

# **2009 Italy Climate Policy Progress Report**

Submitted to the European Commission pursuant to Decision No 280/2004/EC, Article 3(2),

Rev 1 on the basis of EC comments



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# 1 Introduction

This is the second report submitted by Italy under Decision No. 280/2004/EC

The projections in this report are updated and have been elaborated by a joint working group composed by members of Environment Ministry of Land and Sea, Ministry of economic development, ISPRA - Institute for Environmental Protection and Research, ENEA - Italian National Agency for New Technologies, Energy and the Environment.

The exercise is a first effort to identify possible measures in the post Kyoto period up to 2020, after the “Climate package” was approved in December 2008.

The structure and content of the report follow not only the Implementing Provisions adopted under 280/2004/EC (Commission Decision 2005/166/EC) but also the UNFCCC reporting guidelines (FCCC/CP/1999/7).

In accordance with Decision 280/2004/EC, article 3.2, this report contains the following three items:

1. Policies and measures that are divided in two types of scenarios:
  - WEM (existing measures) national base scenario; all measures included are just implemented;
  - WAM (scenario with additional measures):it includes measures that could be done in non ETS sector (Effort Sharing Directive).
2. Projections of future emissions
3. Implementation of Community legislation, institutional and financial arrangements

For ease of presentation, six appendices present in tabular format some of the information included in the reporting template send to the Climate Change Committee of the EU Commissions.

The report has been prepared by ISPRA , Environment Department, Monitoring and prevention of Atmospheric Impacts, in agreement with Direction RAS of Environment Ministry. This activity is mentioned in the current three-year plan of the institute

## 2 Policies and measures

This chapter describes policies and measures recently implemented or adopted which have had, or are expected to have, a large impact on greenhouse gas emissions in Italy. In the chapter are included EU, national and local policies. The policies and measures assessed are the one's known by the end of 2008.

The chapter is organized by sector using the sectoral definitions requested by the UNFCCC guidelines (Energy, Transport, Industry, Agriculture, Forestry, and Waste). It also includes paragraphs on policies in the buildings sector (households and services sector) and on cross-sectoral policies.

Each section describes groups of policies and measures organized by greenhouse gas; only the most important ones are described in detail. The paragraphs need to be read in conjunction with Annex 1, which provides the following information required by Decision 280/2004/EC by sector in tabular form:

- greenhouse gas affected
- name of policy
- objective or activity affected
- type of policy
- status
- implementing entity
- quantitative estimate of emission reduction impacts in the 2010 – 2020 period after 2005 (other impacts are included in trend scenario)

Each section closes with a summary table showing the effects realized in the sectors in terms of avoided emissions. In some cases, policies and measures are presented in an aggregated form; in the analyses performed at a high level of aggregation it is often neither possible or meaningful to separate out the impacts of individual instruments and programs which aim at the same emission source or activity.

Italy has committed itself to reduce its greenhouse gas emissions by 6.5% below base-year (1990) levels over the first commitment period, 2008-2012 and shall reduce non ETS sector emissions of 13% by 2020 respect to 2005 level under Effort Sharing directive.

The Revised Guidelines for national policies and measures for the reduction of greenhouse gas emissions were approved on December 19<sup>th</sup>, 2002 by the Interministerial Committee for Economic Planning (CIPE)<sup>1</sup> together with the related National Action Plan (2003-2010). These documents identify the policies and measures already decided, even if not fully implemented, and some other additional measures envisaged to enable Italy to meet its commitment under the Kyoto Protocol. Alongside with domestic measures, the National Plan provides for the use of the Clean Development and Joint Implementation mechanisms to reach the Kyoto target up to a maximum of 50% of the total reduction ' effort.

An update of the 2002 Revised Guidelines, as well as of the National Action Plan, is therefore being prepared, according to the principles set by the Deliberation approved by the Interministerial Committee for Economic Planning (CIPE) on 11<sup>th</sup> December 2007.

Most of the implemented policies are included in the update trend scenario. The policies reported therefore have been updated , implemented or adopted since 2006 on the basis of the above guidelines.

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<sup>1</sup> CIPE Deliberation 123 of 19<sup>th</sup> December 2002.

## 2.1 Cross Sectoral Policies

Some policies are applied to more than one sector.

### 2.1.1 The White Certificates system

The White Certificates system represents a cross cutting policy aimed at promoting energy efficiency and delivering emissions reductions in all the energy end use sectors: industrial, residential, service. The system was firstly introduced in July 2001 by means of two ministerial decrees, later repealed and substituted by two new decrees approved in April 2004. Those decrees set the obligation on electricity and gas distributors to achieve the primary energy saving target of 2.9 Mt of oil equivalent per year by 2009.

The Decree of the Ministry for the economic development of 21 December 2007<sup>2</sup> set the new targets for the years 2008 and 2009 and the prolonging of system at 2012 according to the following table:

Table 1 – National target for primary energy savings

REVISED TARGET FOR THE ITALIAN WHITE CERTIFICATE SYSTEM 2008-2012 (Mtoe/Year)		
Year	Electricity distributors	Gas distributors
2008	1,2	1
2009	1,8	1,4
2010	2,4	1,9
2011	3,1	2,2
2012	3,5	2,5

Each gas/electricity distributor gets its own target on the basis of its national market quota. The annual energy saving targets can be achieved through the implementation of energy saving projects<sup>3</sup> in all energy end-use sectors. Projects contribute to the achievement of targets for 5 years; only for specific projects (buildings thermal envelope, bioclimatic design, reduction of cooling needs, etc) the time limit is raised up to 8 years. Projects can be implemented either by distributors - directly or through controlled companies - or by energy saving companies (E.S.Co.). Target-bound distributors can therefore gain their own certificates, or buy them on the market from other parties. Certificates can be traded bilaterally or else through an organized market. Each Certificate testifies the saving of 1 t of oil equivalent.

The Plan of action for the energy efficiency 2007 set a target of reduction of end use energy consumption for the year 2016; in this context an extension of the objectives of the white certificate system has been previewed. These new objectives have been considered in this report as adopted measures. A further extension of the white certificate system objective till 2020 is foreseeable, so it has been considered as a planned measure.

<sup>2</sup> Decreto del Ministero dello sviluppo Economico del 21 dicembre 2007, recante "Revisione e aggiornamento dei decreti 20 luglio 2004, concernenti l'incremento dell'efficienza energetica degli usi finali di energia, il risparmio energetico e lo sviluppo delle fonti rinnovabili", in G.U. n. 300 del 28 dicembre 2007.

<sup>3</sup> Eligible projects are: Rephasing of electric systems; Electric motors and their applications; Lighting systems; Reduction of electricity leaking; Switching from electricity to other fuels when this produces primary energy savings; Reduction of electricity consumption for heating purposes; Reduction of electricity consumption for air conditioning; High efficient electric appliances; High efficient office equipment; Switching from other fuels to electricity when this produces primary energy savings; Reduction of primary energy consumption for heating, ventilation and air conditioning system; Promotion of end-use technologies fuelled by renewable sources; Electric and gas-fuelled vehicles; Information campaigns to raise awareness and promote energy savings.

### 2.1.2 Emissions Trading Scheme

The EU Emissions Trading Scheme (EU ETS) was established in 2003 by Directive 2003/87/EC and is the largest emissions trading scheme in the world. It covers CO<sub>2</sub> emissions by all medium and large installations in the fields of energy conversion, refinery processes, coke ovens, and the steel, cement, glass, ceramic and cellulose and paper industries.

Installations in the EU ETS can meet their obligations either by implementing emission reduction measures of their own or by purchasing allowances, which might come from installations in other EU countries and credits from the Kyoto Protocol project mechanisms.

Since 1<sup>st</sup> January 2005, operators of installations have been required to monitor their emissions and to ensure that they surrender allowances equivalent to their emissions in any calendar year.

According to directive 2003/87/CE, each Member State must submit a National Allocation Plan for each trading period to set the total quantity of allowances to be issued and the number of allowances each installation will receive.

On 15<sup>th</sup> May 2007, the Commission has accepted Italy's National Allocation Plan for the period 2008-2012 on condition that certain changes were made, including a reduction in the total number of emission allowances proposed by 13.2 million tons of CO<sub>2</sub> equivalent per year, to 195.8 million tons. On this basis, the National Authority for ETS has prepared the Allocation Decision, which is currently being reviewed by the European Commission.

On 20<sup>th</sup> February 2008, the Italian Ministry of Environment, Land and Sea delivered the "Decision on National Allocation Plan for the period 2008-2012". This decision sets for Italy the total average number of emission allowances for period 2008-2012, up to 201,63 Mton CO<sub>2</sub>, following a consultation with the European Commission and the Italian stakeholders,.

In the Table 2 are reported emissions projection for ETS sector at 2010 e 2020. For 2010 it's also reported how many credits operators should buy on the market to achieve the national NAP.

It's no possible to make the same consideration for 2020 because it is not yet defined the NAP. So the effect of this measures cannot be evaluated for 2015-2020. Moreover this measure helps ,modifying the economy structure, introducing a value to carbon but, due the national circumstances, do not produces reduction in the net emissions.

Table 2 – National Allocation Plan on ETS sector

	2007	2010	2020
	Mt CO <sub>2</sub>	Mt CO <sub>2</sub>	Mt CO <sub>2</sub>
Emission projections for ETS sectors trend scenario	226,4	233,7	255,0
NAP- Emissions from National Allocation Plan		201,6	
Impact of measures		32,1	

## 2.2 **Energy sector**

### 2.2.1 CO<sub>2</sub>

This sector is under Emission Trading Scheme, but there are new European directive that should be taken account in a WAM scenario. CO<sub>2</sub> policies relating to the energy sector have traditionally fallen into three general categories:

1. Use of renewable energy
2. Cogeneration
3. Improving the efficiency of electric power plants

Policy instruments currently in effect are described below.



### 2.2.1.1 Renewable energy sources

#### **The Green Certificates system**

Since the early 90s several different schemes have been introduced to subsidise the diffusion of renewable energy sources. A feed in tariffs system was adopted in 1992 (Cip 6), but its high costs and unsatisfactory results suggested the suspension in the numbers of the new plants qualifying for incentives. Under this decree, only those plants already operating or at least under construction at the time of its entry into force, could still be qualified for the CIP 6 incentives. A new incentive scheme, based on a market oriented mechanism, was later introduced with legislative decree 79/99.

The legislative decree 79/99 introduced the obligation on electricity providers (producers and importers) to feed the grid with a minimum share of electricity produced from renewable energy sources. The obligation started in 2002. The initial share was set at 2% of the overall electricity produced or imported (exceeding 100 GWh), but the increase of this quota over time was already planned in the decree. As reported in the subsequent paragraphs, the law provides for an indirect bonus for cogeneration: in order to calculate the required quantity of renewable electricity, the electricity produced by cogeneration plants is subtracted from the total.

Providers are allowed to fulfil their obligation by different means:

- they can generate the required share of renewable electricity setting up new renewable capacity;
- they can import the required share of renewable electricity from foreign countries where a similar mechanism is in force, or;
- They can purchase the relative quota, represented by the so called Green Certificates, on the market.

Green Certificates are tradable rights issued for the first eight years of incremental generation of renewable electricity: in order to qualify for the issuance of Green Certificates the plant generating renewable electricity must have started operation after April 1<sup>st</sup>, 1999. Each certificate represents 50 MWh and its price is determined by market forces. However, Green Certificates are still issued even to “Cip 6” plants and they are attributed to the GSE<sup>4</sup>. In case of insufficient supply of Green Certificates on the market, the GSE can sell these certificates at a prescribed price that is the difference between the take-up price paid to the generator and the average price paid in the same period to conventional producers. This price has become an upper boundary for the price of the certificates freely sold on the market.

#### **Recent measures affecting the Green Certificate System**

Several recent measures have brought in important changes to the system envisaged by legislative decree 79/99.

**Legislative decree 387/03** increased the minimum 2% quota of renewable electricity to be fed into the grid by 0.35% per year for the period 2004 – 2006 and set the deadlines by which the increases for the periods 2007—2009 and 2010—2012 had to be updated. The Decree also allowed Green Certificates to be issued for biomass and waste-fuelled plants for 12 years (instead of the original 8 years).

**Decree 24 October 2005** introduced the obligation on the GSE to purchase the Green certificates that could not be sold on the market, due to insufficient demand.

**Legislative decree 152/06** extended the period during which the incremental production of renewable electricity entitles to the right to obtain Green Certificates from 8 to 12 years.

**Budget law 2007** repealed the provision set forth in legislative decree 387/03 that qualified cogeneration plants combined with district heating and plants producing electricity from the non biodegradable fraction of waste and RDF for the issuance of Green Certificates.

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<sup>4</sup>

Gestore dei Servizi Elettrici S.p.A.

**Budget law 2008**<sup>5</sup> established that, for the period 2008-2012, the minimum quota of renewable electricity to be fed into the grid has to be increased every year by 0,75%. It also introduces a specific support scheme for renewable energy from biomass (subparagraph 144), as well as a fixed overall subsidy for renewable energy produced by installation with a capacity lower than 1 MW (subparagraph 145)<sup>6</sup>.

At 2020 the 17% the final consumption shall be supplied from renewable sources, according to renewable directive. The trend scenario at 2020 will delivered at 9% of the total production.. The further expansion of renewable use with the implementation of measures reported in Table 3 will bring the percentage up to 14%. It 's not yet decided how to achieve the remaining 3%

The Table 3 Summarize all measures for renewable energy including the electricity production, because the directive do not distinguish between electric or thermal renewable energy use.

All measures about Photovoltaic electricity are now included in the trend scenario.

**Table 3 - Summary of policies and measures in the energy sector - renewable energy sources**

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO2eq Gg		
					2010	2015	2020
<b>Renewables</b>							
<b>WAM scenario - Implemented</b>							
Renewables	PV systems (decree 28.07.2005 as amended by decree 06.02.2006)	Supporting the expansion of photovoltaic plants through feed in tariffs until a maximum capacity of 500 MW is reached	CO <sub>2</sub>	Implemented			
Renewables	PV systems (decree 19.02.2007)	Supporting the expansion of photovoltaic plants through feed in tariffs until a maximum capacity of 1200 MW is reached	CO <sub>2</sub>	Implemented			Measures already included in trend scenario
Renewables	PV systems (budget law 2007)	Supporting the installation of photovoltaic systems in new buildings	CO <sub>2</sub>	Implemented			
Energy supply - RES Thermal Energy	Building sector (decree 192/05, as amended from DLg 311/06 executive decrees are still on the road)	Supporting solar thermal, biomass for use (chimney, geothermie at low temperatures and geoswitch)	CO <sub>2</sub>	Implemented			
<b>WAM scenario - Adopted / Planned</b>							
Energy supply - RES Electric	New supporting system for RES (Budget Law 2008). NSF 2007 - 2013 has not been evaluated separately but	Supporting electricity production from RES, in particular from those less competitive	CO <sub>2</sub>	Adopted	610	4025	7440

<sup>5</sup> Law 244 of 24 December 2007

<sup>6</sup> For a complete scheme of subsidy see Table 12 of "Final\_2008\_Climate\_Policy\_Progress\_Report\_IT"

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
	considered as supporting measure						
Energy supply - RES Thermal Energy	Energy efficiency in buildings (Budget Law 2008)	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermal at low temperatures and geoswitch	CO <sub>2</sub>	Adopted	108	539	970
Energy supply - RES Thermal Energy	Action Plan July 2007	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermal at low temperatures and geoswitch	CO <sub>2</sub>	Adopted	108	539	970
Energy supply - RES Thermal Energy	Position Paper 2007 - RES	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermal at low temperatures and geoswitch	CO <sub>2</sub>	Planned	650	1780	2910

Source: ENEA

### 2.2.1.2 Cogeneration

Cogeneration is currently supported by means of different incentive schemes, rewarding both the production of heat and the production of electricity. In particular, all cogeneration plants benefit from the White Certificate system (see 2.1.1) while RES cogeneration plants are additionally entitled to receive Green Certificates to reward the green electricity produced.

- Legislative decree 79/99 introduced a Green Certificate system
- Law 239/04 entitled cogeneration plants combined with district heating to receive Green Certificates to reward the thermal energy actually used for district heating,
- Legislative decree 20/2007, introduced to transpose directive 2004/8/CE into the national legal system, provides for a set of comprehensive measures designed to promote high-efficiency cogeneration based on a useful heat demand through the White Certificates system.

The main benefits currently granted to co-generation are:

- dispatch priority;
- exemption from the obligation to purchase Green Certificates;
- incentive prices for the electricity produced by co-generation plants having a capacity of less than 10 MVA;
- right to obtain White Certificates for all cogeneration plants (the implementing measures of legislative decree 20/07, still at the drafting stage, will modify the current scheme to ensure stronger support);
- right to obtain Green certificates for those cogeneration plants using geothermal energy or firing/co firing biomass;
- net metering for the electricity produced in high-efficiency cogeneration plants with a nominal capacity not over 200 kW;
- simplified authorization procedure (plants with a thermal capacity over 300 MW are subject to the authorization procedure provided for by law 55/02, while new simplified procedures have to be adopted for smaller plants)

- obligation for new buildings and buildings subject to major renovation to lay down all the necessary works to allow the connection to district heating systems, when existing (and not further than 1 km) or planned.

These measures have been included in the trend scenario. As adopted measures have been considered those included in the Action Plan for improving energy efficiency. This plan is designed to reach quantifiable targets till 2016.

As regards new measures still at the planning stage, the competent Ministries are currently working on a new decree to extend the energy efficiency targets to 2020 and further support the diffusion of cogeneration plants and district heating systems, but the details of the new support scheme still have to be defined.

Since RES cogeneration plants benefit both from the Green Certificates system (for the production of electricity) and from the White Certificate system (for the energy saving effects), the expected emission reductions have been reported partly in the Energy Supply–Renewables sector and partly in Energy Supply–Cogeneration sector.

Table 4 - Summary of policies and measures in the energy sector – Cogeneration

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
<b>ENERGY</b>							
<b>Cogeneration</b>							
<b>WAM scenario - Implemented</b>							
Energy supply - Cogeneration	ActionHigh efficiency cogeneration (Legislative 20/07)	Supporting CHP plants through the issuing of White certificates	CO <sub>2</sub>	Implemented	Measures already included in trend scenario		
<b>WAM scenario - Adopted / Planned</b>							
Energy supply - Cogeneration	Action Plan July 2007 (White certificates - new targets at 2015)	Supporting energy savings	CO <sub>2</sub>	Adopted	0	1235	2470
Energy supply - Cogeneration	White certificates - increase after 2015	Further support cogeneration	CO <sub>2</sub>	Planned	0	0	275
Energy supply - Cogeneration	District heating and integrated territorial energy systems - AIRU proposal	Feed-in tariffs for heat supplied to users	CO <sub>2</sub>	Planned	0	137,5	275

Source : ENEA

### 2.2.1.3 Energy efficiency of electric power plants

The liberalization of the electricity sector brought in by Legislative decree 79/99 started a deep refurbishment of the power generation sector. The decree had the main purpose of reducing the dominant position of Enel, the former state monopolist, by forcing it to sell part of its generation capacity to new entrants.

Subsequent Decree 4 August 1999 identified the plants that had to be sold to new entrants and specified those that had to be converted to from fuel oil steam plants to new combined cycle gas turbine plants (CCGT) using natural gas. This last provision was intended to increase the overall efficiency in power generation and to reduce CO<sub>2</sub> emissions of the energy supply sector. Out of a total capacity to be divested of 15,000 MW, 9,400 MW were forced to be converted to CCGT.

Law 55 of 9 April 2002 was introduced to simplify the authorization procedure for the construction and operation of power plants with a capacity of over 300 MW. From 2002 to the end of 2006 the Ministry of Economic Development issued 45 authorization for 21,400 MWe of new capacity; among these 23 authorizations, for an overall capacity of 9,897 MW, were issued according to the new procedure brought in by law 55/02.

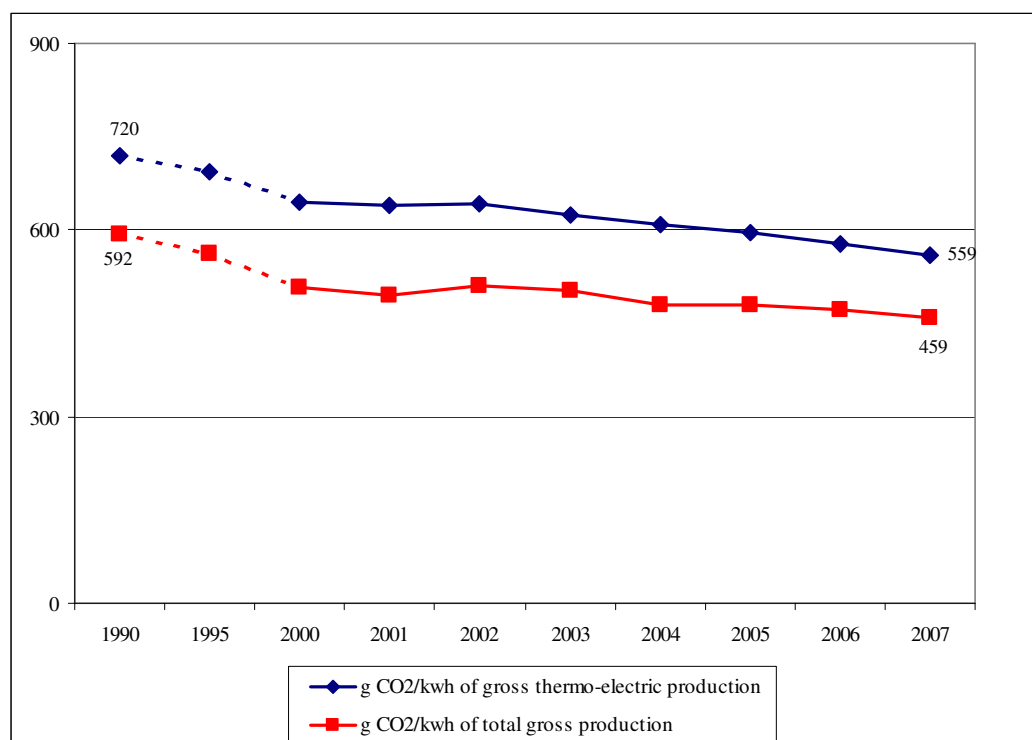
Law 239 of 23 August 2004 introduced some important changes in the energy sector. One of its main purposes was to speed up the authorization process for the construction of new power plants and energy infrastructures, particularly grid lines.

Since the entry into force of law 239/04, new energy infrastructures for approximately 2,300 MW have been developed and new CCGT plants for about 3,200 MW have been constructed, which led to consistent emissions reductions.

The short term effect of the implementation of these laws is already visible in the analysis of the historical data on electricity generation, while the “medium-long term” effect can be inferred by the analysis of the new power plants which are currently under construction and those entering into the production phase is scheduled for 2009.

The overall effect of these substitutions has been a decline of the specific emissions of the thermoelectric sector which declined from 592 g/kWh in 1990 to 459 g/kWh in 2007.

Figure 1 - Emission factors of gross production



Source: ISPRA

The decline in the specific emissions, essentially due to an increase in the overall efficiency in the thermoelectric production and a decline in the carbon content of the fuel used in the power plants, has contributed in limiting the increase of the emissions due to the increase of the overall thermoelectric production.

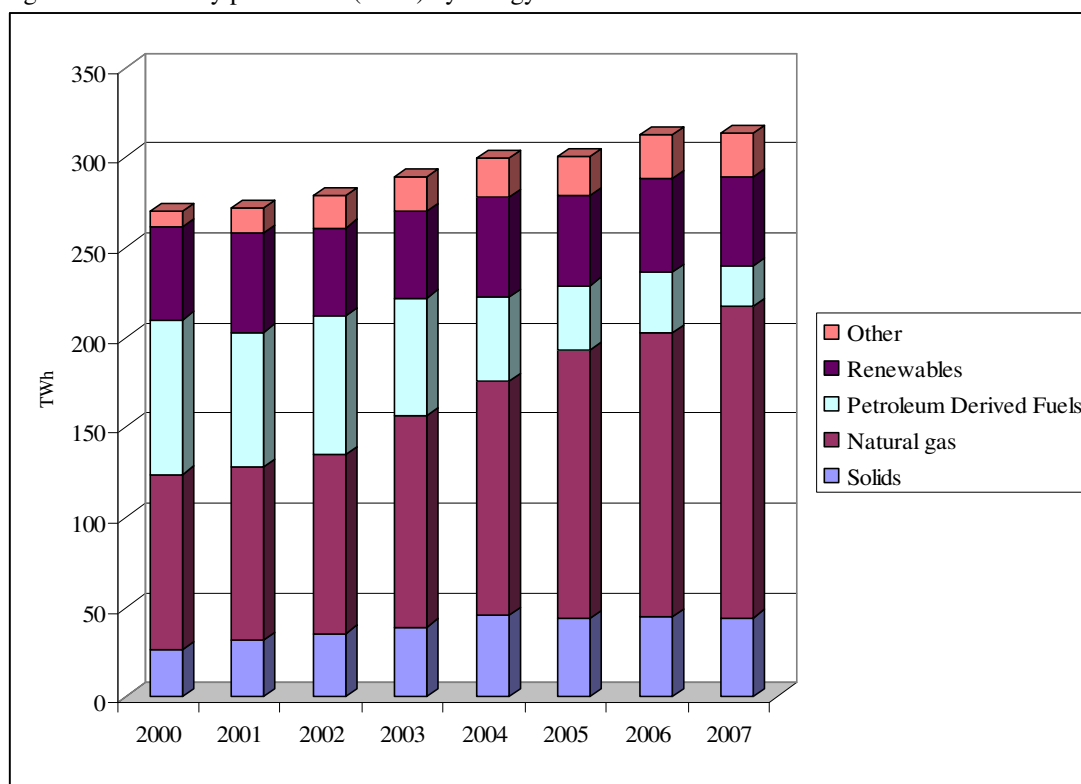
From 2000 to 2007 in Italy there was increased use of natural gas and a decrease of petroleum derived fuels use. Other energy sources are quite stable.

Regarding the period after 2009 it is foreseen that two new coal power plants should enter into operation; that is Civitavecchia before 2010 and Porto Tolle is expected after 2015. These two plants will substitute three old oil fired power plants. In the trend scenario the emissions from these two plants are balanced with the phasing out of less efficient coal plants.

The striking increase in natural gas consumption requires the construction of new import infrastructure and the construction of new import terminals for LNG.

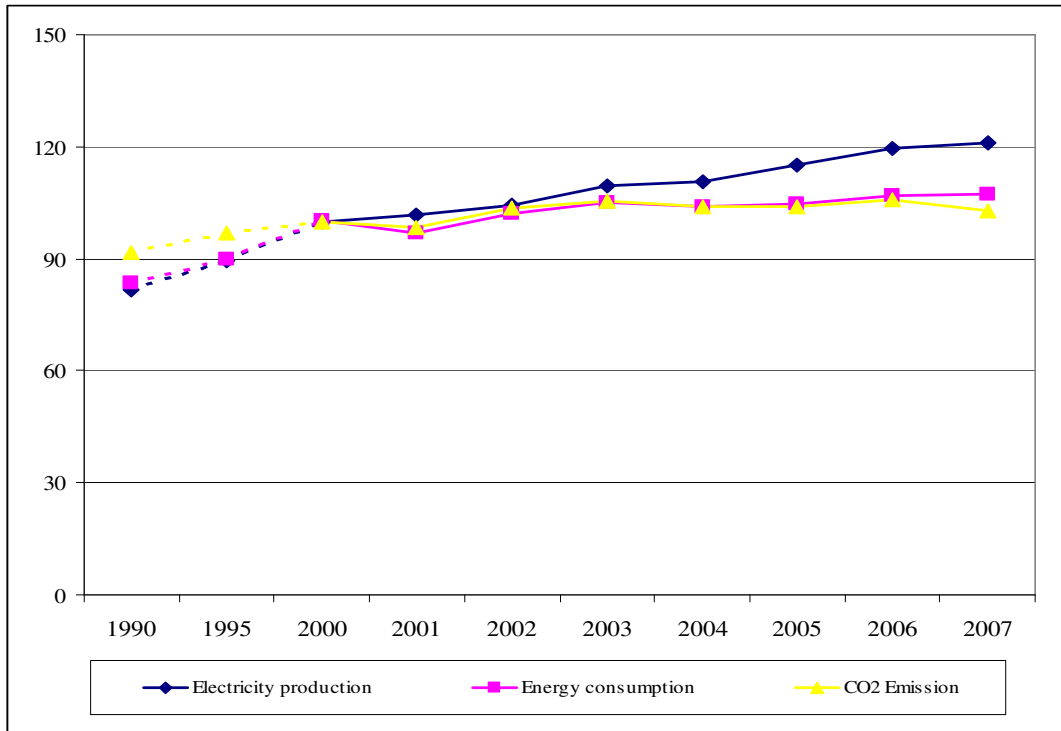
All measures are included in trend scenario.

Figure 2 - Electricity production (TWh) by energy source



Source: ISPRA elaboration of TERNA data

Figure 3 - Electricity production, energy consumption and CO<sub>2</sub> emissions in the Thermoelectric sector (index numbers)



Source: ISPRA elaboration of TERNA data

## 2.3 Industry

### 2.3.1 CO<sub>2</sub>

Policies affecting CO<sub>2</sub> emissions in the industry sector are generally designed to improve industrial energy intensity.

A main instrument is represented by the White Certificates system.

Another important initiative recently introduced by the Government concerns the replacement of existing inefficient electric motors with high efficient ones. This is a measure that can help achieve substantial CO<sub>2</sub> emissions reductions in the industry sector, but the engines' high purchase price and the lack of information about their energy saving potential represent a main obstacle to their diffusion. The Budget laws 2007 and 2008 therefore provide for tax credits for high efficiency electric engines and inverters .

Since the potential for energy saving in the industry sector is still consistent, several new additional measures are currently under discussion to try to exploit it.

Further measures will be introduced to implement directive 2006/32/CE on energy end use efficiency and energy services.

White certificated related to decree December 2007 have been considered also implemented policies and measure

White certificated related to new target of Action plan 2007 have been considered adopted policies and measure.

Futher extention of Action plan target to 2020 with White Certificate system have been considered as planned measures.

Two more options currently under discussion concern the introduction of mandatory energy efficiency standards for machinery and the obligation to install highly efficient electric motors, inverters, etc when replacing the existing ones. This policies and measure have been also considered as planned measure.

The following table does not take into consideration the expected emission reductions attributable to cogeneration which have been reported before.

Table 5 - Summary of policies and measures in the industry sector

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
<b>INDUSTRY</b>							
<b>WEM scenario - Implemented</b>							
Industry	Aluminium	Reducing greenhouse gas emissions from the aluminium industry through a strong increase of its recycling rate	CO <sub>2</sub>	Implemented	measure already included in the trend scenario		
<b>WAM scenario - Implemented</b>							
Industry	White certificates	Supporting energy savings	CO <sub>2</sub>	Implemented	640	1330	2020
<b>WAM scenario – Adopted / Planned</b>							
Industry	Action Plan July 2007 (White certificates - new targets at 2015)	Supporting energy savings	CO <sub>2</sub>	Adopted	0	1380	2760



Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
Industry	White certificates - increase after 2015	Further extend of energy saving targets at 2020	CO <sub>2</sub>	Planned	0	0	1.750
Industry	Energy efficiency standards for equipments	Eco design and new standards for energy efficiency of equipments (Directive 2005/32/CE) (mandatory standards for electrical engines, inverters, boilers, etc )	CO <sub>2</sub>	Planned	0	1.525	3.050

Source: ENEA

### 2.3.2 N<sub>2</sub>O

Reduction of N<sub>2</sub>O emissions in plants for the production of nitric acid.

This measure can result in significant reductions in process emissions from the industrial sector, with the cost of the decrease proving extremely limited.

In the production of nitric acid, the most advanced technology calls for installation of SCR (selective catalytic reduction) systems for the treatment of process gases with the adoption of the BAT standard, equal to 2.5 kgN<sub>2</sub>O/tHNO<sub>3</sub>. The measure could be applied to the main production plant in Italy.

Table 6 - Additional measures in industrial processes (Mt CO<sub>2</sub> equivalent)

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
<b>INDUSTRY</b>							
<b>WEM scenario - Implemented</b>							
Industrial processes	Nitric Acid	Reduction of N <sub>2</sub> O emissions in nitric acid production plants	CO <sub>2</sub>	Implemented	measures already included in the trend scenario		

## 2.4 Transport

The policies and measure considered in the transport sector are: infrastructural, intermodal management, technological and standard and fleet update measures. Infrastructural measures regarding completion of high capacity and high speed networks and tuning of regional networks for commuting and goods, completion of mass rapid transport networks in urban areas, management measures regarding enhancement of road urban public transport network have been considered implemented policies and measure.

Intermodal measures regarding shifting from private road traffic to public road traffic and shifting goods transport from the road to the sea, with management measures regarding supporting efficiency in private road transport and improve road circulation in the urban areas have been considered adopted policies and measure.

As planned measures have been considered:

- Fleet update regarding further subsidy to change older cars with new ones with average emissions of 120 CO<sub>2</sub>/km (130 gCO<sub>2</sub>/km engines efficiency plus -10 gCO<sub>2</sub>/km from additional reduction tools);

Table 7 – Most recent Italian subsidy to change old cars with new ones

	Without discarding	With discarding (EURO 0 - 1 - 2 up to 1999)	Total
<b>Using natural gas as fuel, electric or hybrid:</b>			
With CO <sub>2</sub> emissions less than 120 g/km	3.500 €	+ 1.500 €	= 5.000 €
With CO <sub>2</sub> emissions more than 120 g/km	1.500 €	+ 1.500 €	= 3.000 €
<b>Using LPG as fuel</b>			
	1.500 (+ 500 € Budget Law 2008)	+ 1.500 €	=3.500 €
<b>Gasoline fuel:</b>			
With CO <sub>2</sub> emissions less than 140 g/km	0 €	+ 1.500 €	= 1.500 €
<b>Diesel fuel:</b>			
With CO <sub>2</sub> emissions less than 130 g/km	0 €	+ 1.500 €	=1.500 €

We underline that Italy has a long standing policy of expansion of the fleet lower CO<sub>2</sub> emitting gas fuelled vehicles, cars in particular. This policy aim an expansion of the already sizeable vehicle fleet fuelled with LPG (about 1 million vehicles of circulating fleet to date) and the establishment of a sizeable fleet of natural gas fuelled vehicles, to date about 0.45 million vehicles. Key item in this policy is the expansion of the filling station network. For LPG the network is well extended in all the country, comprising about 2100 filling stations. In recent years a big investment program aim to create a network of natural gas filling stations with a target of 600 distributors, nation wide so to sustain in all the country the circulation of those vehicles. Until 2000 the network of filling stations was rather extended only in some regions of the north part of the country.

Both policies are included in the trend scenario and not explicitly mentioned here, in 2020 trend scenario include the use about 1.3 Mtoe of LPG and 1.5 Mtoe of natural gas in the transport sector. Those quantities represents about 6% of road transport fuels.

### Measure: use of biofuels

The Budget laws 2007, following the European directive CE30/2003 prescribes that the minimum quota of biofuel to 2009 is a 3% of total sold and 5,75% to 2010. The Decree 23 April 2008 support this measure.

New measures regarding the objective to reach a share of 6% of petrol and diesel road consumption by 2020 are under definition.

Part of this target is included in the trend scenario and the additional measures considered for the compliances to 2020 target are regarded as “adopted”.

Table 8 - Summary of policies and measures in the transport sector

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
<b>TRANSPORT</b>							
<b>WEM scenario - Implemented</b>							
Transport	Biofuels	Expansio of biofuels use according to existing national legislation	CO <sub>2</sub>	Implemented	measure already included in the trend scenario		
<b>WAM scenario - Implemented</b>							
Transport	Infrastructural measures	Completion of High Capacity and High Speed networks and tuning of regional networks for commuting and goods. Completion of mass rapid transport networks	CO <sub>2</sub>	Implemented	1800	3750	5700
Transport	Management measures	Enhancement of road urban public transport network	CO <sub>2</sub>	Implemented	700	3045	5390
<b>WAM scenario – Adopted / Planned</b>							
Transport	Biofuels	Supporting the use of biofuels	CO <sub>2</sub>	Adopted	200	1925	3650
Transport	Intermodal measures + public transport	Shifting private road transport to public road transport. Shifting road goods transport to the sea. Supporting efficiency in goods road transport.	CO <sub>2</sub>	Adopted	0	600	1200
Transport	Management measures	Improve road circulation in the urban areas	CO <sub>2</sub>	Adopted	0	1150	2300
Transport	Fleet update	National incentives and new directive to bring average emissions of cars to 130 CO <sub>2</sub> /km (126 g CO <sub>2</sub> /km average for the Italian new fleet starting from 2015, include the effect of subsidies from 2009 average emisisions 130 g for diesel and 140 g for petrol cars)	CO <sub>2</sub>	Planned	1000	5.400	10.170

Source: Nomisma Energy

## 2.5 *Agriculture*

### 2.5.1 *N<sub>2</sub>O*

Emission reduction from the Agricultural soil source is mainly related to the rationalisation in the use of fertilizers. In order to achieve the objective is essential to consider ongoing efforts to heighten awareness of the practise, the adoption of the code of agricultural practice, and the integrated production of agricultural holding and organic farming. On the other hand, the CAP<sup>7</sup> reform process, since Agenda 2000 is characterized by a progressive reinforcement for integrating environmental objectives in the framework of market policy and rural development. By combining different recommendations, still additional measures with mitigation potential can be encouraged for reducing the use of fertilizers. The measure is now in the trend scenario.

### 2.5.2 *CH<sub>4</sub>*

Electricity generation from animal waste has increased in Italy thanks to the support provided by the feed-in prices granted by Resolution no. 6/92 of the Inter-ministerial Price Committee (CIP 6/92) and the renewable quota obligation for electricity producers/importers established by the Legislative Decree of 16<sup>th</sup> March 1999, N° 79, and subsequent legislation. In future years, further intervention will be required to sustain this trend, and to extend the covering of animal waste storage systems, equipped with devices allowing collection and use of biogas, not only in new farms but also in major existing ones. Additional measures for the reduction of methane emission are concentrated in two animal categories: cattle and swine. Also this measure is in the tren scenario.

An investment analysis, taking into account the value of the electricity produced, generates a positive VAN, though the result is not enough to convince operators to invest. Therefore, the dimension of the initiative would depend on: the level of incentives available for the production of electricity from renewable energy sources, plus, the availability of subsidies for the construction of the systems, and a clear regulation with respect to the authoritative procedure for the final destination of the effluents.

Another measure oriented towards the same objective is the Integrated Pollution Prevention and Control Directive (96/61/EC), which calls for the introduction of an authorisation process based on the adoption of the Best Available Technology (BAT) for poultry farms with more than 40,000 birds and pig farms with more than 2,000 animals (heavier than 30 kg) or 750 sows. In terms of structural initiatives for existing facilities, financial incentives could be drawn from the Rural Development Plans (PSR) financed by the EAGGF<sup>8</sup>.

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<sup>7</sup> Common Agriculture Policy

<sup>8</sup> EAGGF, European Agriculture Guidance and Guarantee Fund

Table 9 - Additional measures for the agriculture sector

Name of policies or measures	Objective and/or activity affected	GHG affected	type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas CO <sub>2</sub> eq
						2010 2015 2020
NO ENERGY SECTORS						
AGRICULTURE						
<b>Adopted / Planned</b>						
Nitrogen fertiliser	Rationalisation in the use of nitrogen fertiliser	N <sub>2</sub> O	regulatory	planned	Government, MIPAF, ISPRA	measure already included in the trend scenario
Animal storage	Recovery of biogas from animal storage system	CH <sub>4</sub>	regulatory	planned	Government, MIPAF, ISPRA	

Source: ISPRA

## 2.6 Forestry

### 2.6.1 CO<sub>2</sub>

As already communicated to European Commission in the “Report on the determination of Italy’s assigned amount under Article 7, paragraph 4, of the Kyoto Protocol”, Italy has elected Forest Management as an activity under Article 3.4 of Kyoto Protocol, while has not elected Cropland Management, Grazing Land Management or Revegetation.

Forest management and art 3.3 activities shall be tracked and certified by the National Registry for forest carbon sinks in order to be accountable.

A brief description of the activities and the National Registry is given in the following.

#### 2.6.1.1 Forest management (art. 3.4)

The Italy’s forest area is the total eligible area under forest management activity. Italian forest area has to be considered managed forest lands, as explained in FAO TBFRA2000 (page 129)<sup>9</sup>.

Credits from forest management were capped, in the first commitment period, to 0.18 Mt C per year times fives. The figure was clearly underestimated and Italy submitted country-specific data on forest management activity under Article 3, paragraph 4, of the Kyoto Protocol.

Under SBSTA conclusion FCCC/SBSTA/2006/L.6 and related COP/MOP2 decision (FCCC/KP/CMP/2006/10/Add.1), additions to and subtractions from the assigned amount, resulting from forest management under art. 3.4 shall not exceed 2.78 Mt C/year.

#### 2.6.1.2 Afforestation and reforestation activities (art. 3.3)

For the first commitment period, Article 3.3 applies to land that is subject to an afforestation, reforestation or deforestation activity at any time between 1 January 1990 and 31 December 2012. Up to now, there isn’t a fund for the activities related to art. 3.3 and 3.4 of Kyoto, considering that the fund of 50 million euros per year for each of the years 2008, 2009 and

<sup>9</sup> Notes and comments relating to chapter II in pag 129 of FAO TBFRA2000 says: “These data on the managed areas of forests in tables 9 to 17 refer only to forest managed with specific plans. Nevertheless, all other Italian forests are submitted to general silvicultural prescription (Prescrizioni di massima e di polizia forestale). These prescriptions are adopted at Provincial level and determine the practical forms of management to be applied”.

2010 established in the Budget Law 2008 (subparagraph 335) was zeroed by actual Government.

### 2.6.1.3 National Registry for forest carbon sinks

The so-called “National Registry for forest carbon sinks” is part of the Italian National System; it is the instrument to estimate, in accordance with the COP/MOP decisions, the IPCC Good Practice Guidance on LULUCF and every relevant IPCC guidelines, the greenhouse gases emissions by sources and removals by sinks in forest land and related land-use changes and to account for the net removals in order to allow the Italian Registry to issue the relevant amount of RMUs. A Decree, issued on 1<sup>st</sup> April 2008 by the Ministries for the Environment and for Agriculture and Forestry Policies, officially instituted the National Registry for forest carbon sinks. The National Registry for Carbon sinks should have been in place from January 2008, to supply data for the first Kyoto submission in January 2010.

The registry is currently being organized and looking for refunding; nevertheless up to now, no resources have been allocated.

The key elements of the accounting system in the National Registry for forest carbon sinks are:

- National Land-Use Inventory (IUTI), aimed at identifying and quantifying:
  - forest land areas;
  - land in conversion from forest land category since 31<sup>st</sup> December 1989;
  - land in conversion to forest land category since 31<sup>st</sup> December 1989.
- National Inventory of Carbon Stocks (ISCI), aimed at quantifying carbon stocks and carbon stock changes in any land-use category in the first commitments period.
- National Census of Forest Fires (CIFI), aimed at identifying and quantifying forest land areas affected by fires
- National Inventory of non-CO<sub>2</sub> emissions from forest fires (IEIF), aimed at estimating non-CO<sub>2</sub> emissions from forest land areas affected by fires.

A Scientific Committee has been set up in order to support the design and implementation of the activities related to the National Registry for forest carbon sinks. The Committee involves all major national, regional and local institutions in charge on carbon cycle studies, inventories and monitoring.

In Table 10 estimated annual removals that can be obtained through forest management (art. 3.4) and afforestation and reforestation activities are reported, identifying two different categories to be considered under article 3.3:

- a) plantations already established and areas subject to induced recolonization of the vegetation
- b) new plantations

Up to now, no estimate of removals due to art. 3.3 and 3.4 activities have been provided, due to the difficulties related to the establishment of the National Registry for Carbon Sinks and the resulting technical hitches to report successfully under the KP reporting rules. A first evaluation of yearly adsorbed carbon from national sinks in the commitment period amounts to 10.2 Mt CO<sub>2</sub>.

Table 10 - Measures for the generation and certification of carbon credits during the first commitment period

Name of policies or measures	Objective and/or activity affected	GHG affected	type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas CO <sub>2</sub> eq		
						2010	2015	2020
<b>FORESTRY</b>								
<b>Adopted / Planned</b>								
Forestry (2008-2012: values to be reviewed according to pending international negotiations)	Forest management	CO <sub>2</sub>	regulatory	planned	Government, MIPAF, ISPRA	0	0.0	00
	Afforestation and reforestation (old plantations) and induced recolonization areas	CO <sub>2</sub>	regulatory	planned	Government, MIPAF, ISPRA			
	Afforestation and reforestation (new plantations)	CO <sub>2</sub>	regulatory	Adopted by financial law 2008	Government, MIPAF, ISPRA	0	0.0	0.0

Source: ISPRA

## 2.7 Waste

### 2.7.1 CH<sub>4</sub>

Two initiatives are proposed:

- Compliance with separate collection targets and biodegradable waste disposed of into landfills
- Only bio-stabilized waste disposed of into landfills

#### 2.7.1.1 Compliance with separate collection targets and biodegradable waste disposed of into landfills

- fulfilment of the deadlines set for MSW separate collection, reported in Table 11
- fulfilment of the deadlines set for biodegradable waste sent to landfill, reported in Table 12

Table 11 - Targets for separate collection (%)

	2005	2006	2007	2008	2009	2011	2012
Separate collection	24.3%	35%	40%	45%	50%	60%	65%
Law disposition	ISPRA-ONR, 2006	D.Lgs. 152/2006	L. 296/2006	D.Lgs. 152/2006	L. 296/2006	L. 296/2006	D.Lgs. 152/2006

Source: ISPRA

Table 12 - Targets for biodegradable waste to landfills (kg/person\*year)

	2008	2011	2018
Biodegradable waste (kg/person*year)	173	115	81
Low disposition	D.Lgs. 36/2003	D.Lgs. 36/2003	D.Lgs. 36/2003

Source: ISPRA

### 2.7.1.2 Only bio-stabilized waste disposed of into landfills

A further measure regard the pre-treatment of all the biodegradable wastes which will be disposed into landfills, encouraging the anaerobic digestion of MSW also in co-digestion with other type of waste such as sludge from municipal waste water treatment plants and animal waste. This practice will increase also the energy recovery from the biogas production.

In Table 13 are summarized emissions reduction from measures proposed.

Table 13 - Evolution scenario with measures of the emissions of greenhouse gases from the waste sector (Mt CO<sub>2</sub> equivalent)

Greenhouse gas emissions (Mt CO <sub>2</sub> equivalent)	1990	1995	2000	2005	2007	2010	2015	2020
Landfills	13,3	15,8	16,8	14,4	13,3	11,6	11,0	10,6
Wastewater treatment	3,9	4,0	4,3	4,3	4,5	4,6	4,9	5,2
Waste incineration	0,8	0,9	0,6	0,7	0,7	0,6	0,6	0,6
Waste composting	0	0	0	0	0	0	0	0
Total waste sector (trend scenario)	17,9	20,7	21,7	19,4	18,5	16,8	16,5	16,3
Compliance with separate collection targets and biodegradable waste disposed of into landfills						1,2	2,8	3,7
Only bio-stabilized waste disposed of into landfills							4,9	5,4
Total waste sector (scenario with existing measures)						15,6	13,7	12,6
Total waste sector (scenario with additional measures)							11,6	10,9

Source: ISPRA

Table 14 - Summary of policies and measures in the waste sector

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affecte d	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
<b>WASTE</b>							
<b>WEM scenario - Implemented</b>							
Waste	Separate collection	Compliance with separate collection targets and reduction of biodegradable waste disposed into landfills	CH <sub>4</sub>	Implemented	measure already included in the trend scenario		
<b>WAM scenario – Adopted / Planned</b>							
Waste	Separate collection	Compliance with separate collection targets and reduction of biodegradable waste disposed into landfills	CH <sub>4</sub>	Adopted	0	2100	1700

Source: ISPRA



## 2.8 Buildings sector (households and services) o (residential and tertiary)

### 2.8.1 CO<sub>2</sub>

The package of policies deployed in this sector aims at tackling energy efficiency through specific actions targeted both at existing and new buildings and at appliances.

**White Certificate system** This is one of the main measure developed for the civil sector.

**Decree 27 July 2005** implemented the provisions of article 4 of law n. 10 of 9 January 1991. It requested stricter standards for the construction and the renovation of buildings and promoted the implementation of the decrees on energy efficiency.

**Energy performance of buildings** Improving the energy efficiency of buildings and reducing the related emissions has become a priority policy in the last few years. The implementation of directive 2002/91/CE was an opportunity to introduce stricter energy requirements and to promote the diffusion of renewable energy sources in the building sector. The Directive lays down requirements on the application of minimum standards for the energy performance of new buildings and on the performance of large existing buildings undergoing major renovation. The directive also requires the provision of energy performance certificates when buildings are constructed, sold or rented out.

**Legislative decree 192/2005** implemented the directive into national law but it required the adoption of further ministerial decrees to become fully operational. Measures introduced included: methodology for calculating the energy performance of buildings; application of performance standards on new and existing buildings; certification schemes for all buildings; regular inspection and assessment of boilers/heating and cooling installations.

At the end of 2006, legislative decree 192/2005 was amended by **legislative decree 311/2006** to strengthen the buildings thermal demand requirements. The new law applies to new buildings and to existing buildings subject to major renovation<sup>10</sup> and provides for some important measures. Amongst the main provisions, the following obligations are worth citing:

- Installation of technical blinds for solar protection and insulation of new buildings and buildings subject to overall renovation (limited to buildings over 1000 m<sup>2</sup>);
- laying down of all the necessary works to allow the connection of new buildings (and buildings subject to major renovation) to district heating systems, when existing (and not further than 1 km) or planned;
- installation of solar thermal systems that cover at least 50% of hot water demand for all new buildings and in case of replacement or renovation of the existing heating system;
- Installation of PV systems (with a power capacity to be defined in a subsequent ministerial decree) in all new buildings and in existing buildings with a total floor area over 1000m<sup>2</sup>;

**Budget laws 2007 and 2008** provide for fiscal incentives in the civil sector aimed at: improving insulation of existing buildings, installation of solar thermal panels, installation of high efficiency boilers, substitution of old fridge with A+ refrigerators, high efficiency lighting systems in non residential buildings.

Part of these measures have been included in the trend scenario. The other part have been considered as implemented measures.

White certificated related to decree December 2007 have been considered also implemented policies and measure.

Further measures will be introduced by implementation of directive 2006/32/CE on energy end use efficiency and energy services in the civil sector.

The measures considered in the Action Plan for energy efficiency till 2016 have been considered as adopted measures while an extension of the Action Plan to 2020 has been considered as a planned measure.

White certificated related to new target of Action plan 2007 have been considered adopted policies and measure.

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<sup>10</sup> As regards the minimum energy performance requirements of existing buildings subject to major renovation, the decree applies only in case of large buildings of over 1000 m<sup>2</sup> and in case of expansion of existing buildings (over 20%). The decree applies only partially to existing buildings under the 1000m<sup>2</sup> threshold.

Further extension of Action plan target to 2020 with White Certificate system have considered as planned measures

Consistent reductions are expected also from the introduction of mandatory energy efficiency standards for appliances, currently under discussion in the competent Ministries. Another measure that has a realistic chance to be introduced in the near future is the further strengthening of energy efficiency requirements for new and existing buildings, reducing energy consumption and promoting the diffusion of renewable energy sources. These measures have been considered as planned.

Table 15 - Summary of policies and measures in the civil (residential and tertiary) sector

Name of policies or measures	Objective and/or activity affected	Brief Description of Measure	GHG affected	Status	Estimate of mitigation impact, by gas CO <sub>2</sub> eq Gg		
					2010	2015	2020
Civil sector							
<b>WAM scenario - Implemented</b>							
Civil sector	Energy efficiency in buildings (Budget law 2007)	Supporting renovation for energy savings in existing buildings, promotion of thermal insulation in existing buildings, supporting the installation of condensing boilers, stimulating energy savings in existing buildings	CO <sub>2</sub>	Implemented	260	260	260
Civil sector	White certificates (decree december 2007)	Stimulating energy savings in buildings	CO <sub>2</sub>	Implemented	1.480	2.475	3.470
<b>WAM scenario – Adopted / Planned</b>							
Civil sector	Building Sector (decree 27 July 2005)	Promotion of energy savings in new and existing buildings	CO <sub>2</sub>	Adopted	430	1.085	1.740
Civil sector	Building Sector (Decree 192/05, as amended by decree 311/06)	Increasing energy performance of new and existing buildings	CO <sub>2</sub>	Adopted	430	1.085	1.740
Civil sector	Action Plan July 2007 (White certificates - new targets at 2015). Budget Law 2008 and NSF 2007 - 2013 have not been evaluated separately but considered as supporting measures	-Supporting energy savings	CO <sub>2</sub>	Adopted	0	1.805	3.610
Civil sector	White certificates - increase after 2015	Further extend of energy saving targets at 2020	CO <sub>2</sub>	Planned	0	0	1.950
Civil sector	Additional measures of supporting	Economic incentives to promote more efficient appliances	CO <sub>2</sub>	Planned	0	2.320	4.640

Source: ENEA

## 3 Projections

### 3.1 Description of methodologies, models

The scenarios of greenhouse gas emissions from the combustion of energy sources are drawn from the Markal – Italy model<sup>11</sup>, based on the well known Markal software<sup>12</sup>. The trend scenario used for this submission is an update of the latest reviewed output of the model available, published by ENEA in 2007 in its “Rapporto Energia e Ambiente – 2007, analisi e scenari”<sup>13</sup>. The update consist in the use of 2007 final data and 2008 preliminary energy consumption data as an additional input to the model, with the objective to improve reliability of its results.

The model is a partial equilibrium model and represents the domestic energy system and its main emissions. It represents over 70 independent demand for energy services in four main sectors – agriculture, industry, transport, commercial and household – split by sub sectors, type of service and material. For instance the industrial sector is split in the following sub sectors: iron and steel, non ferrous, bricks and tiles, chemical, paper, mechanical, textile, building, and others. For instance the demand for space heating is expressed in square meters of new or existing households, single or multi-family, central or small boilers, at different level of insulation. Demand and supply curves of each commodity are specified stepwise by set of technologies, for a total of over one thousand. Import and export options are included in most demand / supply curves. Emissions of CO<sub>2</sub> are directly accounted for using IPCC “reference approach” methodology and national Emission Factors.

The basic year of the model is 2004, the latest update use also 2008 as an additional base year, modelled years go up to 2050. The model follows a bottom-up technological approach: start from a single sector, or sub-sector, and identify the derivative aggregate data. This approach yields greater accuracy and details compared to the top-down approach, where sector variables are derived from a macro-variable (ex. income).

Structure and data of the full model, including the very detailed parts on end use devices that satisfy the 70 demands for energy services are summarized in [Contaldi, Gracceva, 2004]. Below some additional details are reported for the two most important sectors from the GHG emission trend point of view:

- **Transport: modeling** is based on detailed demand growth, which accounts for both goods and passenger transport. All modes are included, road, railway, air and water. With regard to road, the modeling of the Italian car fleet (petrol, diesel, gas-powered cars), 2 –wheelers, heavy vehicles and busses is provided. The analysis also considers such variables as passengers-km, tons-km, mileage, occupancy rates and unit consumptions (liters-km).
- **Energy supply** : the technologies represent all fossil fuels power plants in operation in 2007 . In the following periods, when existing power plants gradually go out of service, the growing demand is met by copies of the main existing technologies or more efficient combined cycles, integrated coal gasification, fluid bed cycles, fuel cells, CHP plants or renewable power plants (geothermal, wind, PV, hydro run of the river, mini hydro, solid waste, biogas and biomass). CO<sub>2</sub> sequestration and nuclear power plants are modeled, but not active up to 2020 in trend scenario.

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<sup>11</sup> The model has been first developed in the early nineties to evaluate GHG emissions reduction potential and costs . It has been used to prepare scenarios to evaluate mitigation policies in the first, second and fourth national communications to the UNFCCC. Model outputs have been used, inter alia, for preparing energy input scenarios to be used by Rains – Gains Italy model [[http://www.minni.org/rains/english\\_version.htm](http://www.minni.org/rains/english_version.htm), <http://www.iiasa.ac.at>] for National Emission Ceiling directive update and CAFE program and for preparing national detail for IEA ETP 2008.

<sup>12</sup> Markal (MARKet ALlocation) has been developed by the Implementing agreement of the International Energy Agency for a programme of Energy Technology System Analysis (IEA/ETSAP). The “Second Assessment Report” of IPCC (IPCC, 1995) suggest using Markal models to evaluate impact of mitigation policies. Source code is open, regularly maintained and documented.

<sup>13</sup> <http://www.enea.it/>

### 3.2 Description of scenarios

The scenario underlying the emission projections described in this chapter have been derived updating and improving the official scenario presented in the IV NC and in the previous report to Monitoring mechanism. The main differences between the previous and the actual trend scenarios are the following:

- *upgrade with final energy consumption of 2007 and preliminary data for 2008, adoption of 2008 as a second base year for the model together with 2004 ; those changes have also incorporated in the model the first effects of the ongoing economic crisis*
- *upgrade of international energy prices on the basis of the values proposed by IEA for the ETP 2008 exercise*
- *improving of the modeling of the service and industrial sectors (non energy intensive industry), better representation in model output of sectors included and excluded from EU ETS*
- *further expansion of model technological options, including CCS, hydrogen a san energy vector, nuclear reactors, advanced energy efficiency options for final consumption , on the basis of an harmonized technology set of the IEA ETP exercise ;*
- *improvement of renewable energy options and detailed description in the model, in particular for the electricity production, to allow the estimation of the renewable energy objective of the EU climate package;*

The evolution trend is based on continuation of recent trends in the Italian economy and energy. It comes in particular from certain assumptions relating to social, demographic and economic circumstances of the country, assumptions used to determine the evolution of the demand for energy services, which is the basis of the scenarios. The main variables guiding used for projections of demand for energy services, in the end-use sectors, are:

- for industry: economic growth and industrial production (at Sub sector)
- for tertiary added value (of three major sub-sectors),
- for residential demographic trends of the system (primarily the population and the number of households), some assumptions on the expected evolution of demand characteristics, the expansion of number appliances per household and the growing demand for summer cooling
- for the transport dynamics active population (along with assumptions about mobility per capita) and the growth of national product (especially for transporting goods)

At these variables are added energy prices, which vary in the different scenarios. The actual development of demand for energy services is a result of the balance which is established on different energy markets, with the intersection curves of supply and demand of energy.

#### 3.2.1 Energy prices and national production

Despite the sharp rise in prices in recent years, the evolution trend of international energy prices assumes not catastrophic forecasts.<sup>14</sup>

#### 3.2.2 Technologies for electricity generation

The choice of electric generation technologies is driven by the minimization of costs, but also taking into account the constraints local environmental and / or national (partially internalized in the model as additional costs). The new generating capacity built in the coming years will be made up primarily by the less expensive technology.

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<sup>14</sup> see IEA, Energy Technology Perspectives 2007; IEA, International Energy Outlook 2007, IEA ETP 2008

### 3.2.3 The economic system

The development trend of the system is based on the substantial continuation of recent trends. In the last two decades Italy has grown not much and less than the European average, the evolution trend adopts the vision that the country must come to terms with some of its "specific delays and ambiguity"<sup>15</sup>, which "can not grow beyond the modest levels ", so that the growth is about 1,5%.

Among the factors that motivate this "prudent" vision, in particular with regard to the industrial sector, there is above all the rigidity of the Italian model of specialization, characterized by a low average size of company and by the continuation of the difficulties and the competitive disadvantage compared to high-tech sectors and in high economies of scale<sup>16</sup>. The other element of "Italian anomaly" is the loss of competitiveness of the production system in recent years.

### 3.2.4 Population and transport

The population is still estimated to increase significantly up to 2015 but after is now considered to be more or less stable up to 2030, considering the input of immigrants. The number of families is constantly increasing through the period due to the reduction of persons per family. Demographic trends limits the growth in demand for energy services in the residential sector and also limits the growth of mobility of passengers due to ageing population, especially in the long term.

The modal split of transport sector does not change in significant way in the trend scenario. From 2008 to 2030 the demand for transport services is growing in all modes: road, rail, ship and air.

### 3.2.5 Consumption of primary energy

The total primary energy supply (TPES) in 2020, estimated according to Eurostat methodology, will be about 213.1 Mtoe, with an average growth rate of 1.0% , compared with an estimated average growth rate of 1.1% in 2000-2010. In 2020 the increase in total primary energy consumption compared to 2005 is about 26.5 Mtoe. The weight of natural gas will exceed the oil one in the next decade.

With reference to figure 4 there are quite limited modifications in the estimated total energy consumption between the updated scenario and the previous one, identified as "IV NC" . The reduced consumption in 2010 and thereafter can be explained as the first effects of the ongoing economic crisis. The 2010 data is the average between the 2008 preliminary actual consumption and 2012 modeled forecast . The results are also similar to the EU Primes model<sup>17</sup> results, for year 2020 in between the low and high oil price scenario.

It has to be underlined that the decomposition in primary sources of the total energy consumption shows a renewable energy share significantly higher, both for the increase use of biomass and waste and for the higher hydro production, due the higher than average rains in 2007-2008.

In Annex 2 are reported the mandatory parameters on projection of energy consumption.

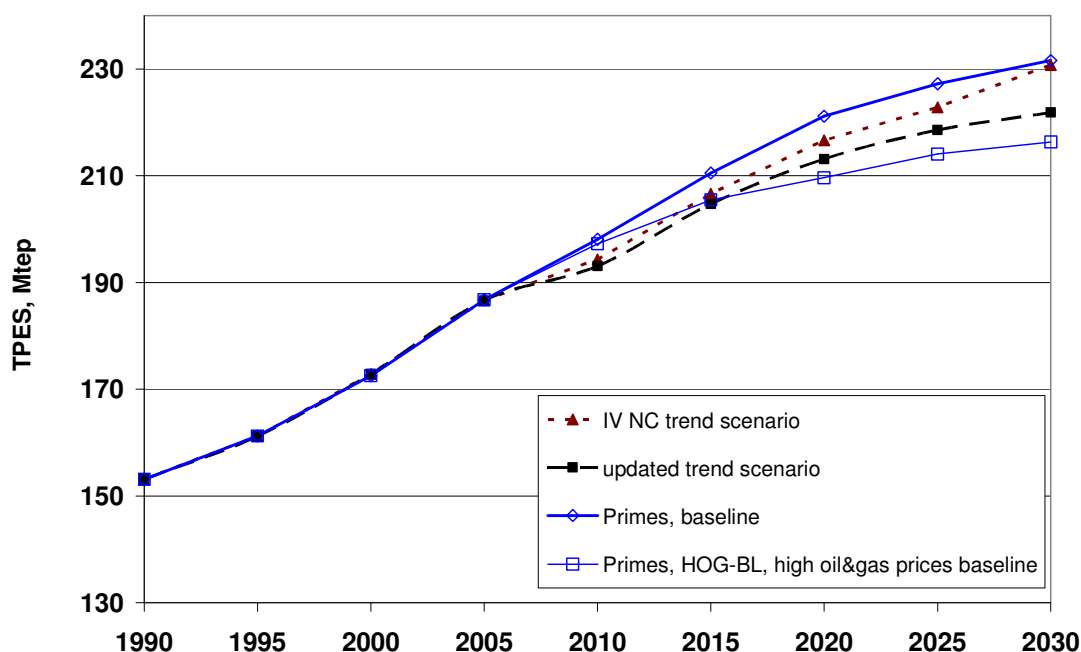
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<sup>15</sup> Confindustria, Previsioni macroeconomiche, 2004, Editore SIPI Srl

<sup>16</sup> ENEA, L'Italia nella competizione tecnologica internazionale, Quinto rapporto, Sintesi e scenari generali, 2006; Centro Europa Ricerche, Crisi delle esportazioni: quello che la lira ci aveva nascosto, Rapporto CER 4/2004; Confindustria, Tendenze dell'industria italiana, 2004, Editore SIPI Srl, Roma.

<sup>17</sup> Model based Analysis of the 2008 EU Policy Package on Climate Change and Renewables

Figure 4 - Projection of gross inland consumption, Mtoe



Note: energy consumption estimated according to Eurostat methodology

### 3.3 Emissions of greenhouse gases

#### 3.3.1 Energy CO<sub>2</sub> emissions

Based on above mentioned scenarios the model computes directly the CO<sub>2</sub> emissions from energy use, while other GHGs and non energy GHG emissions are estimated on the basis of estimated evolution of activity data and average emission factors. Emissions up to 2007 are final data, 2010 is an average between preliminary 2008 data and 2012 modeled data, 2020 is a model estimate.

As can be seen in Figure 5 the final results shows a remarkable reduction in emissions in 2010, and then an increase following a similar pattern to the previous estimates. The reduction in emissions is due to many different factors, some of them structural and other only temporary. The most important are:

- higher than expected share of renewables in TPES, of which the increase in biomass – waste use is structural while the hydroelectric production increase is due to historically high rain levels
- increased efficiency of electricity generation, with the entry in service of many combined cycle plants
- the reduced fuel consumption in transportation due to high fuel prices in the first 8 months of 2008 and low activity levels in last months of 2008
- the sharp reduction of energy consumption in industrial sector in the last four months of 2008

For the period 2010 -2020 a sector by sector analysis shows that:

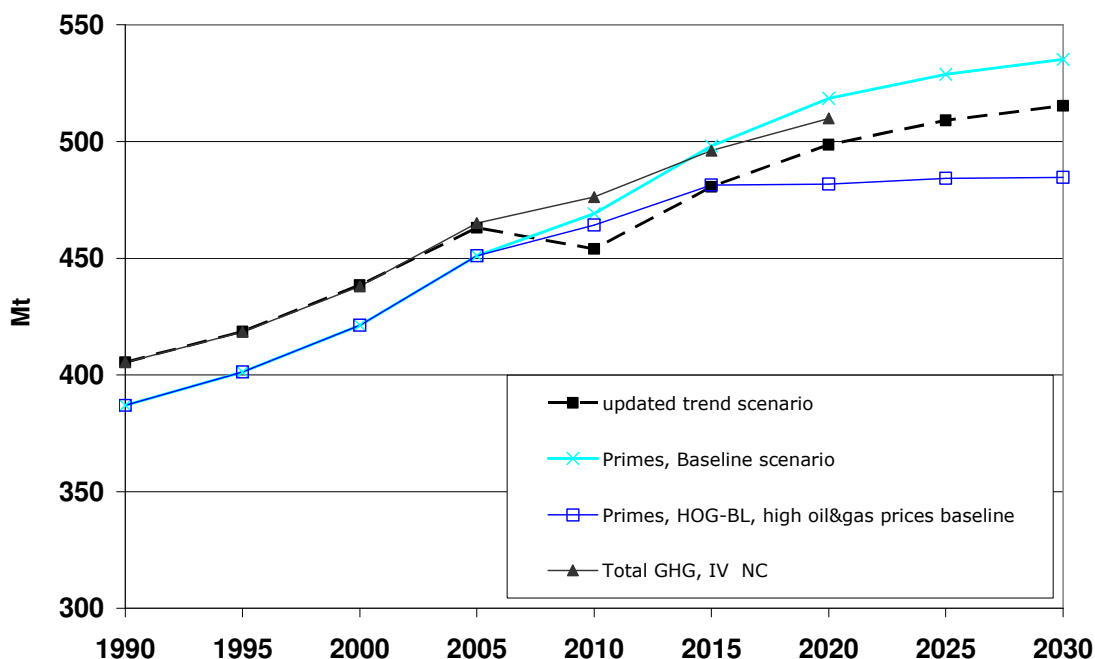
- the higher increase is in the energy sector, 2010 – 2020 +22% ; in historical years, 1990 – 2010 +16%; in this sector the emissions growth is directly linked to the increase in fossil fuels based electricity production, that outpace the efficiency improvements; in projection years only a limited further increase in thermoelectric efficiency is expected, electricity import should be slightly reduced and renewable production is quite limited in trend scenario, from 13.7% (2005) to 15.1% (2020) of gross consumption. The increase in

consumption is projected to continue and it is quite difficult to say when it will be reduced or halted; if reference is made to per capita KWh consumptions the Italian data is still remarkably lower than EU average; moreover a sizeable import of electricity is still foreseen up to 2020 and, if it is reduced, increases can be even higher;

- quite high increase is also registered in transport sector, both historical years, 1990 – 2010 +27%, and in the projection years, 2010 – 2020 +11% ; this trend is common to many EU countries and indicated how difficult is to curb emissions in this sector, even if there is a saving of money in doing it; the reduced increase in projection years is linked to a reduced demand growth and to the effect of the ongoing policies to increase efficiency of cars, further expansion of low GHG emitting fuels, natural gas and biofuels, and the expansion in the use of non road mode of transportation.
- civil sector, is also increasing, historical years, 1990 – 2010 +11%, projection years 2010 – 2020 +9% ; direct emissions increases are mainly linked to the expansion of the services sector but also the expansion of residential building stock (second and third houses), increased house size and higher internal temperature play an important role.
- industry emissions are almost stable, historical years, 1990 – 2010 -11%, projection years 2010 – 2020 +4% ; this trends reflect the historical and projected evolution of the production sector, an expansion of the non energy intensive sectors without reducing the production of energy intensive materials; overall 1990-2020 trend is stable because about half of the percentage reduction in emissions in historical years reflect the reduction in emission from the electricity production attributed to industrial companies, due to the transformation of those activities from “cogeneration” to “independent electricity and heat producers” after the liberalization of the electricity market.

Methodologically speaking we underline that the emissions computed by the model do not match 100% with the inventory estimate for the base modeling year, currently both 2004 and 2008, because of the unavoidable simplifications in the modeling of the energy system. The discrepancies are reduced to 1-2% in total and up to 4% in the single sectors. Those estimates are in any case the best available for projections of the emissions.

Figure 5 - Actual and projected net CO<sub>2</sub> emissions from energy sector, Mt CO<sub>2</sub>



Note: net emission are the physical emissions in the Italian territory excluding the emission reductions due to flexible mechanism

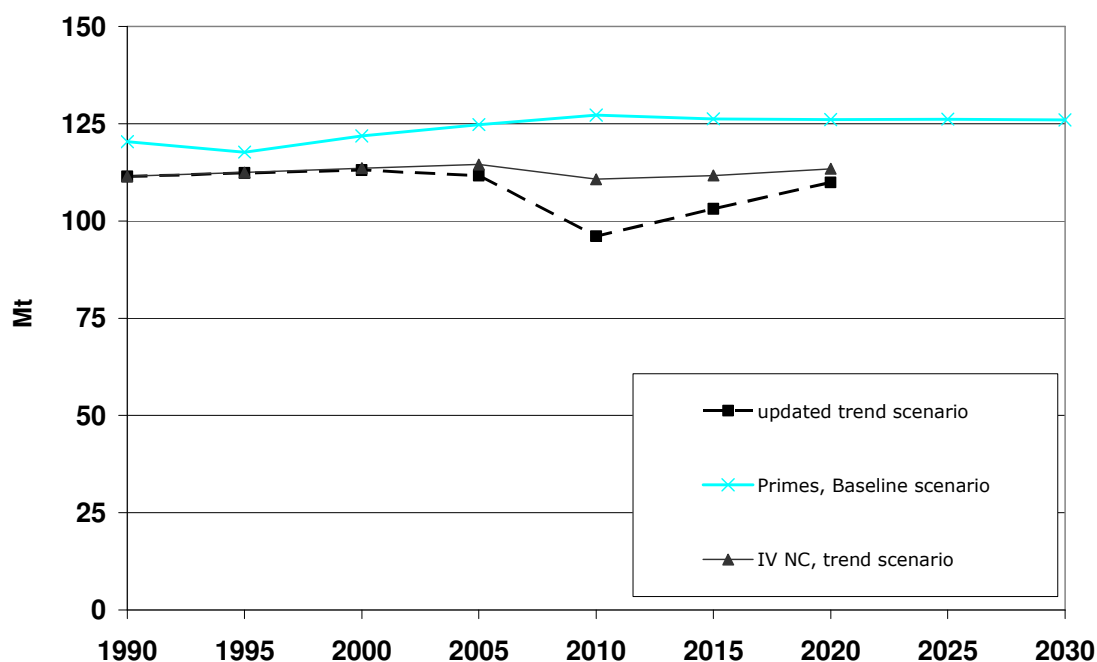
### 3.3.2 *other GHG emissions*

In figure 6 the emissions of CO<sub>2</sub> from non energy sector and of GHGs from energy and non energy sector is reported. As can be seen there is a sharp reduction in emission in 2010. The reduction is due to the effect of previously only planned measures that have been implemented and are now included in trend scenario, in the following in order of importance:

- implementation on N<sub>2</sub>O emission control in the adipic acid and nitric acid production
- reduction of emissions from landfills due to increased recovery of methane
- reduction of other process emission due to a reduction of related industrial production
- increase recovery of animal wastes for biogas production and reduced/modified fertilizer use

According to the scenario the emissions are projected to increase up to 2020. The increase is mainly connected to a sizeable increase in use of substitute of ozone depleting substances and for a lesser part to an increase of industrial production after 2010. For all other sector the emissions continue to decline.

Figure 6 - Actual and projected net GHG emissions , Mt CO<sub>2</sub> eq

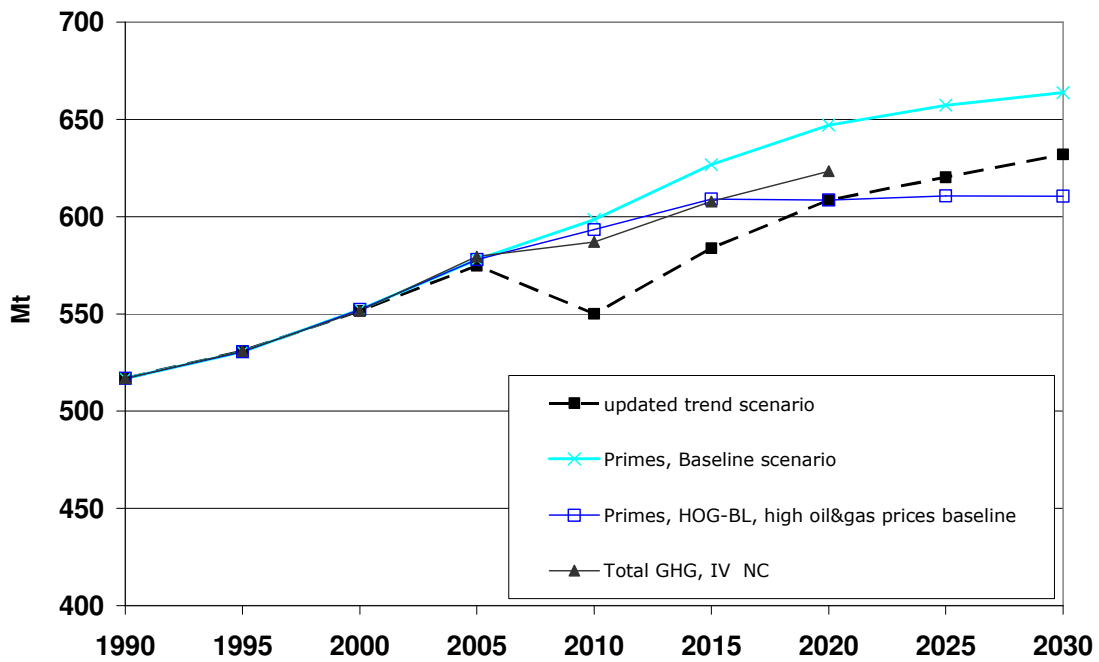




### 3.3.3 Total emissions of greenhouse gases

The resulting trend in total GHG emissions is reported in the figure 7. Results from national scenario are compared with the results of Primes model output and previous national scenario. As can be seen the trend is consistently lower for various reasons, explained in detail in the previous paragraph

Figure 7 - Actual and projected net GHG emissions , Mt CO<sub>2</sub> eq



### 3.4 *The Kyoto mechanisms – Joint Implementation (JI) and Clean Development Mechanism (CDM)*

Italy recognises that the Kyoto Mechanisms play an essential role in meeting commitments under the Protocol both for the private and the public sectors.

The Government Resolutions n.600100 of 16<sup>th</sup> February 2006, establishes that the Kyoto Protocol 80% reduction target of Italy was to be achieved through internal measures and the other 20% could be catch using CDM and JI.

As already mentioned before, according to the former Government political programme, which took office in May 2006, the Italian Government planned to utilise the flexible mechanisms (CDM and JI) up to a cap of 20% of the overall reduction target. This amounts to 20 MtCO<sub>2</sub>eq/yr in the five years of the 1st commitment period of the Kyoto Protocol (2008-2012).

The 15<sup>th</sup> May 2007 EU Commission decision about “II National Plan of Allocation of CO<sub>2</sub>” has settled a ceiling for the utilization of CDM/JI credits by sectors under 2003/87/CE Directive. This ceiling is the 15% of national cap which, additionally to the Government demand of CERs/ERUs, amounts to a total of 30 million tons of CO<sub>2</sub>/year.

Italy also takes part in projects under the flexible mechanisms of the Kyoto Protocol, those relating to the “Clean Development Mechanism (CDM) ”. On the basis of avoided annual emissions attributed to each project, have been developed three scenarios in relation to the number of countries participating in the project:

- Scenario A, same allocation of quotas of annual reduction in emissions between the countries participating in the project
- Scenario B, no allocation of quota for Italy to reduce emissions
- Scenario C, all quotas allocated to Italy

The data of IGES CDM Project Database, which collects the information available by the United Nations Framework Convention on Climate Change (United Nations Framework Convention on Climate Change / UNFCCC), were integrated with data relating to the UNFCCC involved in each project. Based on calculations made in the period 2008-2012 the annual emissions avoided through the participation in CDM projects have range from a minimum of 3.7 Mt CO<sub>2</sub> to a maximum of 37.6 mtCO<sub>2</sub>. Overall, Italy is involved in 38 CDM projects registered, in 39.5% of the projects it is the only proposer, while in other cases with other countries, whose number varies from 2 to 14.

Table 16 – GHG avoided with “Clean Development Mechanism (CDM) ”project

	2002	2005	2008	2009	2010	2011	2012
Scenario A	1.145	669.656	8.243.253	8.604.854	8.731.356	8.784.505	8.764.337
Scenario B	1.145	9.376	3.224.925	3.610.321	3.759.517	3.829.629	3.829.533
Scenario C	1.145	3.991.768	37.246.158	37.629.285	37.722.149	37.759.848	37.665.472

The table does not include 4 other projects, not yet recorded and under review, which are involved Italy alone or in partnership with one or two other countries, the potential total annual reduction of emissions into these projects amounts to 8.1 MtCO<sub>2</sub>.

Many more projects, an order of magnitude higher in number, are still in the pipeline.

### 3.5 *Total effect of policies*

The Table 17 summarize the effects of the additional measures described in details. The potential overall emission reduction achievable through the implementation of all those measures is reported separately for the implemented/adopted and the planned measures and the estimated reduction values take into account the potential double counting of emission reduction of renewable sources, see 2.2.1.1.

At 2010 ETS sector will have an emissions equal to 201.6 MtCO<sub>2</sub>/anno (National Allocation Plan 2008-2012). Please note that this value not include emissions other than CO<sub>2</sub> (little compared to the total emissivity of the areas ETS). Farther ETS sector can use CERs / ERUs in 15% of the amount of shares allocated to them during the 2008-2012 period, that's mean 30.2 MtCO<sub>2</sub>/anno.

The emission of non-ETS sectors in 2010, is determined as the difference between the total emissions and one estimated for the ETS sector. This emission have from 2005, a negative trend due to the fact that recent winters have been characterized by a higher temperature media and to the economic crisis underway.

Emissions expected for non ETS sector in 2010 are 312,4 MtCO<sub>2</sub>eq, given by the emissions trend (320.5 MtCO<sub>2</sub>eq.), which are subtracted:

- The reductions achieved through policies and measures already implemented and adopted (4,7 MtCO<sub>2</sub>/anno)
- Reductions CERs accounted for due to already acquired ERUs (3.4 MtCO<sub>2</sub>eq.)

At 2010 the total emissions estimated, taking into account all the reductions achievable by the measures already adopted and implemented (including the purchase of CERs / ERUs), will be equal to 514 Mt CO<sub>2</sub> and the "gap" to achieve the Kyoto (483255 MtCO<sub>2</sub>/anno) is equal to 30,8 MtCO<sub>2</sub>/anno.

The options identified at the time to fill this gap are summarized as follows:

- Implementation of additional P & Ms currently only identified: -1 MtCO<sub>2</sub>eq
- Improving of efficiency in final use of electricity 2,6 MtCO<sub>2</sub> eq
- Carbon sink first estimation: -10.2 MtCO<sub>2</sub>/anno.
- Further purchase of CERs / ERUs for a maximum of 13,7 MtCO<sub>2</sub>eq/anno.

At 2020 instead emissions from ETS sectors are not defined because the NAP for 2013-2020 is not available.

For non-ETS sectors emissions at 2020 will be 313,7 MtCO<sub>2</sub>eq, given by the emissions trend (352.4 MtCO<sub>2</sub>eq.), Which are subtracted

- reductions achievable through policies and measures already implemented 38,7 MtCO<sub>2</sub>eq

With the adoption of the "effort sharing" decision the reduction target for non-ETS sectors amounted to 303,4 (-13% compared to 2005 emission level ) and therefore the "gap" to achieve that goal is accounts for 10 - 18 MtCO<sub>2</sub>eq/anno, depending on the effective emission reduction achieved by the implemented measures . The mitigation options available to "fill" the gap amount to 59,8 MT. Of those reductions 14,6 concern the use of credits from project-based mechanisms (4% of the emissions occurred in 2005 in accordance with the limitations introduced by the decision "effort sharing").

Table 17 - Summary table of trend scenario and effect of measures, Mt CO<sub>2</sub> eq.

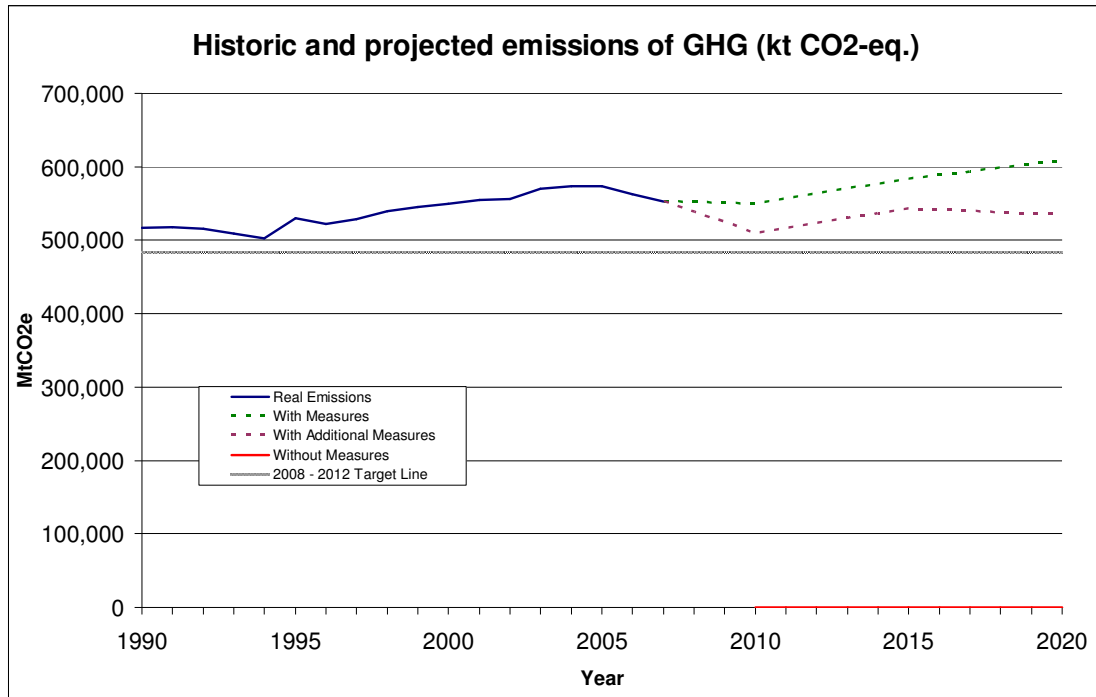
	1990	1995	2000	2005	2007	2010	2015	2020
<b>National emissions (trend scenario)</b>	<b>516,9</b>	<b>530,1</b>	<b>550,9</b>	<b>574,8</b>	<b>552,8</b>	<b>554,2</b>	<b>586,3</b>	<b>611,4</b>
change from 1990		2,6%	6,6%	11,2%	6,9%	7,2%	13,4%	18,3%
<i>ETS Sector</i> (trend scenario)	207,6			226,0	226,4	233,7	250,1	255,0
Civil Aviation (include in ETS from 2012)							3,7	4,0
change from 2005 (aviation excluded)					0,2%	3,4%	10,7%	12,8%
<i>ETS sector</i> (scenario with P&Ms)				226,0	226,4	201,6		
Max use of CERs/ERUs in ETS sector						30,2		
<i>Non ETS sector</i> (trend scenario)	309,3			348,8	326,4	320,5	332,5	352,4
change from 2005					-6,4%	-8,1%	-4,7%	1,0%
change from 1990				12,8%	5,5%	3,6%	7,5%	13,9%
Impact of P&Ms implemented/ adopted						4,7		31 - 39
CERs/ERUs already bought from the Italian Carbon Found						3,4		
<i>Non ETS sector</i> (scenario with P&Ms)						312,4		314-321
<b>National Emissions(scenario with P&amp;Ms)</b>						<b>514,0</b>		
<b>Kyoto objective/effort sharing decision</b>						<b>483,3</b>		
Gap						30,8		10 - 18
Identified action to fill up the gap						27,4		59,8
P&Ms additional in non ETS sector						1,0		21,1
Improving of efficiency in final use of electricity						2,6		14,6
Emission reductions with art. 3.3 and 3.4, provided the national forestry inventory is prepared and Kyoto rules stay for other commitment periods.						10,2		
Max use of CER/ERU: [50% of the gap to 2005 (94,6 MtCO <sub>2</sub> eq)] -[ use of CERs/ERUs in ETS sector (30,2 Mt CO <sub>2</sub> eq)]						13,7		14,0

Source: ISPRA elaborations

Total effect of Policies is summarized in Figure 8. Data up to 2007, blue line, are inventory data, gray line is the Italian Kyoto target. The two dotted lines starting from 2008 show the trend emissions in WEM and WAM scenarios.

We underline that in 2010 it has been included the effect of the emission allowances acquired by operators to comply with ETS cap. The allowances to be acquired in 2015 and 2020 cannot be estimated because the total EU cap has not yet been subdivided at country level. Therefore in the graph the WAM scenario has an uneven trend.

Figure 8 – Historic and projected emissions, kt CO<sub>2</sub> eq



### ***3.6 Sensitivity analysis and uncertainty, possible outcome of the ongoing economic crisis***

First, working with two scenario's provides insight into how fundamentally different developments in socio-economic parameters such as internationalization and public responsibility influence emissions and policy effectiveness. And second, bottom-up analyses of uncertainties in energy market developments and structural physical and technological developments on a sector by sector basis provide information about the impacts of those uncertainties on emissions.

Four different sources of uncertainty have been identified. First, uncertainties in monitoring and historic data carry through into projections. Examples of such uncertainties include incomplete or incorrect information regarding historic starting points, activity data or emission factors. These uncertainties are described in detail in the National Inventory Reports of Italy. Second, simulation models themselves consist of simplifications which may not do justice to complex reality. Third, policies change over time under the influence of European policies, political preferences and new information and may not be captured adequately in the analyses. And finally, there are uncertainties associated with future economic, social and technological developments which are the driving forces in the scenario's. These include in particular uncertainties relating to international energy price developments, growth in world trade, the behavior of actors in the market, technological developments and the effectiveness of policies. These are generally the uncertainties with the greatest impacts on the overall uncertainty margins.

#### ***3.6.1 Ranges***

The IPCC Good Practice Guidance (IPCC, 2000) defines the Tier 1 and Tier 2 approaches to estimating uncertainties in national greenhouse gas inventories. Quantitative estimates of the uncertainties for the Italian GHG inventory are calculated using a Tier 1 approach, which provides a calculation based on the error propagation equations. In addition, a Tier 2 approach, corresponding to the application of Monte Carlo analysis, has been applied to specific categories of the inventory but the results show that, with the information available at present, applying methods higher than the Tier 1 does not make a significant difference in figures. The results of the study, 'Evaluating uncertainty in the Italian GHG inventory', were presented at a EU workshop on Uncertainties in Greenhouse Gas Inventories, held in Finland in September 2005, and they are also available on website at the address [http://air-climate.eionet.europa.eu/docs/meetings/050905\\_EU\\_GHG\\_Uncert\\_WS/meeting050905.html](http://air-climate.eionet.europa.eu/docs/meetings/050905_EU_GHG_Uncert_WS/meeting050905.html). For the Italian inventory emission sources are disaggregated into a detailed level and uncertainties are therefore estimated for these categories.

The Tier 1 approach estimates, for the 2005 total emission figures without LULUCF, an uncertainty of 3.2% in the combined GWP total emissions, whereas for the trend between 1990 and 2005 the analysis assesses an uncertainty of 2.6%.

Including the LULUCF sector into the national figures, the uncertainty according to the Tier 1 approach is equal to 8.3% for the year 2005, whereas the uncertainty for the trend is estimated to be 7.7%.

The assessment of uncertainty has also been applied to the base year emission levels. The results show an uncertainty of 3.5% in the combined GWP total emissions, excluding emissions and removals from LULUCF, whereas it increases to 7.2% including the LULUCF sector.

QC procedures are also undertaken on the calculations of uncertainties in order to confirm the correctness of the estimates and that there is sufficient documentation to duplicate the analysis. The assumptions on which uncertainty estimations are based are documented for

each category. Figures used to draw up uncertainty analysis are checked both with the relevant analyst experts and literature references and are consistent with the IPCC Good Practice Guidance (IPCC, 2000; IPCC, 2003).

The emissions projection have the same range of the inventory uncertainties.

### *3.6.2 Possible outcome of the ongoing economic crisis*

As said in para 3.2 the scenario include the first effects of the economic crisis but not the ongoing general downturn of the world economy. To say it simple the scenario work that was completed in late 2008, because of the strong uncertainty, consider that in 2009 the economy would recover and start to grow again, with the industrial value added subdivided in the usual (average historical) share between sectors..

To date this assumptions is much less plausible and an exercise has been attempted to estimate the possible effects of a few years of negative or low economic growth. The Italian industrial system is strongly export oriented and very sensitive to the changes in international trade.

This speculative scenario has been developed on the basis of a short term economic forecast prepared by the industrial association in February 2009, that forecast -4% valued added growth in 2009 and a recovery from 2010 with slower growth for a few years. Steel and construction materials production will be particularly affected by this downturn, with noticeable effects on emissions. No changes have been forecasted for the international energy prices, in other words we considered that the price level of around 40\$/bbl for oil is only temporary.

This scenario is only speculative, due to the strong uncertainty of the economic evolution in next years, so its results can be considered an additional uncertainty in the emissions level of 2020. the results of the exercise show a reduction of TPES of 1.3% in 2010, 2.4% in 2015 and 2.7% in 2020. Among the fossil fuel sources the reduction is mainly in natural gas consumption. The outcome is not surprising because the demand of coal is stable for price reasons and the demand of oil is also stable because the most important use is now in transport sector, less influenced by the crisis, and in absolute values renewables remain constant in the period.

With regard to energy related CO<sub>2</sub> emissions the model estimate no variations in 2010, due to reallocation among fossil fuels, a reduction of 8 Mt in 2015 and of 15 (2.9%) Mt in 2020.

## **4 Implementation of European legislation, institutional and legal arrangements**

### ***4.1 Implementation of Common and Coordinated Policies and Measures in Italy***

Annex 1 describes the linkages between national policies and measures and the Common and Coordinated Policies and Measures (CCPM's) of the European Union.

In Italy all CCPM's have a remarkable impact and can be considered as a base issue for national policies. The impact of CCPM's can be roughly divided in two categories. Some CCPM's (such those referred to civil and transport sectors) reduce emissions much beyond what is achieved by or possible with national policies. The second category contains CCPM's which do not lead to any additional emission reductions beyond those generated by national policies, but do have other benefits which contribute to the effectiveness and efficiency of national policies.

The benefits of CCPM's are quite high in the civil and transport sectors. It is a matter of fact that, for a series of different reasons, in our national legislative framework has been almost impossible to implement emission saving policies in these sectors without a link to an EU directive. The adoption and wide spread success of energy labeling in appliances is an example of those policies: the diffusion of efficient appliances did take off a few years later than in other EU countries and it is questionable that it could even go out of a nice market without EU directive.

In the regional level legislation the situation is different, but only a few Regions do implement some policies regardless on the EU legislation; also in those cases CCPM's give an important contribution improving the 'level playing field' and addressing competitive distortions which might otherwise result from unilateral introduction of policies.

On the other hand, Italy has an historical tradition in energy efficiency in the energy and industrial sectors and a quite high use of renewable sources compared to EU average. Those sectors are generally quite efficient with reference to the EU average. Effective energy efficiencies policies are implemented nationally, as the diffusion of combined cycles for electricity generation. In this cases a EU framework gives in any case a stimulus to extend and improve some policies, as the use of renewables in the electricity generation.

### ***4.2 Legal and institutional steps to prepare to implement commitments***

#### ***4.2.1 National Action Plan***

The National Action Plan 2003–2010 set up an Interministerial Technical Committee for greenhouse gas emissions (CTE), chaired by the Ministry for the Environment. The Committee has the responsibility to regularly monitor progress in the implementation of policies and measures, on the basis of indicators and sectoral-level emissions. It also has the task to carry out cost-effectiveness analysis to identify additional measures needed to meet the Kyoto target. The Technical Committee includes representatives of the Regions and of the Ministries for Economic Development, Agricultural and Forestry Policies, Infrastructures, Transport, University and Research, Foreign Affairs.

#### ***4.2.2 Ratification Kyoto Protocol***

Italy ratified the Kyoto Protocol through law n. 120 of 1 June 2002. The new law prescribed the review of the 1998 "Guidelines for national policies and measures for the reduction of greenhouse gas emissions" and required the identification of new policies and measures aimed at:



- increasing the energy efficiency of the national economic system and fostering the use of renewable energy sources;
- increasing carbon dioxide removals deriving from land use, land-use changes and forestry, as established under article 3 paragraphs 3 and 4 of the Kyoto Protocol;
- implementing the Clean Development and the Joint Implementation mechanisms established under the Kyoto Protocol;
- fostering Research and Development activities in order to: promote hydrogen as a main fuel in energy systems and in the transport sector; promote the construction of: biomass plants; solar thermal power plants; wind and photovoltaic power plants; waste and biogas fuelled power plants.

#### 4.2.3 Interministerial Committee for Economic Planning (CIPE)

Under the guidelines established by the government, the inter-ministerial committee for economic planning (CIPE), on the basis of proposals of the authorities concerned, act as a coordination in the planning and national economic policy and coordination of economic policy with national Community policies, providing, inter alia, to<sup>18</sup>:

- Define the lines of economic policy to be pursued at national, EU and international level, identifying the specific guidelines and priorities for economic and social development, outlining the actions needed to achieve the goals, taking into account the need to pursue a sustainable development in the environmental aspects, and the resulting issuing directives for the implementation and verification of results;
- Establish general guidelines for the enhancement of development processes in the territory, with particular reference to depressed areas through close cooperation with the regions, provinces and autonomous local authorities concerned with the terms stipulated in the legislative decree n . 281 of 28<sup>th</sup> August 1997,. To this end approving, among other things, plans and programs of sectoral intervention in allocating, on a proposal from the authorities concerned, the financial resources to be allocated, through the institutional program, development planning;
- Promote institutional program and establish general guidelines for activation of other programming tools;
- Periodically redefine goals and addresses, if necessary, the financial resources allocated and not used properly are adjusted
- Determine guidelines and principles for exercising administration functions on the regulation of utilities, without prejudice to the competence of the Authority

The most important law made b CIPE are :

- Law 137/98 of 19/11/1998 about Guidelines for policies and national measures for the reduction of greenhouse gases. This decision contains six national initiative for emissions reduction:<sup>19</sup>:
  - Increasing the efficiency of the pool of thermoelectric facilities
  - Reducing energy consumption in the transportation sector
  - Increasing energy production from renewable sources
  - Reducing energy consumption in the industrial, residential and service sector
  - Absorption of CO2 emissions by forests
  - Reduction of emissions in non energy sectors
- Law 123/2002 Revised guidelines for national policies and measures regarding the reduction of greenhouse gases This law is important because annexed have the National Act Plan. Information about that are reported in 4.2.1.

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<sup>18</sup> Draft legislative decree on the "reorganisation of competence of CIPE and unification of the Ministry of Treasury and the Ministry of Budget and Economic Planning", implementing the delegation referred to in Article 7 of the law on April 3, 1997, n. 94

<sup>19</sup> III NC October 2002

- 11/12/2007 deliberation CIPE n.135 Update CIPE resolution No 123/2002 laying down "review of the guidelines for national policies and measures to reduce greenhouse gas emissions". The resolution of 2002 is amended:
  - gas emissions 1990, already quantified in 521.0 million tons of CO2 equivalent in the new figure of 516.85 million tons of CO2 equivalent;
  - according to the scenario gas emissions-2010, already quantified in 579.7 million tons of CO2 equivalent in the new figure of 587.0 million tons of CO2 equivalent;

The new resolution also launches a broader process of updating Resolution No. 123/2002 to be concluded by 31<sup>st</sup> March, 2008. This update, in its final phase, will provide all actions and measures necessary to achieve the objective of reducing greenhouse gases set for the Italy under the Kyoto Protocol, and the identification of resources necessary financial and their coverage. This update, in principle, should not impose additional commitments reduction for areas subject to emission trading;

The additional measures should be identified as a priority in the transport sector (particularly the management of mobility in urban and extra-urban) in the civil sector , in agriculture and in the promotion of 'eco-efficiency in industrial and civil consumption (public and private).

By 15<sup>th</sup> January the competent ministries, with the support of the regions and local authorities should provide the technical committee emissions (CTE: National Committee for the implementation and management of Directive 2003/87/EC Directive exchange emission quotas commented on this item ) identifying such measures and quantify their contribution to reducing greenhouse gas emissions.

#### 4.2.4 *Regions*

Italy is an example of a Regional State, meaning a form of state in which a sovereign public entity coexists with other territorial entities that are given a legal status valid only domestically, together with a certain degree of legislative and administrative independence. In addition to the regions, the territorial entities into which the Italian State is subdivided are the provinces and the municipalities. Only the Regions, however, are constitutional entities, given that they have autonomy in designing their policy, and are part of the constitutional structure of the State.

The most recent trend would seem to favour the transfer to the regions of responsibilities once managed on the central level in order to achieve the objective of establishing a system of administrative federalism, even though the great majority of the prerogatives in the field of the environment have been left under the control of the central government. The sole prerogative of some significance to be removed from State control is the power of planning: all national plans were eliminated, with the exception of the plan for defending the sea and the coasts from pollution, the plan for purifying waste water, and the plans for the national watershed.

Even in the context of a limited transfer of functions, such as that which has taken place in the field of the environment, the implementation of Legislative Decree 112/98 provided the regions with an opportunity to rearrange, within a unified framework, their own prerogatives, together with those of the provinces, of the individual and associated municipalities and of the mountain communities, setting a number of common principles for the entire field, or for interconnected compartments of the same, such as the environment and energy. Within this scenario, many regions, drawing on the legal norms currently in force, have redesigned their internal rules and regulations, reserving:

- for the provinces, the entire planning system in the field of the environment and energy, under the assumption that the provincial plans for territorial coordination, first contemplated under Law 142 and later reinforced by the provisions of art. 57 of Legislative Decree no. 112/98, are designed to safeguard environmental resources and optimize the use of energy resources; as a result, the overall system for the authorisation of all production and service-industry activities is the prerogative of the provinces.

- for the municipalities, full responsibility for services to citizens and initiatives on the municipal level, employing the municipal urban-planning instruments for decisions regarding the approach to environmental defense and energy concerns (acoustic zoning, reclamation initiatives, long-distance heating, energy savings);
- for the regions, the role of taking concerted action with the Central State regarding underlying decisions on legislative and administrative guidelines, as well as strategic planning, in coordination with local government bodies, and after having received the opinions of the local economic, social, scientific and environmental forces, plus the setting of quality objectives and the monitoring of the results.

#### 4.2.5 *National Inventory*

ISPRA is in charge of the development and compilation of the national emission inventory on the basis of a Legislative Decree issued on 27<sup>th</sup> February 2008 which institutes the National System for the Italian Greenhouse Gas Inventory. In order to establish compliance with national and international commitments, the national GHG emission inventory is compiled and communicated annually by ISPRA to the competent institutions, after endorsement by the Ministry for the Environment, Land and Sea.

Specifically, ISPRA is responsible for all aspects of national inventory preparation, reporting and quality management. Activities include the collection and processing of data from different data sources, the selection of appropriate emissions factors and estimation methods consistent with the IPCC 1996 Revised Guidelines, the IPCC Good Practice Guidance and Uncertainty management and the IPCC Good Practice Guidance for land use, land-use change and forestry, the compilation of the inventory following the QA/QC procedures, the assessment of uncertainty, the preparation of the National Inventory Report and the reporting through the Common Reporting Format, the response to the review process, the updating and data storage.

#### 4.2.6 *National System for Monitoring Greenhouse Gases*

A Legislative Decree, issued on 27<sup>th</sup> February 2008, institutes the National System for the Italian Greenhouse Gas Inventory.

As required by article 5.1 of the Kyoto Protocol, Annex I Parties shall have in place a National System by the end of 2006 at the latest for estimating anthropogenic greenhouse gas emissions by sources and removals by sinks and for reporting and archiving inventory information according to the guidelines specified in the UNFCCC Decision 20/COP.7. In addition, the Decision of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions (280/2004/EC) requires that Member States establish a national greenhouse gas inventory system by the end of 2005 at the latest and that the Commission adopts the EC's inventory system by 30<sup>th</sup> June 2006.

Italy has therefore developed a national inventory system, National System, which includes all institutional, legal and procedural arrangements for estimating emissions and removals of greenhouse gases and for reporting and archiving inventory information.

The Italian National System, currently in place, is fully described in the document 'National Greenhouse Gas Inventory System in Italy' (ISPRA, 2008).

A specific unit of ISPRA is responsible for the inventory compilation in the framework of both the Convention on Climate Change and the Convention on Long Range Transboundary Air Pollution. All the measures to guarantee and improve the transparency, consistency, comparability, accuracy and completeness of the inventory are undertaken.

The Italian greenhouse gas inventory is communicated to the Secretariat of the Framework Convention on Climate Change and to the European Commission in the framework of the Greenhouse Gas Monitoring Mechanism, after endorsement by the Ministry for the Environment, Land and Sea.

## Annex 1

### Summary Table: Policies and Measures in Italy

#### WEM – SCENARIO

Projections Scenario	Name of policy or measure (or group)	Status of policy, measure or group	Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated		
					2010 (GgCO <sub>2</sub> eq)	2015 (GgCO <sub>2</sub> eq)	2020 (GgCO <sub>2</sub> eq)
WEM	Renewables	implemented	PV systems (decree 28.07.2005 as amended by decree 06.02.2006)	Supporting the expansion of photovoltaic plants through feed in tariffs until a maximum capacity of 500 MW is reached	0,00	0,00	0,00
WEM	Renewables	implemented	PV systems (decree 19.02.2007)	Supporting the expansion of photovoltaic plants through feed in tariffs until a maximum capacity of 1200 MW is reached	0,00	0,00	0,00
WEM	Renewables	implemented	PV systems (budget law 2007)	Supporting the installation of photovoltaic systems in new buildings	0,00	0,00	0,00
WEM	Transport	implemented	Biofuels	expansion of biofuels use according to existing national legislation	0,00	0,00	0,00
WEM	Industry	implemented	Aluminium	Reducing greenhouse gas emissions from the aluminium industry through a strong increase of its recycling rate	0,00	0,00	0,00
WEM	Industrial processes	implemented	Nitric Acid	Reduction of N <sub>2</sub> O emissions in nitric acid production plants	0,00	0,00	0,00

Projections Scenario	Name of policy or measure (or group)		Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated
WEM	Energy supply - Thermal Energy	RES implemented	Building sector (decree 192/05, as amended from DLGs 311/06) executive decrees are still on the road	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermal at low temperatures and geoswitch	0,00 0,00 0,00
WEM	Energy supply Cogeneration	- implemented	High efficiency cogeneration (Legislative decree 20/07)	Supporting CHP plants through the issuing of White certificates	0,00 0,00 0,00
WEM	Agriculture	implemented	Nitrogen fertilizer	Rationalization in the use of nitrogen fertiliser	0,00 0,00 0,00
WEM	Agriculture	implemented	Animal storage	Recovery of biogas from animal storage systems	0,00 0,00 0,00
WEM	Waste	implemented	Separate collection	Compliance with separate collection targets and reduction of biodegradable waste disposed into landfills	0,00 0,00 0,00

## WAM SCENARIO

Projection s Scenario	Name of policy or measure (or group)	Status of policy, measure or group	Common and coordinated policy and measure (CCPM)	Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated		
						2010 (GgCO <sub>2</sub> eq)	2015 (GgCO <sub>2</sub> eq)	2020 (GgCO <sub>2</sub> eq)
WAM	Energy/industrial sector	implemented	Cross-cut: Emissions trading scheme (Dir 2003/87/EC)	ETS cap	Emission reduction due to emission trading cap by EU Comm. for period 2008-2012	32.100,00		
WAM	Industry	implemented	En. consumption: End-use efficiency and energy services (Dir 2006/32/EC)	White certificates	Supporting energy savings	640,00	1.330,00	2.020,00
WAM	Civil sector	implemented	En. consumption: Energy performance of buildings (Dir 2002/91/EC)	Energy efficiency in buildings (Budget law 2007)	Supporting renovation for energy savings in existing buildings, promotion of thermic insulation in existing buildings, supporting the installation of condensing boilers, stimulating energy savings in existing buildings	260,00	260,00	260,00
WAM	Civil sector	implemented	En. consumption: Energy performance of buildings (Dir 2002/91/EC)	White certificates (decree December 2007)	Stimulating energy savings in buildings	1.480,00	2.475,00	3.470,00
WAM	Transport	implemented	Trans: Integrated European railway area (2nd + 3rd Railway package) (COM(2002)18 final)	Infrastructural measures	Completion of High Capacity and High Speed networks and tuning of regional networks for commuting and goods. Completion of mass rapid transport networks	1.800,00	3.750,00	5.700,00

Projection s Scenario	Name of policy or measure (or group)		Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated			
WAM	Transport	implemented	Trans: Environmental performance freight transport (Marco Polo Programme)	Management measures	Enhancement of road urban public transport network	700,00	3.045,00	5.390,00
WAM	Waste	implemented	Waste: Directive on waste (Dir 2006/12/EC)	Separate collection	Compliance with separate collection targets and reduction of biodegradable waste disposed into landfills	0,00	2.100,00	1.700,00
WAM	Energy supply - RES Electric	adopted	En. supply: Electricity production from renewable energy sources (Dir 2001/77/EC)	New supporting system for RES (Budget Law 2008). NSF 2007 - 2013 has not been evaluated separately but considered as supporting measure	Supporting electricity production from RES, in particular from those less competitive	610,00	4.025,00	7.440,00
WAM	Energy supply - RES Thermal Energy	adopted	En. consumption: Energy performance of buildings (Dir 2002/91/EC)	Energy efficiency in buildings (Budget Law 2008)	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermic at low temperatures and geoswitch	325,00	890,00	1.455,00
WAM	Energy supply - RES Thermal Energy	adopted	En. supply: Electricity production from renewable energy sources (Dir 2001/77/EC)	Action Plan July 2007	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermic at low temperatures and geoswitch	325,00	890,00	1.455,00
WAM	Energy supply - Cogeneration	adopted	En. supply: Promotion of cogeneration (Dir 2004/8/EC)	Action Plan July 2007 (White certificates - new targets at 2015)	Supporting energy savings	0,00	1.235,00	2.470,00

Projection Scenario	Name of policy or measure (or group)		Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated			
WAM	Industry	adopted	En. consumption: End-use efficiency and energy services (Dir 2006/32/EC)	Action Plan July 2007 (White certificates - new targets at 2015)	Supporting energy savings	0,00	1.380,00	2.760,00
WAM	Civil sector	adopted	En. consumption: Energy performance of buildings (Dir 2002/91/EC)	Building Sector (decree 27 July 2005)	Promotion of energy savings in new and existing buildings	430,00	1.085,00	1.740,00
WAM	Civil sector	adopted	En. consumption: Energy performance of buildings (Dir 2002/91/EC)	Building Sector (Decree 192/05, as amended by decree 311/06)	Increasing energy performance of new and existing buildings	430,00	1.085,00	1.740,00
WAM	Civil sector	adopted	En. consumption: Energy labelling of household appliances (Dir 2003/66/EC (refrigerators - freezers), 2002/40/EC (electric ovens), 2002/31/EC (air-conditioners), 99/9/EC (dishwashers), 98/11/EC (lamps), 96/89/EC (washing machines), 96/60/EC (washer-driers) and 92/75/EC	Action Plan July 2007 (White certificates - new targets at 2015). Budget Law 2008 and NSF 2007 - 2013 have not been evaluated separately but considered as supporting measures	Supporting energy savings	0,00	1.805,00	3.610,00
WAM	Transport	adopted	Trans: Biofuels Directive (Dir 2003/30/EC)	Biofuels	Supporting the use of biofuels	200,00	1925,00	3.650,00
WAM	Transport	adopted	Trans: Environmental performance freight transport (Marco Polo Programme)	Intermodal measures + public transport	Shifting private road transport to public road transport. Shifting road goods transport to the sea. Supporting efficiency in goods road transport.	0,00	600,00	1.200,00



Projection s Scenario	Name of policy or measure (or group)		Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO2eq per year for the year(s) indicated			
WAM	Transport	adopted	Trans: Environmental performance freight transport (Marco Polo Programme)	Management measures	Improve road circulation in the urban areas	0,00	1.150,00	2.300,00
WAM	Energy supply - RES Thermal Energy	planned	En. supply: Electricity production from renewable energy sources (Dir 2001/77/EC)	Position Paper 2007 - RES	Supporting solar thermal, biomass for thermal use (chimney, boiler), geothermic at low temperatures and geoswitch	0,01	1.780,00	2.910,00
WAM	Energy supply - Cogeneration	planned	En. supply: Promotion of cogeneration (Dir 2004/8/EC)	White certificates - increase after 2015	Further support cogeneration	0,00	0,00	275,00
WAM	Energy supply - Cogeneration	planned	En. supply: Promotion of cogeneration (Dir 2004/8/EC)	District heating and integrated territorial energy systems - AIRU proposal	Feed-in tariffs for heat supplied to users	0,00	137,50	275,00
WAM	Energy supply - Increase of infrastructure efficiency	planned	En. supply: Internal electricity market (Dir 2003/54/EC)	CESI Report	Reducing electric losses due to reactive energy	0,00	95,00	190,00
WAM	Energy supply - Increase of infrastructure efficiency	planned	En. supply: Internal electricity market (Dir 2003/54/EC)	CESI Report	Reducing energy losses through the modernization of the national electricity transmission grid and of the distribution grid	0,00	380,00	760,00
WAM	Industry	planned	En. consumption: End-use efficiency and energy services (Dir 2006/32/EC)	White certificates - increase after 2015	Further extend of energy saving targets at 2020	0,00	0,00	1.750,00

Projection Scenario	Name of policy or measure (or group)		Objective of measure(s)	Brief Description of Measure	Ex-ante (Projected) Estimate of GHG emission reduction effect or sequestration effect in Gg CO <sub>2</sub> eq per year for the year(s) indicated		
WAM	Industry	planned	En. Consumption: energy-efficiency labelling for office equipment (Reg No. 2422/2001)	Energy efficiency standards for equipments	Eco design and new standards for energy efficiency of equipments (Directive 2005/32/CE) (mandatory standards for electrical engines, inverters, boilers, etc )	0,00	1.525,00 3.050,00
WAM	Civil sector	planned	En. consumption: Energy labelling of household appliances (Dir 2003/66/EC (refrigerators - freezers), 2002/40/EC (electric ovens), 2002/31/EC (air-conditioners), 99/9/EC (dishwashers), 98/11/EC (lamps), 96/89/EC (washing machines), 96/60/EC (washer-driers) and 92/75/EC	White certificates - increase after 2015	Further extend of energy saving targets at 2020	0,00	0,00 1.950,00
WAM	Civil sector	planned	En. consumption: Ecodesign requirements for energy-using products (Dir 2005/32/EC)	Energy efficiency standards for household appliances	Eco design and new standards for energy efficiency of household appliances (Directive 2005/32/CE)	0,00	2.320,00 4.640,00
WAM	Transport	planned	Trans: Voluntary agreement with car manufacturers to reduce specific CO <sub>2</sub> emissions (ACEA, KAMA, JAMA)	Fleet update	National incentives and new directive to bring average emissions of cars to 130 CO <sub>2</sub> /km (126 g CO <sub>2</sub> /km average for the Italian new fleet starting from 2015, include the effect of subsidies from 2009 average emisisions 130 g for diesel and 140 g for petrol cars)	1.000,00	5.400,00 10.170,00

## Annex 2 Mandatory parameters on projections

### *General Economic Parameters*

		1990	1995	2000	2005	2010	2015	2020
Gross Domestic Product	Value mld 2005 basis (€)	1,173	1,249	1,373	1,417	1,530	1,665	1,812
Population	Thousand people	56694	56846	56929	58462	60190	61130	61160
International coal prices	€ per GJ (Gigajoule)				2,02	1,67	1,4	1,17
International oil prices	€ per bbl				48,32	49,86	52,9	55
International gas prices	€ per GJ (Gigajoule)				4,88	5,17	5,4	5,56

### *Assumptions for energy sector*

parameter				1990	2005	2010	2015	2020
total	gross	inland	Mtoe	153,1	186,6	193,1	204,7	213,11
consumption								
	• Electricity import		Mtoe	2,98	4,23	3,46	3,18	3,16
	• oil		Mtoe	89,86	83,17	79,61	77,07	76,48
	• coal		Mtoe	14,82	16,48	17,32	18,68	19,48
	• gas		Mtoe	39,00	70,65	76,44	85,61	90,80
	• renewable		Mtoe	6,48	12,12	16,27	20,17	23,70

### Annex 3

#### IPCC source categories related to sectoral definitions

sector	activity	IPCC source category
energy	centralized and own generation of power, energy distribution, oil and gas production, refineries	1A1, 1B, part of 2 <sup>1</sup>
industry	chemicals, foodstuffs and luxury items, paper, basic metals, construction materials, other metals, other industry, cokes manufacturing, construction	1A2, part of 2
transport	transport incl. mobile equipment and off-road vehicles from construction, agriculture and services	1A3, part of 1A4c, part of 1A2f
agriculture	agriculture and horticulture excl. mobile equipment and off-road vehicles	1A4c,4
waste	waste incineration <sup>2</sup> and landfills	6
buildings	households, services excl. mobile equipment and off-road vehicles	3, 1A4a, 1A4b

<sup>1</sup>emissions due to flue gas desulphurization

<sup>2</sup>when electricity is generated by waste incineration, the emissions are allocated to the energy sector.

IPCC category 5 is not included in the projections. The forest carbon balance is projected separately in section 2.7.

## Annex 4 Trend emissions by gas

The following tables show trend emissions by gas and sector. The figures are taken from the CRF 2009 submission.

GHG Emissions	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	(base year)																	
	CO <sub>2</sub> equivalent (Gg)																	
Net CO <sub>2</sub> emissions/removals	367.037	348.232	350.168	361.573	338.908	359.585	346.789	362.122	377.855	378.212	383.389	375.767	374.907	359.145	397.091	394.682	395.617	404.176
CO <sub>2</sub> emissions (without LULUCF)	434.688	433.831	433.418	427.116	420.095	445.401	438.910	443.112	454.389	459.592	462.715	468.439	470.590	486.014	488.970	490.056	485.754	475.302
CH <sub>4</sub> emissions (including CH <sub>4</sub> from LULUCF)	41.882	43.091	42.498	42.889	43.406	44.185	44.199	44.567	44.290	44.257	44.284	42.978	41.870	41.143	39.873	39.679	38.075	38.414
CH <sub>4</sub> emissions (excluding CH <sub>4</sub> from LULUCF)	41.739	43.055	42.437	42.738	43.345	44.158	44.177	44.493	44.204	44.214	44.197	42.922	41.839	41.078	39.838	39.645	38.044	38.217
N <sub>2</sub> O emissions (including N <sub>2</sub> O from LULUCF)	37.415	38.430	37.888	38.535	37.875	38.563	38.161	39.386	39.405	40.101	39.781	39.794	39.056	38.559	39.645	37.902	32.842	31.856
N <sub>2</sub> O emissions (excluding N <sub>2</sub> O from LULUCF)	37.400	38.427	37.882	38.423	37.624	38.364	38.158	39.330	39.006	39.542	39.772	39.788	39.053	38.552	39.642	37.899	32.540	31.836
HFCs	351	355	359	355	482	671	450	756	1.182	1.524	1.986	2.550	3.100	3.796	4.515	5.267	5.956	6.701
PFCs	1.808	1.452	850	707	477	491	243	252	270	258	346	451	424	498	348	353	282	288
SF <sub>6</sub>	333	356	358	370	416	601	683	729	605	405	493	795	740	468	502	465	406	428
Total (including LULUCF)	448.825	431.917	432.120	444.430	421.563	444.096	430.525	447.812	463.608	464.756	470.279	462.335	460.096	443.608	481.975	478.349	473.178	481.862
Total (excluding LULUCF)	516.318	517.476	515.303	509.710	502.439	529.686	522.622	528.671	539.655	545.535	549.509	554.946	555.746	570.406	573.815	573.685	562.982	552.771
	CO <sub>2</sub> equivalent (Gg)																	
<b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
	(base year)																	
Energy	418.945	418.508	417.774	414.371	408.283	431.961	427.889	432.025	443.395	448.402	450.722	455.290	457.264	471.623	473.756	474.506	469.586	458.673
Industrial Processes	36.467	36.131	35.532	32.697	31.363	34.530	31.480	31.969	32.422	32.862	34.903	36.946	37.040	38.232	40.522	40.367	35.916	36.296
Solvent and Other Product Use	2.394	2.334	2.334	2.293	2.210	2.180	2.279	2.280	2.367	2.348	2.285	2.211	2.219	2.167	2.144	2.139	2.147	2.133
Agriculture	40.576	41.371	40.862	41.163	40.641	40.349	40.097	41.150	40.418	40.795	39.940	38.954	38.250	38.102	37.917	37.242	36.627	37.210
Land Use, Land-Use Change and Forestry	-67.493	-85.559	-83.183	-65.280	-80.876	-85.590	-92.097	-80.859	-76.048	-80.779	-79.230	-92.611	-95.649	-126.798	-91.840	-95.336	-89.804	-70.910
Waste	17.936	19.132	18.800	19.187	19.942	20.666	20.876	21.247	21.054	21.126	21.659	21.545	20.973	20.283	19.475	19.432	18.707	18.459

## Annex 5 – Emissions Projections

### GHG emissions disaggregated by emission sector (Mt CO2 eq.) WEM Scenario

	2007	Average 2008-2012	2015	2020
Without LULUCF	552.771	550.024	583.785	608.544
With LULUCF	481.862	550.024	583.785	608.544
1. Energy	458.673	458.446	490.756	513.621
2. Industrial Processes	36.296	35.728	38.222	41.100
3. Solvent and Other Product Use	2.133	2.145	2.074	2.013
4. Agriculture	37.210	36.685	36.244	35.491
6. Waste	18.459	17.020	16.489	16.319
7. Other	-	-	-	-
5. LULUCF	- 70.910	-	-	-

Source: ISPRA

### GHG emissions from 1990 to 2020, disaggregated by end-use sector (Mt CO2 eq.) WAM Scenario

	2007	Average 2008-2012	2015	2020
Without LULUCF	552.771	509.724	543.117	534.214
With LULUCF	481.862	509.724	543.117	534.214
1. Energy	458.673	418.146	452.189	440.991
2. Industrial Processes	36.296	35.728	38.222	41.100
3. Solvent and Other Product Use	2.133	2.145	2.074	2.013
4. Agriculture	37.210	36.685	36.244	35.491
6. Waste	18.459	17.020	14.389	14.619
7. Other	-	-	-	-
5. LULUCF	- 70.910	-	-	-

Source: ISPRA

## Annex 6: Projections Indicators

					2008-2012	2015	2020
Indicator: Total CO2 intensity of GDP, t/Mio Euro					324,3	308,9	294,0
1	MACRO	Total CO2 intensity of GDP, t/Mio Euro	Total CO2 emissions, kt GDP, Bio Euro 2005	Total CO2 emissions (excluding LUCF) as reported in the CRF Gross domestic product at constant 1995 prices (source: National Accounts)	496300	514400	532600
Indicator: Passenger Car CO2 Gg/Mvkm)					0,18	0,18	0,18
2	TRANSPORT C0	Passenger Car CO2 Gg/Mvkm)	CO2 emissions from passenger cars, kt	CO2 emissions from the combustion of fossil fuels for all transport activity with passenger cars (automobiles designated primarily for transport of persons and having capacity of 12 persons or fewer; gross vehicle weight rating of 3900 kg or less - IPCC source category 1A3bi).	73900	79100	80100
			Number of kilometres by passenger cars, Mkm	Number of vehicle kilometres by passenger cars. (source: transport statistics).	421105	439398	453250
Indicator: Freight Transport CO2 (Gg/Mtkm)					0,14	0,14	0,13
3	TRANSPORT D0	Freight Transport CO2 (Gg/Mtkm)	CO2 emissions from freight transport (All modes), kt	CO2 emissions from the combustion of fossil fuel for all transport activity including light duty trucks (vehicles with a gross vehicle weight of 3900 kg or less designated primarily for transportation of light-weight cargo or which are equipped with special features such as four-wheel drive for off-road operation - IPCC source category 1A3bii) and heavy duty trucks (any vehicle rated at more than 3900 kg gross vehicle weight designated primarily for transportation of heavy-weight cargo - IPCC source category 1A3biii excluding buses). Includes rail and domestic air and marine transport.	52750	55800	58000
			Freight transport (All modes), Mtkm	Number of tonne-kilometres transported	366245	397670	438410
Indicator: Energy related CO2 intensity of industry, t/Mio Euro					202	202	196

				2008-2012	2015	2020	
4	INDUSTRY A1	Energy related CO2 intensity of industry, t/Mio Euro	CO2 emissions from fossil fuel combustion in industry, kt	Emissions from combustion of fossil fuels in manufacturing industries, construction and mining and quarrying (except coal mines and oil and gas extraction) including combustion for the generation of electricity and heat (IPCC source category 1A2). Energy used for transport by industry should not be included here but in the transport indicators. Emissions arising from off-road and other mobile machinery in industry should be included in this sector.	75871	79495	81495
			Gross value-added total industry, Bio 2005	Gross value added at constant 1995 prices in manufacturing industries (NACE 15-22, 24-37), construction (NACE 45) and mining and quarrying (except coal mines and oil and gas extraction) (NACE 13-14) (source: National Accounts)	375,2	393,6	416,2
Indicator: Specific CO2 emissions of households, t/dwelling				2,29	2,21	2,16	
5	HOUSEHOLDS A.1	Specific CO2 emissions of households, t/dwelling	CO2 emissions from fossil fuel consumption households, kt	CO2 emissions from fossil fuel combustion in households (IPCC source category 1A4b).	53100	53430	53720
			Stock of permanently occupied dwellings, 1000	Stock of permanently occupied dwellings	23228	24172	24906
Indicator: CO2 intensity of the Service Sector, t/Mio Euro				26	26	25	
6	SERVICES A0	CO2 intensity of the Service Sector, t/Mio Euro	CO2 emissions from fossil fuel consumption in services, kt	CO2 emissions from fossil fuel combustion in commercial and institutional buildings in the public and private sectors (IPCC source category 1A4a). Energy used for transport by services should not be included here but in the transport indicators.	25300	27554	29250
			Gross value-added services, Bio Euro 2005	Gross value added at constant 1995 prices ( NACE 41, 50, 51, 52, 55, 63, 64, 65, 66, 67, 70, 71, 72, 73, 74, 75, 80, 85, 90, 91, 92, 93, 99) (source:National Accounts)	962,32	1062,92	1169,03
Indicator: Specific CO2 emissions of public and autoproducer power plants, t/TJ				0	0	0	
7	TRANSFORMATIO N B0	Specific CO2 emissions of public and autoproducer power plants, t/TJ	CO2 emissions from public and autoproducer thermal power stations, kt	CO2 emissions from all fossil fuel combustion for gross electricity and heat production by public and autoproducer thermal power and combined heat and power plants. Emissions from heat only plants are not included.			



					2008-2012	2015	2020
			All products –output by public and autoproducer thermal power stations, PJ	Gross electricity produced and any heat sold to third parties (combined heat and power plants - CHP) by public and autoproducer thermal power and combined heat and power plants. Output from heat only plants is not included. Public thermal plants generate electricity (and heat) for sale to third parties, as their primary activity. They may be privately or publicly owned. Autoproducer thermal power stations generate electricity (and heat) wholly or partly for their use as an activity, which supports their primary activity. The gross electricity generation is measured at the outlet of the main transformers, i.e. the consumption of electricity in the plant auxiliaries and in transformers is included. (source: energy balance)	1367	1549	1686
Indicator: Specific N 2 O emissions of fertiliser and manure use, kg/kg					0,02	0,02	0,02
8	AGRICULTURE	Specific N 2 O emissions of fertiliser and manure use, kg/kg	N 2 O emissions from synthetic fertiliser and manure use, kt	Direct N2O-emissions from synthetic fertilizer use and manure applied to soils, kt	21,4	21,1	20,6
			Use of synthetic fertiliser and manure, kt nitrogen		1135	1108	1073
Indicator: Specific CH 4 emissions of cattle production, kg/head					0,067	0,067	0,068
9	AGRICULTURE	Specific CH 4 emissions of cattle production, kg/head	CH 4 emissions from cattle, kt	CH4 emissions from enteric fermentation cattle, kt	402	395	383
			Cattle population, 1 000 head		6018	5889	5600
Indicator: Specific CH 4 emissions from landfills, kt / kt					0,03	0,03	0,04
10	WASTE	Specific CH 4 emissions from landfills, kt/kt	CH 4 emissions from landfills, kt	Specific CH4 emissions from managed landfills, kt/kt	553	525	504
			Municipal solid waste going to landfills, kt	Solid waste going to managed landfills	17879	15722	12406

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