated on the bases of historical data as well as on the implementation of adopted policies and measures. The composition of the solid waste landfilled at disposal sites was estimated taking into account the composition of MSW generated and the amounts of waste recycling and compost. The generation rate per capita, the quantities of biodegradable waste disposed in managed and unmanaged sites (SWDS) and the fraction of biodegradable waste landfilled for the period 1990 – 2030 are presented in ***Table 14.***

Table 14. Main assumptions of projections scenarios for solid waste disposal on land

	2015	2020	2025	2030
Generation rate (kg / cap / day)	1.286	1.373	1.472	1.581
Biodegradable landfill in managed sites (kt)	2,202	1,115	1,254	1,407
Biodegradable landfill in unmanaged sites (kt)	0	0	0	0
Fraction of biodegrable landfill (%)	58	27	29	30

Policy issues that affect significantly the projection of GHG emissions from solid waste disposal on land and wastewater handling include (a) the implementation of Council Directive 1999/31, regarding sanitary landfill (which is the main reason for the significant increase of waste recycled, especially from 2010 and

onwards and the increase on the implementation of systems for flaring or recovery of biogas) and (b) the Directive on Packaging and Packaging Waste (94/62/EC) concerning the Paper and Cardboard recycling.

The estimation of methane emissions from solid waste disposal on land was performed with the FOD method while the default 2006 IPCC methodology was followed for the other source categories (domestic wastewater handling, human sewage and industrial wastewater handling). The total emissions from waste sector are presented in ***Table 15***.

Table 15. GHG emissions from the waste sector (kt CO_2eq)

Year	2015	2020	2025	2030
Total	**4996**	**5050**	**4836**	**4728**

5.2.2.4 Agriculture

The main determinant parameters of GHG emissions from agriculture are the animal population, the quantities of synthetic nitrogen fertilizers applied on soils and the agricultural crops production.

Regarding the animal population, the rate of change of population of each animal category is estimated based on the analysis of the trends observed in the last decade, taking into consideration the economic recession of the current decade and the anticipated economic recovery for the next decade. As a result it was assumed that the number of goats, sheep, non-dairy cattle, poultry and buffalo increases annually with a rate of 0.05%, 0.07%, 0.24%, 0.32%, and 5.2%, respectively, for the period 2000 - 2030. The number of swine, horses, dairy cows and mules and asses decreases with a mean annual rate of 0.35%, 0.77%, 0.80 and 2.13%, respectively for the period 2000-2030. In ***Table 16*** the evolution of animal population is presented, for the period 1990 – 2030.

The use of synthetic nitrogen fertilizers (***Table 17***) decreases continuously with a mean annual rate of 1.23% for the period 2000 – 2030. The decrease in the use of synthetic nitrogen fertilizers for the period 2010-2020 could probably be attributed to the mitigation measures and to the effect of the economic crisis, while for the period 2020-2030 an increase in the use of synthetic nitrogen fertilizer is foreseen as the result of the anticipated economic recovery despite the impact of the mitigation measures. Data for the period 1990-2014 derive from the Pan-Hellenic Association of Professional Fertilizers Producers & Dealers

(PHAPFPD), while the projections are based on the analysis of the trends observed in the whole period 1990-2014.

Table 16. Animal population (thousands) per species (3-year average)

Animal population (thousands)	Projection			
	2015	2020	2025	2030
Dairy cattle	137.8	135.7	139.1	142.5
Non dairy cattle	511	507	516	526
Buffalos	2.0	2.1	2.3	2.5
Sheep	8642	8526	8739	8958
Goats	4820	4498	4947	5441
Horses	26	26	28.6	31.5
Asses & mules	36	26	25	24
Swine	830	810	830	851
Poultry	29849	30938	31711	32504

Table 17. Projection of nitrogen inputs in soils (in kt) from synthetic fertilizers

	Projection				
	2010	2015	2020	2025	2030
Synthetic fertilizers (kt N)	213	205	200	205	210

Finally for the projection of agricultural crops production, similarly with the animal population, an analysis based on the trends observed in the last decade, was performed. In ***Table 18***, the projections of agricultural crops production areas for the period examined are presented.

For the estimation of CH4 emissions from enteric fermentation of cattle and sheep, which account for 80% of methane from this sub-source, Tier 2 methodologies were applied, while for the other animal default emission factors by 2006 IPCC Guidelines for Eastern Europe are used. The CH4 emissions from manure management are estimated based on emissions factors suggested by I2016 PCC Guidelines for developed countries. The emission factors used for the estimation of N2O from manure management are the ones suggested by IPCC Guidelines for Western Europe for cattle and buffalo and for Mediterranean countries for the rest of the animals. The methodologies and emission factors suggested by the 2006 IPCC Guidelines were used for the estimation of GHG emissions from agricultural soils, rice cultivations and field burning of agricultural residues. Finally, other parameters like manure management systems and percentage of

agricultural residues burned on site are kept constant at 2000 levels, while it is also assumed that climate parameters will not undergo significant changes.

Table 18. Projection of agricultural crops production

Production (ktn)	Projection			
	2015	2020	2025	2030
Wheat	1775	1639	1557	1479
Barley	193	175	193	212
Oats	85	87	91	90
Rye	33	31	33	34
Maize	2290	2385	2504	2629
Rice	158	158	166	174
Beans	21	21	2	2
Peas	2	2	4	4
Lentils	4	4	5	5
Other	5	5	913	913
Potatoes	825	830	1365	1365
Sugarbeet	1128	1241	1557	1479

Total GHG emissions from agriculture are presented in ***Table 19***.

Table 19. GHG emissions from agriculture in the "with measures" scenario (kt CO_2eq)

Year	2015	2020	2025	2030
Total	**9046**	**8873**	**9056**	**9244**

In general, a declining trend in emissions from the agriculture sector is expected for the period 2015-2020. Except of the citified way of life which has been adopted and the abandonment of rural areas, the declining trend could be attributed to reduction of agricultural production and to the reduction in the use of synthetic nitrogen fertilizers.

For the period 2020-2030, an increase in emissions from the agriculture sector is foreseen as a consequence of anticipated economic recovery. It must be mentioned that the mitigation measures for this period have also been taken into consideration resulting in an slight increase of GHGs emissions compared to what would be in their absent.

5.2.2.5 LULUCF sector

The projections for years 2015, 2020, 2025 and 2030 for the LULUCF sector in Greece consistent with the UNFCCC Annex I reporting guidelines on national communications are reported in this chapter. It should be noted that there has not been any change in the methodology used for the preparation of projections in comparison to the first biennial report.

Projections of GHG emissions and removals from the LULUCF sector (see **CTF Table 6(a)**) were based on methods and assumptions used for the estimation of emissions and removals during 1990 – 2013. Emission factors used are the ones used in the preparation of the last officially submitted inventory. An analysis of data and trends of the last decades was elaborated in order to estimate the evolution of GHG emissions and removals, and the following assumptions have been made:

- According to the forest definition used in the inventory, the area of managed and harvested forest land will remain constant, equal to 2013 levels.
- The annual biomass uptake in these lands, as well as, the annual losses as a result of the fellings will remain constant, equal to that estimated for the period 1990 – 2013.
- Area under deforestation activities will remain constant and equal to the average area deforested during the period 1990 – 2013.
- Areas affected by wildfires each year will be equal to the average area burnt in the period 1990 – 2013 (this assumption results in reduced inter-annual variation in net emissions/ removals of greenhouse gases from this sector in relation to the variation observed during 1990 – 2013).
- The contribution of harvested wood products in total emissions/removals remains constant and equal to the average value estimated for the period 1990-2013.

5.2.3 Results of the sensitivity analysis performed for the projections

During the preparation of projections, many alternative scenarios based on sensitivity analysis of their input variables and underlying assumptions were examined.

In this chapter four additional scenarios of GHG emissions projections are presented for sensitivity analysis purposes. In the next table, the main assumptions and the deviation of key input variables comparing to the examined “with measures” scenario are illustrated.

Apart for the energy sector, no other sector is included in sensitivity analysis, since the energy sector accounts for more than 80% of GHG emissions.

Table 20. Main assumptions of Sensitivity Analysis Scenarios

Scenario No	Main assumptions
SensSc1	WM scenario
SensSc2	Same as WM scenario with additional energy efficiency measures (***Table 21***)
SensSc3	Achieving in 2020 the following targets: - 20% of the primary energy use is coming from RES and - 34% share of RES in power production. A new lignite-fired plant of 600MW capacity will start operation in 2019.
SensSc4	No binding targets concerning RES and CO2 emissions (i.e. the model is run without the constraint of 20% RES in 2020 and -4% of non-ETS sector GHG emissions). A new lignite-fired plant of 600MW capacity will start operation in 2019.
SensSc5	Same as SensSc4 without the commissioning of the lignite-fired plant in 2019.

In ***Figure 6***, the evolution of GHG emission projections of the scenarios listed in ***Table 20*** is illustrated. As it can be concluded from the 4 sensitivity scenarios examined, the deviation of key input variables from the WM scenario is projected to have no effect on total GHG emissions in 2015. However, the total emissions for year 2020 are estimated to increase, with the exception of SensSc2. The highest increase is estimated by scenarios 3, 4 and 5.

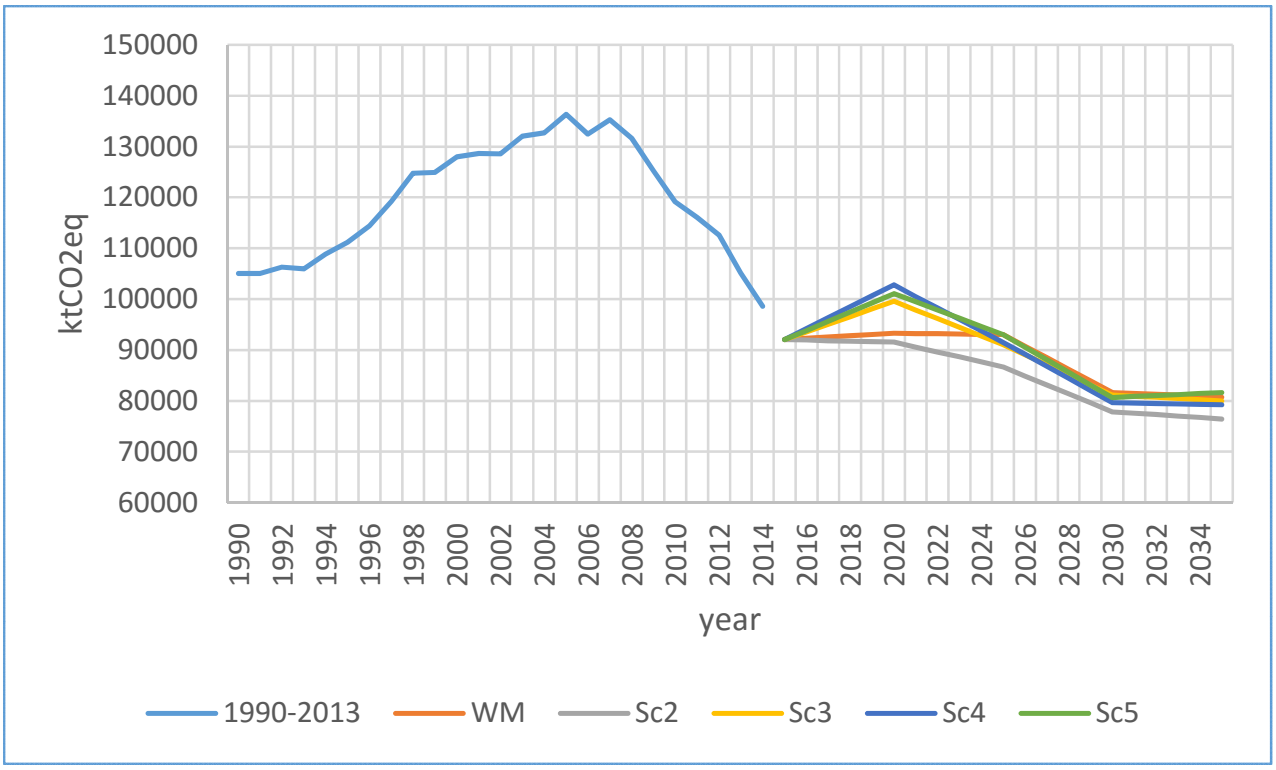


Figure 6. Evolution of GHG emission projections corresponding to the sensitivity analysis scenarios examined

Table 21. Additional energy efficiency measures (SensSc2)

Measure	Implementation
Thermal insulation in buildings constructed before 1980 leading to 50% reduction of the heating demand until 2030 The measure is an extension of the measure "Energy upgrade of building in residential and tertiary sector" focusing on the further installation of thermal insulation in buildings of residential, tertiary and public sector, which have been constructed before 1980.	Residential, tertiary and public sectors
Penetration of electric vehicles with at least 5% share in total passenger kilometers for short-distance routes until 2030 The measure foresees the penetration of electric vehicles of any type for private vehicles and public agencies operating vehicle fleets. Moreover, the construction of public and private vehicle recharging points, powered mainly by renewable energy sources and/or conventional energy sources is considered as a prerequisite for the effectiveness of the measure.	Transport sector
20% share of the fixed rail transport in total passenger-kilometers for short-distance routes until 2030. The measure targets to the increase of fixed rail transport in order to reduce private car use and the corresponding passenger-kilometers for short-distance routes resulting in energy savings.	Transport sector
30% share of the fixed rail transport in total tonne-kilometers until 2030. The measure targets to the increase of fixed rail transport in order to reduce freight transport use and the corresponding tonne-kilometers resulting in energy savings.	Transport sector
10% share of the fixed rail transport in total passenger-kilometers until 2030. The measure targets to the increase of fixed rail transport in order to reduce private car use and the corresponding passenger-kilometers resulting in energy savings.	Transport sector

6 Provision of financial, technological and capacity-building support to developing country Parties

The provision of financial support by Greece to developing country Parties is presented in **CTF Tables 7, 7(a) and 7(b)** for the reporting years 2013 and 2014. The provision of capacity-building support by Greece to developing country Parties is presented in **CTF Table 9** for the reporting years 2013 and 2014. No provision of technology development and transfer support was reported by Greece for the reporting years 2013 and 2014.

Funds are determined as "new and additional" if they are new sources or amounts of funding since the last NC reporting period, and climate change supporting activities are targeted.

Currently, Greece does not have a system to track private financial flows, as Greece's current emphasis is on tracking public financial flows associated with climate change.

The Hellenic Aid programme has systems in place to track, measure and record climate change related assistance provided to developing countries. Specifically, the Hellenic Aid programme coordinates programming, allocation and monitoring of development cooperation, multilateral and bilateral funding. The Ministry of Economy is responsible for Greece's contributions to multilateral institutions, such as the Global Environmental Facility, the World Bank, the European Bank for Reconstruction and Development and the United Nations Development Programme. The Ministry of Environment and Energy is responsible for the allocation of annual official and multilateral contributions to international organizations, United Nations convention secretariats including the United Nations Environment Programme and the UNFCCC, trust funds and agencies related to environmental issues.