ITALIAN REPORT ON DEMONSTRABLE PROGRESS UNDER ARTICLE 3.2 OF THE KYOTO PROTOCOL

INTRODUCTION

This report has been prepared in response to Article 3.2 of the Kyoto Protocol and in line with Decisions 22/CP.7 and 25/CP.8 of the UN Framework Convention on Climate Change. As required by these decisions, the report provides the Conference of the Parties with the basis for reviewing progress in the following areas:

- a description of domestic measures for the mitigation of greenhouses gas emissions, including legal and institutional steps to implement the emission reduction commitment under the Kyoto Protocol and arrangements for domestic compliance and enforcement;
- trends in, and projections of, national greenhouse gas emissions;
- impact of domestic policies and measures on emission trends and projections;
- activities undertaken in fulfilment of the commitments under Articles 10 and 11 of the Kyoto Protocol.

This report was elaborated in parallel with the review of the government's strategy to achieve Italy's emissions reduction target under the Kyoto Protocol approved by the Inter-ministerial Committee for Economic Planning (CIPE) deliberation n. 123 in 2002 and is based on the background information used for such revision.
The review mainly concerns the update of national greenhouse gas emissions projections and of additional policies and measures to be implemented to meet the Kyoto Protocol target.
As the revision of the government's strategy has not yet finalized, the information presented in such report could not be fully consistent with the one contained in the approved revised national strategy.
Such updated information will be included in the Italian 4th National Communication.

SUMMARY

Italy has a legally binding commitment under the Kyoto Protocol to reduce greenhouse gas emissions by 6.5 per cent below base-year levels, on average, over the first commitment period, 2008-2012. Based on preliminary figures, this is assumed to be an average of 485.7 $MtCO_2$ equivalents a year in 2008-2012.Considering that Italy has one of the lowest energy intensities among OECD countries in terms of energy use per unit of GDP, meeting such commitment represents a real challenge. However Italy has decided to commit to such ambitious goal because it recognises that if climate change is not tackled seriously, the consequences will be very damaging for the global environment, the economy and security.

Actions to combat climate change were are in place since 1994, when CIPE approved the National Programme for the Containment of Carbon Dioxide Emissions by 2000 at 1990 levels. Since that time Italian government has aimed at achieving the Italian Kyoto target and regularly updated the national programme to reduce greenhouse gas emissions. In 2002 following the ratification of the Kyoto Protocol (Law, 1 June 2002, n. 120), an overall national strategy to meet the Kyoto target was developed.

The current Government, which took office in May 2006, has strongly reaffirmed the political will to achieve the emission reduction commitment under the Kyoto Protocol and has launched the review of the national strategy that at the moment is still ongoing. The review mainly concerns the update of national greenhouse gas emissions projections and the identification of additional policies and measures to be implemented to meet the Kyoto Protocol target.

The general approach to achieving the Kyoto Protocol target consists in the implementation of domestic policies and measures for at least 80% of the reduction effort and in the use of the Kyoto mechanisms up to 20%. Considering that the distance to the Kyoto target is about to 97.6 $MtCO_2eq/yr$, this means that at least 78 $MtCO_2eq/yr$ emission reductions would be achieved through domestic policies and measures (including domestic sinks and the national implementation of the EU Directive 2003/87/CE on the establishment of an emissions trading system inside the Community)

Table S.1 provides the details of the contributions to the fulfillment of the Kyoto. As the revision of the government's strategy has not yet finalized, it has to be emphasized that, the information presented in such report is subject to slight changes.

Table S.1 – Contributions to the fulfillment of the Kyoto Protocol target

	$MtCO_2eq/year$
Base-year GHG emissions	519.5
Kyoto target (-6.5% compared to base-year emissions)	485.7
GHG emissions in 2010 in the "with measures" scenario	587.3
Overall gap between the "with measures" scenario and the Kyoto target	101.6
GHG emissions in 2010 in the "with measures" scenario and including credits from JI/CDM already bought (about 4MtCO2/year)	583.3
Actual gap (including credits from JI/CDM already bought)	97.6
Contribution of additional domestic measures	52.8
Contribution of domestic LULUCF activities (art. 3.3/3.4 KP)	16.2
Contribution of the implementation of the EU-ETS	10.5
Credits from additional JI/CDM project activities	16.0

The additional policies and measures identified in the draft national strategy affect all economic sectors and all greenhouse gases. Example of policies and measures in different sectors are the promotion of Combined Heat and Power (CHP) and renewable energy (energy sector - supply), measures aimed at improving energy saving and energy efficiency (energy sector – industry, tertiary and residential), measures aimed at improving vehicle efficiency and use of biofuels (energy sector - transport sector)

As climate change impacts have being become more and more visible, adaptation to climate change impacts is gradually gaining importance on the political agenda, in addition to mitigation measures. To this regard Italy has implemented and is preparing adaptation measures. Adaptation is developed particularly in the fields of coastal protection, agriculture, and desertification. The focus of climate change adaptation is on mainstreaming actions into sectoral policies rather than developing a stand alone adaptation strategy. In such respect, relevant ministries, local government and specific authorities work in parallel in their respective areas.

In addition to putting itself on track towards meeting its emissions reduction commitments through a straightened national strategy, Italy has also put in place institutional structures and other provisions to enable delivery of its wider Kyoto commitments. These include:

- Establishment of a national registry for holding, transferring, and acquiring EU allowances and Kyoto units and appointment of the National Registry Administrator;
- Implementation of the EU Emissions Trading Scheme[1] since 2005, including the transposition of the EU linking directive into the national law which specifies use of project credits in Phase I (2005-2007) of the EU Emissions Trading Scheme.
- Appointment of the National Authority (DNA) for CDM and JI

Italy is also in the process of developing its national system for greenhouse gas inventory estimation, reporting and archiving and establishing the national registry for issuing and certification of carbon credits (RMUs) from activities under article 3.3 and 3.4 of the Kyoto Protocol.

Further actions are related to the following areas:

- Assistance to developing countries and countries with economies in transition to address climate change

  Italy supports directly mitigation of climate change and adaptation to its adverse effects through a variety of programmes and projects encompassing activities in capacity building, institutional set up and transfer of environmentally sound technologies. To this end Law 1 June 2002, n. 120 allocated 68 millions Euro/year by 2003 in the annual budget of the Ministry of the Environment, Land and Sea (MATTM). Table 4.1 of the present document provides an overview of financial contributions from the Italian Government to the international cooperation on climate change. Italy support developing countries to address climate change indirectly also through financial contribution for the CDM Executive Board activities. To this regard in 2005 a pledge of 1.000.000 US dollars was made. Under UNFCCC Italy also makes a variety of voluntary payments to the Trust Fund for Developing Country Participation and the Trust Fund for Supplementary Activities (see

[1] The scheme was established by EU Directive 2003/87CE and started on 1 January 2005. The first phase runs from 2005-2007 and the second phase will run from 2008-2012 to coincide with the first Kyoto Commitment Period. The Scheme will continue beyond 2012 with further five year phases.

Table 4.2). In such respect it has to be underlined the recent contribution to the Special Climate Change Fund established under the UNFCCC of $ 10 million made in order to contribute, inter alia, to ensure adequate follow up on the further development and implementation of Technology Needs Assessment by developing countries.

As regards scientific co-operation for the transfer of know-how, the Directorate General for Cultural Promotion and Cooperation of the Italian Ministry of Foreign Affairs, in cooperation with the Ministry of University and Scientific Research supports bilateral agreements with developing countries and countries with economies in transition which include environment related issues, such as climate change, terrestrial, coastal and marine ecosystems and clean energies and are aimed at the exchange of information, methodologies and research approach. In addition to that, some technical and scientific institutions such as ENEA (the National Agency for New Technologies, Energy and the Environment) and CNR (the National Research Council) support scholarship programmes for researchers from developing countries and countries with economies in transition in the field of global environment issues.
Italy supports also the work of the IPCC trough the contribution of four Italian scientists as authors/reviewers to the Fourth IPCC assessment report and also through financial contribution (Italy contributed to the IPCC with 150,000 Swiss Francs in 2001 and with 373,200 Swiss Francs in 2004).

- Participation in research programme on climate change
  Research programmes cover mainly the sciences of climate change and to a lesser extent climate vulnerability, impacts and adaptation. The activities are characterized by intensive participation in international and European programmes and by clustering in some a national research programmes.

1. DOMESTIC MEASURES FOR THE MITIGATION OF GREENHOUSE GAS EMISSIONS

1.1 POLICY-MAKING PROCESS

1.1.1. Italy's emission reduction target under the Kyoto Protocol

Italy ratified the Kyoto Protocol on 1 June 2002. The greenhouse gas emission reduction target for Italy in the period 2008-2012 under the Kyoto Protocol is 6.5% less than greenhouse gas emissions in 1990. Italy has chosen the year 1990 as the base year both for the emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) and for the emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
Following the establishment of definitive base-year emission figures equal to 519,5 Mt of CO_2 equivalent and taking into account the methodologies for estimating anthropogenic emissions by sources and removals by sinks referred to in Article 5(2) of the Kyoto Protocol and the modalities of assigned amount pursuant to Article 3(7) and (8) of the Kyoto Protocol, the assigned amount for Italy in terms of tonnes of carbon dioxide equivalent pursuant to Article 3(7) and (8) of the Kyoto Protocol, is 2,428.5 Mt of CO_2 equivalent (485.7 Mt of CO_2 equivalent per year).

1.1.2. National Climate Change strategy

Actions to combat climate change are in place since 1994, when CIPE (the Inter-ministerial Committee for Economic Planning) approved the National Programme for the Containment of Carbon Dioxide Emissions by 2000 at 1990 levels. On 3 December 1997, a second CIPE deliberation was approved to define a framework for the preparation of the programme required to achieve Italy's GHG emissions reduction objective. The CIPE deliberation of 1997 stated, inter alia, that programme had to be coordinated, and that an inter-ministerial work group has to be appointed in order to achieve a higher level of integration in the elaboration of the above-mentioned programme.
According to the orientation deliberated by CIPE on 3 December 1997, in 1998 the Inter-ministerial Committee for Economic Planning was entrusted with revising the guidelines for national policies and measures regarding the reduction of GHG emissions, under the co-ordination of Ministry for the Environment, Land and See (MATTM), where reduction targets, mainly voluntary, have been set for six actions. These included: (i) further promotion of efficiency in the electricity sector; (ii) reduction of energy consumption in the transport sector; (iii) more energy production from renewable; (iv) reduction of energy consumption in the residential, commercial and industrial sectors; (v) reduction of emissions from non-energy sources; and (vi) promotion of carbon sequestration in forests. In 1999 and 2000, policies and measures were introduced making use of a broader spectrum of instruments, including regulatory measures, market-oriented actions and fiscal incentives in the form of a carbon tax.
On 2002, Law of 1 June 2002, n. 120 ratified the Kyoto Protocol and prescribes a review and the reformulation of 1998 Guidelines on the basis of the following criteria:

- improving the efficiency of the Italian economy;
- promoting energy sources differentiation and energy security;
- increasing the share of renewable in the energy portfolio;
- promoting technology innovation in the energy and transportation sectors;
- promoting sustainable agricultural and forestry activities, and the related carbon sinks;

- adding value and improving international technology cooperation supporting the participation of the Italian companies in the CDM and JI (Law 120/2002 does not set limit for the use of Kyoto mechanism in reaching the Kyoto target).

As requested by Law 1 June, 2002 n. 120 in December 2002, the CIPE approved the National Action Plan for 2003–2010 for the reduction of GHG emissions as well as the Revised Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions, containing the government's strategy to achieve Italy's emissions reduction target under the Kyoto Protocol. The strategy as approved in 2002 intended to strengthen the above-mentioned actions, and there were also high expectations that flexibility mechanisms could be used to meet at least part of Italy's GHG reduction commitment.
In January 2006, a Parliamentary Resolution was approved aimed at limiting at 20% the use of credits resulting from Kyoto mechanisms activities in reaching the Kyoto target (Parliamentary Resolution n. 6.00100 of 16 February 2006). Such approach was confirmed in the political program of the new Government, which took office in May 2006.

1.1.3 Monitoring and evaluation of progress with climate policies and measures

The National Action Plan for 2003–2010 sets up, inter alia, an Interministerial Technical Committee for greenhouse gas emissions (CTE), chaired by MATTM to regularly monitor progress in implementation of policies and measures, based mainly on indicators and sectoral-level emissions, and to identify additional measures to meet the Kyoto target on the basis of cost-effective analysis and taking into account progress in achieving the Kyoto target.
CTE includes representatives of the Ministries of Economic Development, Agricultural and Forestry Policies, Infrastructures, Transport, University and Research, Foreign Affairs and of Regions.

CTE is currently updating the National Action Plan for 2003–2010 on the basis of the above-mentioned Parliamentary resolution, in line with the new approach to national climate policy decided by the new Government.

1.1.4 Responsibilities of the Central Administration and of local government bodies in climate change policies

MATTM is fully responsible for conducting climate change negotiation both at international and European Union level and has the leadership in elaborating, updating and monitoring the implementation of the National Action Plan 2003-2010.

The responsibility for implementing actions identified under the National Action Plan is delegated to the relevant Ministries. Such framework has the advantage to define clear responsibilities for meeting domestic targets and also stimulates the integration of climate policies in other policies areas.

As far as concern the role of local government bodies, the most recent trend favors the transfer of responsibilities once managed at central level to regional governments, in order to establish a system of administrative federalism.

Concerning the environmental field, most of the prerogatives have been left under the control of the central government, but having both the energy planning and administrative activities under the

control of local bodies makes it easier to achieve the sustainable development objectives and mainstreaming environmental and energy policy objectives into decisions taken in other sectors.

1.1.5 The European policy context

As an EU Member State, Italy is also subject to EU climate policy and implements EU Common and Coordinated Policies and measures (CCPMs) relevant for climate change. In particular: a) the European Council Decision 2002/358/CE regulates the burden-sharing of the EU emission reduction target for the Kyoto Protocol (8%), b) the EC decision 280/2004/EC, known as the Monitoring Mechanism decision, sets forth that progress of the EU towards the Kyoto target is assessed annually and establishes the relevant monitoring procedures and the EU directive 2003/87/EC introduced the European emissions' trading system. A number of policies and measures included in the National Action Plan are based on the enforcement and the implementation of the corresponding EU legislation (further details are available in the Report on Demonstrable Progress of the European Community).

1.2 POLICIES AND MEASURES BY SECTOR

This report focuses on domestic policies and measures to reduce emissions in sectors consistent with the UNFCCC guidelines for national communications. These sectors are the energy sector - further subdivided into energy supply, industry, tertiary and residential, transport -industrial processes; agriculture; waste management; land use, land use change and forestry. Each sector is dealt with in turn, with a brief description of the relevant policies and measures. Policies and measures introduced since 1990 to reduce GHG emissions are included in the "with measures" scenario; additional policies and measures identified in the current review of the National Action Plan and requiring specific interventions (either regulatory measures or financial incentives), still under consideration, have been included in the "with additional measures" scenario.

1.2.1 Energy sector

1.2.1.1 Energy supply

Any discussion concerning energy and GHG emission in Italy has to start from the fact that its power generation sector is unique compared to those of other industrialised countries. This is due to the following characteristics:

- electricity demand is growing very strongly despite a weak level of economic activity; this is due to the increase in electricity consumption in the residential and industrial sector from the current relatively low levels;
- Italy has an high dependency on natural gas and fuel oil; these two fuels have the disadvantage of having prices linked to those of crude oil, which increased dramatically in the last three years;
- Italy has the highest dependency on electricity imports among the industrialised countries, with a share of 16% of total final electricity consumption coming from abroad;
- Italy has a low level of consumption of coal and the complete absence of nuclear.

Concerning the absence of nuclear production, its abandonment was decided back in 1987 with a national referendum that was followed by the National Energy Plan of 1988. Several measures foreseen by that plan were implemented since the '90s and became relevant also for the reduction of GHG.

The first measure was the **Ministerial Decree 12 July, 1990,** that sets stricter emission limits for industrial plants and for power generation plants. This decree was one of the first important decisions taken by the new Ministry of Environment set up in 1986. It introduced a long list of new limits on pollutants, among which the most important was SO_2. The decree extended to **existing** large power generation plants the limits set for **new** plants by the "Large Combustion Plant Directive" (88/609/CE), that established an upper limit of 400 mg/Nm^3 for SO_2 emissions. This limit was to be compared with the previous one of 5100 mg/Nm^3 set as limit to the sulfur content of the fuel to be used in the power station. The limit was applied to old plants with different steps: by 1997 to 35% of total capacity, by 1999 to 60% and by 2002 to 100% of capacity. The decree forced immediately several local authorities to apply the stricter limits from 1991 with the result of triggering a huge and sudden switch from fuel oil and coal to natural gas, with a subsequent reduction of GHG emissions. This reduction is estimated at 7.8 $MtCO_2eq$ per year.

The most important decision of energy policy approved at the beginning of the '90s **was Decree CIP 6/92**. This decree was the cornerstone of the Italian energy policy during the '90s in the power generation sector. It was approved according to Law 9 of 1991 that implemented the National Energy Plan of 1988, setting objectives of strong increase of power generation from renewable sources and from combined heat and power (CHP or co-generation). It was also aimed at sustaining the entrance of new players, in order to start a liberalisation process, which became more pronounced after 1999. It provided incentives, paid by final consumers, to electricity produced from renewable sources and to CHP plants using fossil fuels when they reach an high level of energy efficiency; in this case these plants are named "assimilated". In 2005, after 13 years from its approval, electricity production under CIP 6/92 has amounted to 50.3 TWh, of which 9.8 TWh from strictly renewable sources and the remaining 40.5 from CHP plants or "assimilated". This additional production replaced that in existing fuel oil plants, the most used technology in Italy during the '90s.

The liberalization process of the power generation sector, that began in 1991 with Law 9/91, accelerated with **Law 481 approved on 14th November, 1995** establishing the Authority for Electricity and Gas. One of the first decisions of the Authority was the revision of the tariff system, with the elimination of cross subsidies, thus providing better economic signals to improve efficiency to final consumers through higher tariffs, especially in the residential sector.

The **Legislative Decree no. 79 of 16th March 1999** enforced the Directive 98/30/CE on the single electricity market. It started a profound reform of the Italian electricity sector, also through its implementing legislation which resulted in significant cuts in GHG emissions One of these implementing measures was **Decree 4 August 1999** signed by the Prime Minister, approving the plan for the divestment by Enel of part of its generation capacity, as requested by article 8, comma 1, of decree 79/99. The decree had the main purpose of identifying the plants that ENEL was obliged to sell, implementing one of the most important point of the reform, that of reducing the dominant position of the former state monopolist. At the same time, however, the decree made compulsory, for a large number of those plants to be divested, the conversion from fuel oil capacity to modern combined cycle gas turbine (CCGT). This triggered a deep refurbishment of the power generation sector, that took place in the following years. Out of a total capacity to be divested of 15000 MW, 9400 MW were forced to be converted to CCGT. This obligation was not foreseen in the reform decree 79/99 and it was decided exclusively for environmental reasons.

The Decree of **11 November, 1999** approved by the Minister of Productive Activities and by the Minister of the Environment, implemented the dispositions of the decree 79/99 reforming the electricity sector, giving strong support to electricity produced from renewable sources. It introduced the system of green certificates, establishing that, as from 2002, producers and importers

of electricity, exceeding 100 GWh of electricity generation or import, were obliged to deliver into the grid a volume equal to 2% of the electricity produced and imported the previous year, generated from plants, built after 1 April, 1999, that use renewable sources.

The Decree n. 106 **of 29 March 2001** of the Minister of the Environment, integrated with the Decree n. 224/00 of the Authority for Electricity and Gas, defined the "Programme for photovoltaic roofs". It supported plants from 1 to 50 kWp connected to low-voltage distribution network in Italy, from 2000 to 2002. This measure had been already defined in the White Paper on renewable energy, approved by the government in August 1999.

The Decree 28 July 2005 of the Minister of Productive Activities introduced, as requested by Decree 387/03, an incentive scheme to support the expansion of photovoltaic plants for a total capacity of 150 MW. The incentive, granted to each kWh, is of 44 €cents for plants below or equal to 20 kW and of 49 €cent per plants with a capacity over 50 kW. The Authority for Electricity and Gas issued decree 188/05 in order to regulate the subject and assign to the grid operator the responsibility to control plants and to approve authorisations. The huge success of this policy, with an amount of requests several times over the 150 MW initial thresholds, paves the way for additional measures of this kind.

Legislative decree 387/2003 of December 2003, enforced directive 2001/77/EC and provided an increase of 0.35% per year, for the years 2005-2007, of the minimum percentage of electricity to be generated from renewable sources, or green certificates, set initially by Decree 79/1999 at 2%. Directive 2001/77/EC of 27 September 2001 on the promotion of electricity produced from renewable energy sources, defined indicative targets for electricity production from renewable sources for each Member States for the year 2010. The target for Italy was set at 25%, but in the footnote in the Directive it was cleared that: "Italy states that 22% would be a realistic figure, on the assumption that in 2010 gross national electricity consumption will be 340 TWh". Therefore Italy is committed to a target of 75 TWh of renewable electricity production. This target reflects a national policy proposed in the "White Paper for the exploitation of renewable sources"(CIPE Deliberation no. 126/1999).

Law 239 of 23 August 2004 aimed at introducing some changes in the reform process of the energy sector. The law was approved after two years of discussion in the Parliament and it was the result of the Parliament investigation that started back in November 2001. Its fundamental purpose was to speed up the permitting process in the construction of new power stations and infrastructures, a need that became more urgent after the black out of September 2003. The effect was to accelerate the construction of new CCGT plants, estimated in additional 3,200 MW, and new electricity import lines for 2,300 MW. The same law extended the possibility to have green certificate to CHP plants when integrated with district heating. The effect of this law was to boost the conversion of existing power generation plants into CCGT and the realization of electricity import lines. Concerning CCGT capacity it is important to emphasize that the Italian power generation sector went through a refurbishing process that had no equal in any industrialized country, with an increase of CCGT capacity by almost 30,000 MW in the period 1990-2010.

The current review of the National Action Plan has also focused on the power generation sector, where the effects of additional measures are expected to be higher. One of the most important measures under consideration is the support given to the expansion of small CHP plants that would bring a reduction of emission of 8 $MtCO_2$ per year through a cut of electricity consumption by 20%. Specific legislative measures in order to support this action are already under discussion in mid 2006, in order also to implement the EU directive on the subject.

Further policies to support additional investment in the use of renewable sources are expected. The success obtained so far by similar actions in boosting a florid sector for the exploitation of renewable sources let understand that also in the future further actions will be taken. Biomass, wind and waste to energy are the technologies that are likely to benefit the most from additional support and incentives, coupled with a parallel reduction of costs. The potential reduction of emissions here is of the order of 5.5 $MtCO_2$ per year.

1.2.1.2 Industry

The **Ministerial Decree 12 July, 1990**, already mentioned for the power generation sector, had similar effects in the industrial sector, forcing the switch from fuel oil to natural gas as main fuel. In the industrial sector, a specific SO_2 emission limit of 1700 mg/Nm_3 was applied, as from 1997; small installations had to comply with this emission standard as from 1991.

The increase of natural gas consumption in the industrial sector was favored also by the **Decree 29 September 1995** that fixed the quality standards of oil products, mostly as concerns sulfur content. It introduced in the industrial sector a limit of 1% to sulfur content, thus banning the use of high sulfur fuel oil, a quality largely available in Italy from local refineries.

Law 10 of 1991, that along with law 9 implemented the National Energy Plan, made the appointment of an energy manager compulsory, as from 1991, in industrial plants, consuming more than 10,000 toe per year of primary energy and in services companies consuming more than 1000 toe per year. In 2005, about 816 industries and 1309 service companies had appointed their energy managers, with total increment of 15% from 2001.

As concerns industrial energy uses, additional reductions might be obtained through the replacement of existing electrical engines with more efficient new ones. The measure could result in a further GHG emission reduction of 2.8 $MtCO_2$. Also for this measure, specific legislation is already under discussion in mid 2006. This action is part of more general policies to boost the competitiveness of the Italian industrial sector.

Further reductions in GHG emissions, of the order of 3 $MtCO_2eq$ per year, may be achieved by promoting waste-to-energy schemes in industrial installations, in particular in the cement industry, e.g. by simplifying the relevant authorization processes. The use of non conventional fuels in the industrial sector in Italy is among the lowest in Europe, since the implementation of such projects is often delayed by administrative problems at local level.

1.2.1.3 Transport

The transport sector has some specific characteristics that do not favour the implementation of any measure aiming at reducing GHG emissions. These characteristics are:

- transport on vehicles using fossil fuels accounts for 90% of emissions of the sector; it is fragmented among millions of different small operators with heterogeneous needs; this forces the adoption of numerous specific measures of small entity with relatively low effects compared to large measures in the power generation sector or in the industrial sector; their implementation is made even more difficult by the fact in the last few years the command and control policies have been abandoned in favour of market oriented instruments that often are even more ineffective;
- the sector is mature since the end of the ‘80s with decisions made mostly to accumulate or substitute existing cars;

- demand for mobility is constantly increasing independently form the general economic trends and outlining a strength on which it is difficult to intervene; often this growth, as in the case of good transport, depends on general change of the global economy, like that of Italy becoming a transit way between producers and consumers of goods;
- any alternative to road transport, like rail or ship, has been proved to have a modest possibility to compete with road transport, with the only exception of air transport, where, however, emissions are even more pronounced;
- despite the continuous urbanisation, changes in consumers patterns are resulting in a constant reduction of the importance of public transport in favour of private road transport.

For all the previous reasons the effectiveness of most transport measures is poor, compared to that of the other sectors consuming energy. Here below we describe measures implemented since 1990, and then discuss possible further interventions identified in the review of the National Action Plan.

Law 194/98 gave support and incentives to local transport companies in order to purchase new buses. The first financing fund was distributed with decree of 6 June 2000.

Decree of 17 February 2000 of the Ministry of Environment (so called Ecological Sundays decree) introduced several different measures and assigned more responsibilities to local authorities, although often more of a window dressing nature, rather than substantial:

- it introduced an obligation for local authorities companies to use at least 5% of the funds allocated by law 194/98 for purchasing electricity-driven vehicles, using hybrid engines or using compressed natural gas (CNG) or liquefied petroleum gas (LPG); it also established specific targets of number of vehicles for the subsequent years;
- with the aim of boosting consumption of fuels with a lower carbon content, some previous decrees were rationalised (Decree of 27.03.1998; Decree of 17.07.1998, n.256; Law N. 426 of 09.12.1998; Decree of 28.05.1999 Ministry of the Environment Ministry of Transport Ministry of the Treasury); they were all characterised by assigning more responsibilities to local authorities;
- it established targets for companies of the public administration for a larger use of vehicles with lower CO_2 emissions; these targets were then postponed because of a widespread use of outsourcing for the use of vehicles;
- implementing the guidelines of the EU White Book "Energy for the Future" [COM(97)0599 – C4-0047/98] it introduced the obligation to have mobility managers in large entities of the public administration with more than 300 employees; the obligation was then extended also to the private sector by Decree of 20.12.2000 Ministry of Environment;
- following the same guidelines, the decree introduced the possibility to set up rules for road pricing, to be implemented through specific local authorities plans;
- in the same direction it set up rules for car sharing then implemented with Decree of 20.12.2000 of the Ministry of Environment.

Important effects derived from the implementation of the **voluntary agreement** between the Ministry of the Environment, Fiat, Unione Petrolifera (association of the oil industries) and FederMetano (association of natural gas distributors) signed in 1999. It set up a specific plan to boost the use of CNG.

A similar **voluntary agreement** was signed in 2000 between the Ministry of the Industry, Fiat-and Consorzio GPL Autotrazione (association of LPG distributors) in order to increase the consumption of LPG; however this agreement was never implemented.

Another **voluntary agreemen**t was signed in April 2002 between the Ministry of Environment, the Ministry of Industry, the Ministry of Finance, the Ministry for Agricultural and local authorities. It set up a program that boosted the use of biodiesel in the public transport.

Decree of 21 December 2001 of the Ministry of the Environment extended financial incentive for conversion to LPG or CNG also to old cars. **Decree of 20 December 2000** of the Ministry of Environment granted financial support to the conversion of cars owned by the public administration to the use of CNG.

Voluntary agreement between FIAT and the Ministry of Environment signed in 1988, then integrated with a similar agreement of ACEA and the European Commission, set up targets to reduce emission of CO_2 from cars; despite the fact that these targets were later denounced by the private industry, at the beginning the agreements helped to reduce emissions;

Law N. 140 of 11 May 1999 provided financial support to the buying of new motorcycles replacing old ones less efficient. In the same way the ministerial decree of 7 June 2000 of the Ministry of Transport and the Ministry of Public Works provided financial support to measures aimed at reducing the use of traditional motor vehicles.

Law 403 of 14 October 1999 of the Ministry of Foreign Affairs ratified and implemented the Convention for Protection of Alps of 1991 and regulated the transit of goods towards Switzerland and Austria; it helped to transfer some good transport from road to rail.

Law 454 of 23 December 1997 and law 27 of 18 February 2000, implementing legislative decree 484 of 20 December 1999, established specific guidelines in order to obtain a reduction of transport of goods on road to rail and ships. **CIPE decision 113 of 2 November 2000** introduced **rules for the so called** project "Sea highways" which target was to move on ship a large part of traditional road transport on long distances. **CIPE decrees 20 November 1995 and 21 April 1999, and laws 448/99, 488/1999 and 388/2000** allocated funds to projects for transport infrastructures within town public transport plans.

In a similar way, **CIPE decree 21 December 2001** (*Legge obiettivo*) supported to general projects to renovate infrastructures at national level.

As concerns additional measures, the obligation to use a growing percentage of biofuels is a measure that is already under implementation as a consequence of the adoption of the EU directive on the same subject. In 2006 the implementing decrees are under discussion in the parliament. Another possible measure in the transport sector would be the enforcement of stricter rules in order to eliminate up to 2012 all vehicles built before 1996 with emission over 145 grams CO_2 per km. This should result in a GHG emission reduction of 9 $MtCO_2$ per year. Always in the transport sector additional measures should be taken in order to strengthen public transport, like the construction of new transport lines, or giving incentives to vehicles using lower emission fuels. The reduction here could be estimated in the range of 4.5 Mt CO_2 per year.

1.2.1.4 Tertiary and residential

The Decree of 29 September 1995 updated the quality standards of oil products, mostly as concerns sulfur content, which had been previously set by law 615/66. This decree, along with other legislation at local level providing incentives to investments for the conversion to gas of heating

systems, supported the sharp increase of natural gas consumption in the residential sector. In 2002 the Government approved a new regulation that changed slightly the 1995 Decree.

Art 31 of Law 449/97 allowed an IRPEF (income tax) deduction during 1998 and 1999 of 41% of the expenses for building renovations. Although this law was not specifically passed to encourage the use of renewable energy, building renovations in 1998 and 1999 supported by this law resulted in the installation of several renewable energy sources systems. From 2000 on, the deduction still applies but it has been reduced to 36%. The same decree introduced a code of self-regulation for energy consumption in buildings of the Public Administration.

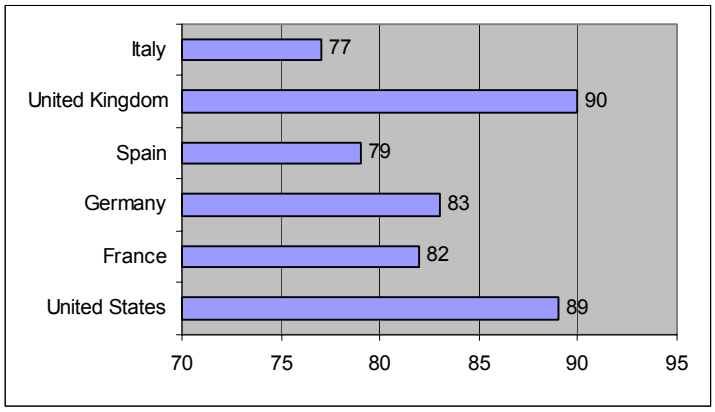
The Decrees of the Ministry of Productive Activities and Ministry of the Environment of 20 July 2004, replaced those approved in 2001 improving their mechanisms to trigger energy saving. Their objective was to reach an energy saving of 2.9 Mt of oil equivalent per year in final uses. Linked to these decrees, on **27 July 2005 the Ministry of Infrastructures** approved a decree implementing the dispositions of article 4 of law 10/91 requesting stricter standards for the construction and the renovation of buildings. This decree promoted the implementation of the decrees on energy efficiency.

As concerns additional measures still under consideration, it is almost certain that the implementation of the decrees introducing energy efficiency targets in final energy uses will continue also beyond 2009, when they should expire on the basis of current legislation. The reduction targets for energy consumption will be strengthened; the resulting GHG emission reduction of emission could be estimated in 6.5 $MtCO_2$ per year. These measures are also urgently needed to reduce emissions in urban areas during the heating seasons.
In addition to that renovations and new building rules for energy efficiency in the residential sector will bring a potential CO_2 emission reduction of 5 Mt per year. The main rules approved are contained in the Decree 27 July 2005 that implemented the dispositions of article 4 of Law 10/91 requesting strict standards for the constructions and renovation of buildings. Decree 18 August 2005 n. 192 adopted the European Directive 2002/97/CE concerning energy efficiency in the residential sector. However, the implementing regulation has still to be approved by local authorities.

1.2.2 Industrial processes

The Italian manufacturing industry has already reached high energy efficiency levels, thanks to a continuous technology innovation which has taken place in the last 20-30 years, mainly driven by high energy costs. Process emissions are also among the lowest in the industrialised world, and the potential to achieve further reductions is therefore quite limited. An interesting example can be found in cement production, which is characterised by one of the lowest value of clinker content per unit of product (See Figure 1.1).

Figure 1.1 - Clinker/cement ratio in some industrialised countries (2004)



Reduction of N_2O emissions from the production of adipic acid and nitric acid can result in a significant drop in overall GHG emissions from industrial processes, with extremely limited reduction costs. In the case of adipic acid, a reduction of at least 90% of N_2O emissions will be achieved through the installation of a catalytic converter to treat off-gases from the only existing plant; this device should be operational by the end of 2006. As for nitric acid, N_2O emissions can be further reduced, even to 1 kg N_2O per ton of nitric acid, through the adoption of high temperature catalytic reduction or selective catalytic reduction at the only plant using the mono-medium process technology.

Emissions of F-gases (HFCs, PFCs, SF_6) have increased since 1995, due to the replacement by HFCs of other substances (CFCs and HCFCs) regulated by the Montreal Protocol. This trend will be reverted through the implementation of **EU regulation no. 842/2006** for containment and recovery of F-gases, also introducing use bans and prohibitions in specific cases, and of **directive 2006/40/EC** for phase out of HFCs with GWP > 150 in mobile air-conditioning systems in motor vehicles.

The implementation of **directive 1999/13/EC** and **directive 2004/42/EC** will help reduce NMVOC emissions and the related indirect CO_2 emissions from the use of organic solvents.

1.2.3 Agriculture

The implementation of the measures of the Common Agricultural Policy has influenced the major driving forces of agricultural GHG emissions in Italy: livestock number, use of fertilizers and crop surface. Livestock number and fertilizer consumption have also been affected by the enforcement of Directive 91/676/EC (the so-called Nitrates Directive) both directly and through its provisions related to the establishment of Codes of Good Agricultural Practice. Italy is also the country in Europe with the highest surface area devoted to organic farming (around 1 million hectares) and this could have an impact on the total amount of fertilizers used and on N_2O emissions from soil.

A decline in current trends of N_2O emissions from soil might be obtained through a more rational use of fertilisers, as prescribed by the **Code of Good Agricultural Practice** (i.e. slow release nitrogen). To this regard, Italy has been one of the first countries of the European Union to draw up, under the provisions of EU Directive no. 676/91, a "Code of Good Agricultural Practice for the Protection of Water from Nitrates", adopted under Ministerial Decree no. 86 of 19 April 1999.

Electricity generation from animal waste has increased in Italy up to 13 GWh in 2003, thanks to the support provided by the feed-in prices granted by Resolution no. 6/92 of the Interministerial Price Committee (CIP 6/92) and the renewable quota obligation for electricity producers/importers established by the Legislative Decree of March 16, 1999, No. 79, and subsequent legislation. This has already resulted in a non negligible **reduction of CH_4 emissions from manure management** Further intervention will be required in future years in order to sustain this trend, and to extend the use of covered animal waste storage systems, equipped with devices allowing collection and use of biogas, not only in new farms but also in major existing ones.

1.2.4 Waste

Waste management in Italy has undergone a structural change since the early '90, when landfills were the only disposal option in most regions of the country, waste recycling was practically non existent and incineration plants were present only in the regions of Lombardy, Emilia Romagna, Tuscany, Sardinia, Liguria (see Table 1.1).

Table 1.1 – Changes in the structure of waste management

	1993	2004
Landfill	85%	54%
Incineration	7%	11%
MBT + RDF	6%	22%
Recycling and composting	2%	13%
Total MSW disposed (tonnes)	23,000,000	30,000,000

Under the influence of the new **National Waste Management Act (Decree 22/97)** – transposing into national law the Waste Directive (1991) and the EU Packaging and Packaging Waste Directive (1994) - which mandates a target for 35% recycling to be fulfilled in each Province, MBT plant have rapidly grown to arrive in 2003 at a total of circa 22% of all the MSW stream, thus playing a crucial role in reducing the amount of waste destined to landfill and in particular its volume.

At the same time the number of incineration plants has increased, although at a much slower rate, since the time scale and costs for planning and building these plants is much longer and public acceptance more difficult to obtain. It is now developing into energy recovery system, especially following the 1997 national waste framework legislation.

This change in waste management policy has not yet resulted in a decline of methane emissions from landfills, which on the contrary have increased 10.5% from 1990 to 2004, mainly as an effect of the increase of the amount of waste being treated anaerobically (whereas in the past large amounts of waste were discarded in open dumps, operating under aerobic conditions). Nevertheless, a sharp decrease is expected in the future, through the implementation of **directive 99/31/EC (the so-called Landfill Directive)**, which prescribes by 2016 a 35% reduction based on 1995 levels of biodegradable municipal waste sent to landfill by 2016. According to Decree 22/97, from the year 2000 landfilling will only be acceptable as a disposal option for inert waste and treated residues.

1.2.5 Land use, land use change and forestry

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 will elect Forest**

Management as an activity under Article 3.4 of Kyoto Protocol, while will not elect Cropland Management, Grazing Land Management or Revegetation. Concerning the activities under article 3.3, carbon stock changes due to Afforestation/Reforestation activities are reported in the UNFCCC sub-category "Land Converted to Forest Land".

In the framework of Deliberation 123/02 by the Interministerial Committee for Economic Planning (CIPE), a detailed plan has been prepared by the Ministry for the Environment, Land and Sea and the Ministry for Agricultural and Forestry Policies, with the aim to achieve the maximum carbon storage by forest sinks ("Piano dettagliato per la realizzazione del potenziale massimo nazionale di assorbimento di carbonio, triennio 2004-2006, PPNAC). This plan is waiting for its final approval by the Regional governments under the context of the Conferenza Stato-Regioni. The plan promotes a more efficient management of existing forests and the establishment of new woodland, with a view to allow the use of credits under Articles 3.3 and 3.4 of the Kyoto Protocol while at the same time contributing to slope stability and increasing the volume of biomass available for energy purposes. The establishment of a national registry of forest carbon sink is foreseen by the plan, as a tool to issue and certify the amount of carbon stored and to allow the use of carbon offsets to contribute to the achievement of the national Kyoto target.

1.2.6 Cross-sectoral policies and measures

In 2005 the European CO_2 emissions trading system (EU-ETS) started operating. It covers a number of industrial and energy sector installations which exceed specific capacity limits set by Annex I of Community Directive 2003/87/EC. The major objective of EU-ETS is to help the EU Member States to achieve their obligations in the frame of the Kyoto Protocol in terms of economic efficiency. Further information on the EU ETS can be found in the Report on Demonstrable Progress of the European Community.

In Italy, the Allocation Decision for the period 2005-2007, elaborated on the basis of the 2005-2007 National Allocation Plan, has been approved on 23rd February 2006. It covers about 945 installations. The Allocation Decision for the period 2008-2012, which coincides with the first Kyoto Commitment Period, will set emission caps for the energy intensive sectors of the Italian economy. The basis for 2008-2012 Allocation Decision is the National Allocation Plan for the period 2008-2012 which is being finalized the by the Ministry for Environment, Land and Sea and the Ministry of Economic Development, according to the guidance provided by the European Commission.
A preliminary assessment of the impact of the second NAP on national GHG emissions is reported in this document. As the 2008-2012 Allocation Decision will be finalised only after the approval of the National Allocation Plan by the European Commission, most likely by the end of 2006/beginning of 2007, emissions reductions achieved under the EU ETS are considered as "additional measures" and have not been included in the reference scenario.

1.3 MINIMISATION OF ADVERSE EFFECTS

Climate policies in Italy are formulated and implemented in a way that should minimise the potential adverse impacts on specific sectors of economic activity, industrial sectors or other Parties to the Convention, including the adverse effects on the international trade, social, environmental and economic impacts in developing countries.

As concerns domestic action, mitigation measures included in Italy's National Action Plan do not focus exclusively on CO_2 from fossil fuels, but cover all sectors of economic activity which are related with GHG emissions or with carbon sinks.

Furthermore, Italy has ensured that the measures implemented in order to increase the differentiation of energy sources do not contradict full liberalization of its energy markets. In particular, the promotion of natural gas consumption improves the safety of energy supply of the country, while new commercial relationships are developed with those countries from which natural gas is imported (e.g. Russia, Algeria, etc.).

Italy also participates to the EU emissions trading scheme, which provides the opportunity to achieve emissions reduction, at installation level, in terms of economic efficiency. Therefore, potential adverse effects are spread between the different sectors of economic activity. In addition, the possible transactions of CERs and ERUs could allow for the development of new commercial relationships between developed and developing countries.

2. GREENHOUSE GAS EMISSION TRENDS AND PROJECTIONS

This chapter includes information on historical trends of the Italy's greenhouse gas emissions since 1990 and sets out projections to 2020. These projections are defined as baseline with measures. The projections do not include the impact of the additional policies and measures and of the EU ETS.

2.1 GREENHOUSE GAS EMISSION TRENDS 1990 TO 2004

Total greenhouse gas emissions, in CO_2-equivalent, excluding CO_2 emissions and removals from land use change and forestry, showed an increase of approximately 11.9% between 1990 and 2004, from 519.7 to 581.6 million tons (Mt) CO_2-equivalent, while the national commitment for reducing emissions by the period 2008-2012 is 6.5% compared to the base year levels. The large gap between the target and actual emissions is due to the fact that Italy already in 1990 had a low level of energy intensity of the economy, thus leaving few possibilities to further improve it. With such a relatively high efficiency, the sharp reduction would have been achieved through a reduction of energy consumption that has not materialised. This would have been possible only with deep technological and social changes in the way energy is consumed in Italy. The target is still achievable with increase efforts in efficiency, renewable sources and technological changes and relying strongly on the use of flexible mechanisms within the Kyoto protocol.

Table **2.1** shows the total greenhouse gas emissions by sector for 1990-2004, in $MtCO_2$ equivalent, as reported in the Common Reporting Format.

Table 2.1: Greenhouse gas emissions in Italy from 1990 to 2004, by sector ($MtCO_2eq$)

	1990	1995	2000	2001	2002	2003	2004	Change 2004/1990	
								$MtCO_2$	%
Energy consumption:	***422,9***	***435,6***	***455,8***	***460,5***	***462,7***	***477,3***	***480,2***	***57,3***	***13,5%***
- Energy industries:	*136,2*	*140,0*	*149,7*	*152,9*	*160,1*	*161,0*	*163,5*	*27,3*	*20,0%*
- power generation	*108,9*	*111,2*	*117,3*	*118,2*	*125,0*	*127,0*	*127,3*	*18,4*	*16,9%*
- refining	*16,5*	*18,7*	*22,4*	*24,3*	*24,3*	*23,3*	*25,7*	*9,2*	*55,8%*
- other	*10,8*	*10,1*	*10,0*	*10,4*	*10,8*	*10,7*	*10,5*	*-0,3*	*-2,8%*
- Industry	*90,7*	*89,5*	*89,6*	*86,9*	*82,9*	*87,8*	*87,2*	*-3,5*	*-3,9%*
- Transport	*104,0*	*115,1*	*124,5*	*126,8*	*129,2*	*130,4*	*132,6*	*28,6*	*27,5%*
- Tertiary and residential	*71,1*	*69,9*	*73,2*	*75,8*	*72,9*	*79,5*	*78,7*	*7,6*	*10,7%*
- Agriculture	*9,2*	*9,6*	*9,0*	*9,3*	*9,2*	*9,3*	*9,2*	*0,0*	*0,0%*
- Other	*11,7*	*11,5*	*9,8*	*8,8*	*8,4*	*9,3*	*9*	*-2,7*	*-23,1%*
From other sources:	***96,6***	***97,0***	***97,9***	***99,4***	***97,9***	***98,4***	***100,5***	***3,9***	***4,0%***
Industrial processes + solvents	*38,9*	*36,8*	*37,3*	*39,4*	*39,7*	*41,2*	*44,1*	*5,2*	*13,4%*
Agriculture	*40,6*	*40,3*	*39,9*	*39,4*	*38,2*	*37,8*	*37,8*	*-2,8*	*-6,9%*
Waste	*17,1*	*19,9*	*20,7*	*20,6*	*20,0*	*19,4*	*18,6*	*1,5*	*8,8%*
TOTAL	***519,5***	***532,6***	***553,7***	***559,9***	***560,6***	***575,7***	***580,7***	***61,2***	***11,8%***

The percentage distribution of the different sectors is unchanged for the whole period. Energy consumption is responsible for the largest part of the total greenhouse gas emissions (82%), followed by agriculture (7%), industrial processes (7%), waste (3%). Almost one third of total increase, 28.6 out of the total of 62.9, came from transport, the sector where it is more difficult to implement policies. Like in the rest of the world, also in Italy, one of the countries with the highest number of vehicles per person, the demand of mobility is expanding constantly and it relies mainly on private vehicles and trucks that consume fossil fuels, mainly oil products.

The power generation sector is second in determining the total increase, with additional 18.4 $MtCO_2$ eq. One of the explanations is the relatively low level of electricity intensity of the economy due to two main reasons: high electricity prices and better climate conditions. This latter aspect however is causing additional consumption in the residential and tertiary sector through air conditioning. The industrial sector is experiencing profound changes in production patterns in order to obtain more flexibility and complexity in new manufacturing processes. All these new methods rely on higher electricity consumption, that results in strong boost to total final consumption and the need of additional power generation.

These developments may explain the fall of emission in the industrial sector by 3.5 $MtCO_2$eq. between 1990 and 2004. The move to higher electricity consumption means that the direct burn of fossil fuels, like fuel oil or natural gas, is shrinking, thus enabling the cut of emissions. Of course this change is transferring the burden to consume fossil fuels to the power generation sector.

GHG emissions from tertiary and residential energy consumption increased by 7.6 $MtCO_2$eq., emphasising the strong link of energy consumption in this sector with GDP growth. A large part of the additional energy demand is related to electricity, that is produced by the power generation sector, however natural gas consumption is constantly increasing for heating uses. GHG emissions from industrial processes and solvent use have increased by 5.2 $MtCO_2$eq. from 1990 to 2004. In particular, emissions from industrial processes have increased by 5.4 $MtCO_2$eq., whereas emissions from solvent use have declined by 0.2 $MtCO_2$eq. The increase in F-gases emissions, amounting to 4.2 $MtCO_2$eq., explains the overall trend for this sector.

GHG emissions from the agricultural sector have decreased by 2.7 $MtCO_2$eq. from 1990 to 2004; this trend is mainly related to the decline in livestock population (in particular dairy cattle).

Finally, GHG emissions from the waste sector have increased by 1.5 $MtCO_2$eq. from 1990 to 2004; this can be explained taking into account the increase in the amount of waste disposed of into landfills and the resulting CH_4 emissions.

Figure 2.1 and 2.2 shows greenhouse gas emissions trends from energy and non energy activities in 1990-2004.

Figure 2.1 – Greenhouse gas emissions from energy activities (1990-2004)

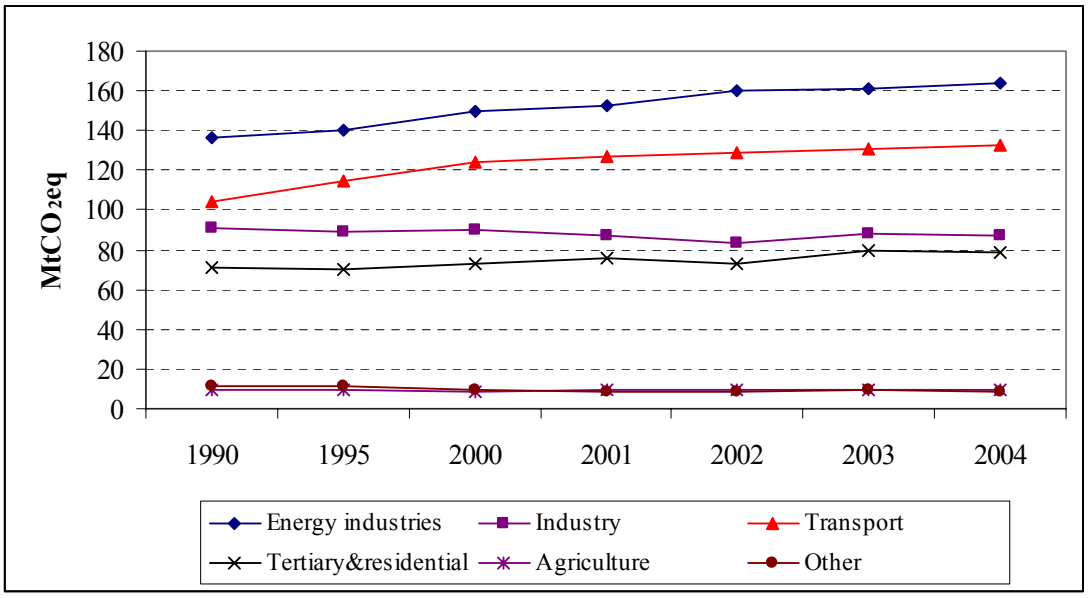
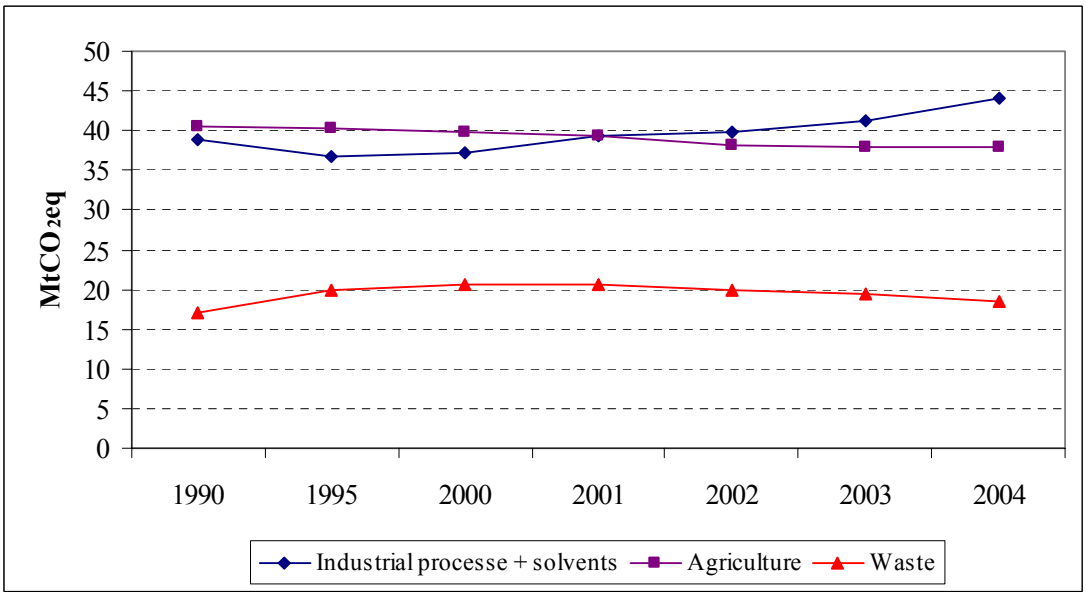


Figure 2.2 – Greenhouse gas emissions from non-energy activities (1990-2004)



Italy's forest area is the total eligible area under forest management activity, since the entire Italian forest area has to be considered managed forest lands, as explained in FAO TBFRA2000 (page 129)[2]. Italy's forest area on 1st January, 1990 has been reported equal to 9,262,894 ha and this is therefore the total eligible area under forest management activity. The country's forest area on 31st December, 2004 has been reported equal to 10,909,147 ha, thus the increase in forest-land area over the period 1990-2004 is 1,646,253 ha.

2.2 GREENHOUSE GAS EMISSION PROJECTIONS TO 2020

Table **2.2** includes historical greenhouse gas emissions for base year, 2000, 2004, 2005 (first estimate) and baseline 'with measures' projections/reference scenario) for 2010, 2015 and 2020, disaggregated by sectors consistent with the UNFCCC's reporting guidelines. Total emissions are expected to increase by 12% or 70.2 $MtCO_2eq$. between 2004 and 2020, reaching the threshold of 652.7 $MtCO_2$. As in the past, the strongest growth will come from the energy sector, especially from transport and power generation sectors.

Table 2.2: Greenhouse gas emissions in Italy from 1990 to 2020, by sector ($MtCO_2eq.$)

	1990	2004	2005[3]	2010	2015	2020	Change 2020/2004	
							$MtCO_2$	%
Energy consumption:	***422,9***	***480,2***	***485,1***	***498,4***	***529,6***	***566,9***	***86,5***	***18%***
- Energy industries:	*136,2*	*163,5*	*167,7*	*174,3*	*191,8*	*210,6*	*47,1*	*29%*
- power generation	*108,9*	*127,3*	*133*	*138,2*	*154,5*	*172,2*	*44,9*	*35%*
- refining	*16,5*	*25,7*	*24,2*	*25,6*	*26,8*	*27,9*	*2,2*	*9%*
- other	*10,8*	*10,5*	*10,5*	*10,5*	*10,5*	*10,5*	*0*	*0%*
- Industry	*90,7*	*87,2*	*86,5*	*89,4*	*92,4*	*96,8*	*9,6*	*11%*
- Transport	*104*	*132,6*	*132,6*	*142*	*151,1*	*163,5*	*30,9*	*23%*
- Tertiary and residential	*71,1*	*78,7*	*80,7*	*75,4*	*77,2*	*79*	*0,3*	*0%*
- Agriculture	*9,2*	*9,2*	*9,4*	*9,3*	*9,3*	*9,4*	*0,2*	*2%*
- Other	*11,7*	*9*	*8,2*	*8*	*7,8*	*7,6*	*-1,4*	*-16%*
From other sources:	***96,6***	***100,5***	***95,3***	***88,9***	***86,5***	***84,9***	***-16,4***	***-16%***
Industrial processes + solvents	*38,9*	*44,1*	*39,8*	*35,3*	*35,5*	*35,5*	*-7,7*	*-18%*
Agriculture	*40,6*	*37,8*	*37,2*	*39,4*	*38,3*	*38*	*0,9*	*2%*
Waste	*17,1*	*18,6*	*18,3*	*14,2*	*12,7*	*11,4*	*-8,7*	*-43%*
TOTAL	***519,5***	***580,7***	***580,4***	***587,3***	***616,1***	***651,8***	***70,2***	***12%***

[2] 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 sylvicultural 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*".

[3] Preliminary

Figure 2.3 – Greenhouse gas emissions from energy activities (1990-2020)

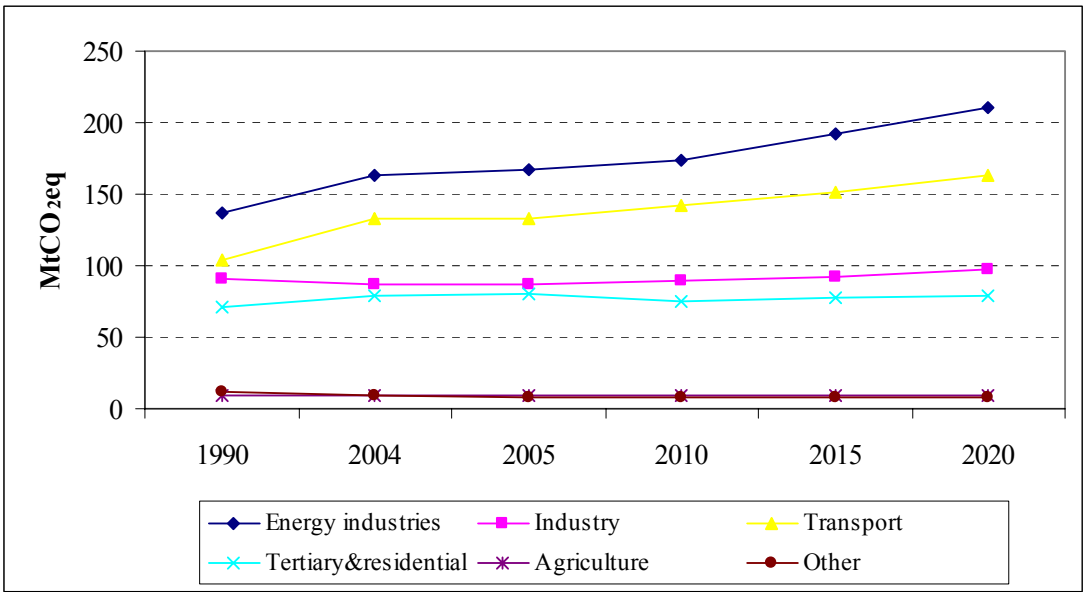
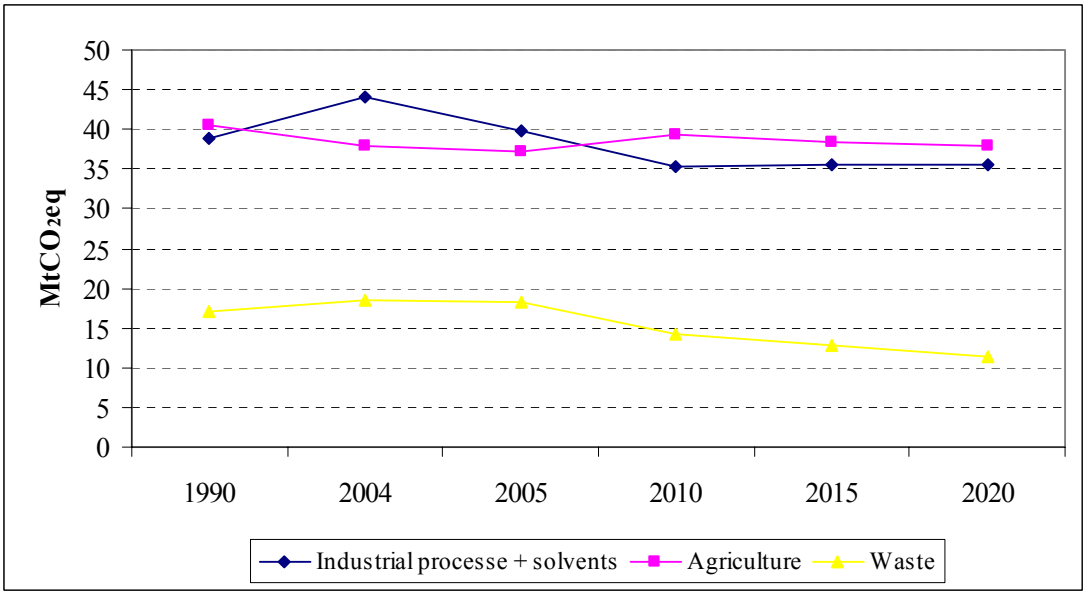


Figure 2.4 – Greenhouse gas emissions from non energy activities (1990-2020)



2.2.1 Energy sector

Emissions from the energy sector are strictly dependant on the level of energy consumption. Forecasts of energy consumption were done using the CEPRIG model with the following assumptions:

- GDP growth of 1.4% per year on average;
- Oil prices towards 35 US 2005 dollars in 2025;
- Reduction of GDP energy intensity by 0.3% per year;
- Growth of electricity intensity of GDP by 0.6% per year.

2.2.1.1 Energy supply

Power generation will account for the largest part of the increase of total emissions with additional 44.9 $MtCO_2eq$, out of a total of 70.2. This is due to the increase of electricity final consumption both in the residential and in the industrial sectors. Emissions from the refining sector will increase only slightly due to higher energy consumption related to the production of better quality oil products that consume more hydrogen.

2.2.1.2 Industry

Reference is made here to the emissions directly resulting from the industrial sector, with the exception of process emissions. Emissions will increase in line with the expansion of industrial production, that will result in additional requests of energy. This demand will affect mostly electricity, however additional demand will occur also for natural gas in some traditional industrial sectors.

2.2.1.3 Transport

The transport sector, after the energy sector, will show the biggest increase in GHG emissions up to 2020, 30.9 $MtCO_2eq$.; this depends on the fact that also in Italy, like in the rest of the world, the demand for mobility will continue to be characterised by have much higher growth rates than those for GDP.

2.2.1.4 Tertiary and residential

Thanks to strong penetration of natural gas and electricity, emissions from the residential sector are going to be stable up to 2020, close to the present level of 79 $MtCO_2eq$.

2.2.1.5 Agriculture

The agricultural sector will be characterized by a reduction in activity levels, along with the positive effect of higher use of renewable sources; these two elements together will limit the projected increase in GHG emissions at 9.4 $MtCO_2eq$.

2.2.2 Industrial processes

Emission projections to 2020 for most industrial processes have been estimated using the growth rates shown in the Table 2.3 here below. They are consistent with those used, for the same activities, in the National Allocation Plan 2005-2007 (24 February 2005) and, in all other cases, with those used in the Business as Usual scenario prepared by the Ministry for Economic Development. For aluminium production and for production and consumption of F-gases, information directly communicated from industry has been used. For SF_6 used in magnesium and aluminium foundries and for solvent and other product use, future trends have been estimated by means of an extrapolation of most recent data.

Table 2.3 – Sectoral growth rates

	2005	2006 - 2007	2008 - 2010	2011 - 2015	2016 - 2020
A. Mineral Products					
1. Cement Production	1,90%	1,90%	0,50%	0,50%	0,50%
2. Lime Production	2,00%	2,00%	0,50%	0,50%	0,50%
3. Limestone and Dolomite Use	0,80%	0,80%	0,50%	0,50%	0,50%
4. Soda Ash Production and Use	1,20%	1,20%	1,20%	1,20%	1,20%
7. Other					
Glass Production (decarbonising)	2,50%	2,50%	1,20%	1,20%	1,20%
B. Chemical Industry					
1. Ammonia Production	1,20%	1,20%	1,20%	1,20%	1,20%
2. Nitric Acid Production	1,20%	1,20%	1,20%	1,20%	1,20%
3. Adipic Acid Production	1,20%	1,20%	1,20%	1,20%	1,20%
5. Other					
Carbon Black	0,60%	0,60%	0,60%	0,60%	0,60%
Ethylene	0,60%	0,60%	0,60%	0,60%	0,60%
Dichloroethylene	0,60%	0,60%	0,60%	0,60%	0,60%
Styrene	0,60%	0,60%	0,60%	0,60%	0,60%
Titanium dioxide	1,20%	1,20%	1,20%	1,20%	1,20%
Propylene	0,60%	0,60%	0,60%	0,60%	0,60%
Caprolactame	1,20%	1,20%	1,20%	1,20%	1,20%
C. Metal Production					
1. Iron and Steel Production					
Steel	0,90%	0,90%	0,80%	0,80%	0,80%
Pig Iron	0,90%	0,90%	0,80%	0,80%	0,80%
Sinter	0,90%	0,90%	0,80%	0,80%	0,80%
2. Ferroalloys Production	1,80%	1,80%	1,80%	1,80%	1,80%
3. Aluminium Production	0,20%	0,20%	0,20%	0,20%	0,20%

The resulting GHG emission trends are shown in the Table 2.4 here below.

Table 2.4 – Greenhouse gas emission trends 2005-2020 for industrial processes

	2005	2010	2015	2020
Mineral products	24,26	25,54	26,22	26,91
Chemical industry	9,89	4,13	4,36	4,60
Metal production	1,68	1,74	1,81	1,88
Production of halocarbons and SF_6	0,02	0,02	0,02	0,02
Consumption of halocarbons and SF_6	2,62	2,63	1,89	1,74
Total industrial processes	***38,47***	***34,06***	***34,29***	***35,16***
Solvent and other product use	1,32	1,20	1,19	1,18
Total industrial processes and solvent and other product use	**39,79**	**35,25**	**35,48**	**36,34**

2.2.3 Agriculture

Emission projections up to 2020 in the reference scenario have been estimated on the basis of data and models used in the preparation of the air emission inventory (GHG and ammonia inventories) and keeping emission factors consistent with inventory data.

The main variables or driving forces for emission projections estimations is the activity data: livestock number, milk production, use of fertilizers and crop surface and production. For livestock number and use of fertilizers, the assumptions concerning trends and abatement options are in line with those used by ENEA to prepare ammonia emission scenarios communicated to the CLRTAP. In particular, the animal population between 2000 and 2020 is expected to drop by 14.0% for dairy cows, 10.4% for other cattle and 9.2% for sheep and goats, and to rise by 12.0% for poultry and 9.5% for swine; use of fertilisers is expected to decline by 5% between 2005 and 2015. Milk production and crop surface and production have been estimated by extrapolating the current time series.

Most of the activity data, time series 1990-2005 reflect the effect of the Common Agricultural Policy (CAP) measures. For example, the reduction in the number of dairy cattle, because of the milk quota, and probably because of the implementation of the CAP reform, the use of fertilizers which leads to a reduction equal to 7% between 2004 to 2005.

The resulting GHG emission trends are shown in the Table 2.5 here below.

Table 2.5 – Greenhouse gas emission trends 2005-2020 for agriculture

	2005	2010	2015	2020
Enteric fermentation	10,81	11,83	11,25	11,22
Manure management	6,86	6,99	6,88	6,77
Rice cultivation	1,50	1,47	1,51	1,52
Agricultural soils	18,01	19,07	18,67	18,44
Field burning of agricultural residues	0,02	0,02	0,02	0,02
Total agriculture	37,19	39,37	38,33	37,95

2.2.4 Waste

In the reference scenario, the total amount of waste has been estimated on the basis of official population forecasts provided by the National Institute of Statistics (ISTAT) and on waste

As concerns waste management practices, it has been assumed that:

- the amount of biodegradable waste disposed of into landfills is in line with the timetable foreseen in the Landfill Directive;
- the share of landfill gas which is collected will reach 60% in 2020
- differentiated collection will increase in line with on the target provided by current legislation (D.lgs. 22/1997 and D.lgs. 152/2006)
- the amount of waste treated in MBT plants and incinerators will increase with the total capacity of operating plants (estimated on the basis of current authorisations).

Furthermore, it has been assumed that as from 2010, every incinerator treating municipal waste will be equipped with an energy recovery system.

The resulting GHG emission trends are shown in the Table 2.6 here below.

Table 2.6 – Greenhouse gas emission trends 2005-2020 for the waste sector

	2005	**2010**	**2015**	**2020**
Solid waste disposal on land	14,20	9,95	8,32	6,81
Wastewater handling	3,39	3,59	3,79	3,98
Waste incineration	0,69	0,64	0,63	0,62
Composting	0,00	0,00	0,01	0,01
Total waste management	18,28	14,18	12,74	11,42

2.2.5 Land use, land use change and forestry

In the Table 2.7 herebelow, carbon stock changes (expressed as $MtCO_2eq$) reported under the UNFCCC sub-category "Forest land remaining forest land" refer to the use of Forest management as an activity under Article 3.4 of the Kyoto Protocol, whereas those reported under "Land converted to forest land" refer to the use of Afforestation/reforestation activities according to Article 3.3 of the Kyoto Protocol.

The driving forces for emission projections estimations are activity data linked to the LULUCF sector; in particular, given the decision about the elected activities under Article 3.4 of Kyoto Protocol, "Forest Land" activity data constitute the key variables to project removals by sinks. Key drivers have been identified in

- forest area: assessment of forest area for the period 2005-2020 was made through data extrapolation, starting from the consolidated time series 1990-2004;
- land converted to forest area: it has been defined following the positive trend individuated in the period 1990-2004;
- harvested area, burned area by forest fires: data extrapolation was made from the available time series.

Table 2.7 – Greenhouse gas absorption 2005-2020

	2005	2010	2015	2020
Forest land remaining forest land	72.1	73.2	74.6	75.8
Land converted to forest land (A/R)	12.9	13.3	13.6	13.9
Total forest land	85.0	86.5	88.2	89.6

3. ANALYSIS OF THE CONTRIBUTION OF DOMESTIC MEASURES AND USE OF KYOTO MECHANISMS

3.1 EVALUATION OF PROJECTED PROGRESS IN EMISSIONS REDUCTION BY MEASURE

3.1.1 Energy sector

As already explained in the previous chapters, the energy sector will be responsible of the highest share of total increase of GHG emissions towards 2020. This despite several measures under implementation that have been included in the reference scenario.

3.1.1.1 Energy supply

The first, and one of the most important measures was the enforcement, as from 1990, of stricter limits for SO_2 emissions from power generation plants and from industrial plants. Both sectors were thus forced to switch rapidly from heavy fuel oil and coal to natural gas, with an associated cut in GHG emissions estimated in 10.2 $MtCO_2eq$, as summarised in the following table.

	2000	2005	2010	2015	2020
Ministerial Decree 12 July 1990 (SO_2 emission limits)	10,2	10,2	10,2	10,2	10,2

Another important decision was the decree Cip 6/92, still relevant for the green certificate market in 2006 and likely to continue to affect it in the next decade. It gave strong incentive to renewable sources electricity production and, more important, to CHP plants. The resulting reduction of emission is expected to increase up to 15.2 $MtCO_2eq$. in 2020.

	1995	2000	2005	2010	2015	2020
Decree Cip 6/92 (incentives to renewable sources and CHP)	2,2	7,3	11	14,1	15,2	15,2

Energy policy during the last decade has been focused mainly on liberalisation of the sector and Law 481 of 1995 was the cornerstone of this process. It established the Authority for Electricity and Gas, which first decision was the reform of the tariff system that brought better signals to final consumers, determining lower consumption and emissions. It is important to emphasise that Italy has in Europe the highest electricity tariffs and prices, both for the residential and industrial sector; this explains largely the low level of electricity penetration in final energy uses.

	2000	2005	2010	2015	2020
Law 481 of 14th November 1995 (electricity tariffs)	1,8	2,1	2,1	2,1	2,1

One of the main decisions in the liberalisation process was that of imposing a reduction of the dominant position of the incumbent ENEL. The decree 4 August 1999 identified those plants that ENEL was forced to sell for a total capacity close to 15,000 MW. The relevant point was that for 9,400 MW sold it was made compulsory also the refurbishment from fuel oil steam plants to new CCGT plants using natural gas. This determined a sharp reduction of emissions that, once completed the conversion, will reach 16.5 $MtCO_2eq$.

	2000	2005	2010	2015	2020
Decree 4 August 1999 (obligation to build CCGT capacity)	0,8	9,4	16,5	16,5	16,5

Decree 11 November 1999 implemented the electricity reform law 79/99, as concerns the introduction of a green certificate market system in support of renewable sources. It is based on the obligation of producers and importers to deliver to the grid electricity coming from new plants using renewable sources. The obligation was set at 2% of the electricity produced or imported in the previous year. Legislative decree 387/2003 of December 2003 increased the obligation by 0.35% per year, for the years 2005-2007. These obligations will boost the use of electricity from renewable sources, with a reduction in GHG emissions of 6 $MtCO_2eq$.

	2000	2005	2010	2015	2020
Decree 11 November 1999 (renewable sources)	0,1	3	6	6	6

The Decree n. 106 of 29 March 2001 of the Minister of the Environment, integrated with the Decree n. 224/00 of the Authority for Electricity and Gas, provided support to electricity produced from photovoltaic plants, which will result in a reduction of GHG emission of 0.12 $MtCO_2eq$.

	2000	2005	2010	2015	2020
Decree 29 March 2001 (Photovoltaic plants)	0	0	0,12	0,12	0,12

Law 239 of 23 August 2004 introduced important changes in the reform process of the electricity sector. The following measures were relevant for GHG emissions:

- extension to district heating of the possibility to have green certificates, with a consequent support to this technology and a reduction of emissions by 0.4 $MtCO_2eq$.;
- speeding up of the authorisation process in the construction of new energy facilities, among which also import grid lines; this will make possible the construction of new import line for 2,300 MW with reduction of domestic emission by 10.6 $MtCO_2$ eq.;
- in the same way the law introduced quicker permitting processes for the construction of additional CCGT plants; the reduction of emission is estimated in 8.9 Mt CO_2eq.

	2005	2010	2015	2020
Law n.239 of 23/08/2004 (district heating green certificates)	0	0,4	0,4	0,4
Law n.239 of 23/08/2005 (new import lines for 2300 MW)	4	10,6	10,6	10,6
Law n.239 of 23/08/2006 (new CCGT capacity)	3	8,9	8,9	8,9

Additional measures in the power generation sector, focusing on the support to the expansion of small CHP plants and on additional investment in the use of renewable sources may result in further GHG reductions of respectively 8.0 and 5.5 $MtCO_2eq$. in 2010.

	2005	2010	2015	2020
Small and medium side CHP (cogeneration) plants	0	8.0	8.0	8.0
Increase of power production from renewable sources	0	5.5	5.5	5.5
Total additional measures	**0**	**13.5**	**13.5**	**13.5**

3.1.1.2 Industry

The sharp increase of natural gas consumption in Italy in place of fuel oil and coal determined a reduction in CO2 emission that could be estimated at 2.4 Mt per year. As already mentioned for the power generation sector, the switch was triggered by the decree of 12 July 1990 that imposed, as from 1997, stricter limits for SO_2, along with other pollutants, in the industrial sector.

	2000	2005	2010	2015	2020
Ministerial Decree 12 July 1990 (SO_2 emission limits)	2.4	2.4	2.4	2.4	2.4

Energy efficiency in the industrial sector has always been one of the main targets of the energy policies. Also the national energy plan of 1988, implemented with law 9 and 10 of 1991, set up specific objectives on energy efficiency, e.g. the appointment of an energy manager, compulsory for industries consuming more than 10,000 tones of oil equivalent per year,. This brought efficiency gains, with positive effects also on GHG emissions, that could be estimated in 0.4 $MtCO_2eq$ per year.

	2000	2005	2010	2015	2020
Law 11/91 (energy managers)	0.4	0.4	0.4	0.4	0.4

The improvement of air quality during the '90s took place through stricter limits on emissions of specific pollutants, already described before, and with quality standards on the fuel quality. Decree 29 September 1995 reduced the limits of sulfur content of fuel oil and gasoil making even more urgent for several industries the switch to natural gas. This brought a further reduction of CO_2 emission of 1.3 $MtCO_2eq$. per year.

	2000	2005	2010	2015	2020
Ministerial Decree 29 September 1995 (fuel oil quality)	1.3	1.3	1.3	1.3	1.3

As concerns industrial energy uses, additional reductions might be obtained through the replacement of existing electrical engines with more efficient new ones (3.6 $MtCO_2$, and promoting waste-to-energy schemes in industrial installation, in particular cement factories (3.0 $MtCO_2$).

	2005	2010	2015	2020
Replacement of existing electrical engines	0	3.6	3.6	3.6
Promoting waste-to-energy schemes in industrial installations	0	3.0	3.0	3.0
Total additional measures	**0**	**6.6**	**6.6**	**6.6**

3.1.1.3 Transport

More than 60 different policies and measures activated since 1990 could be identified in the transport sector. For the characteristics of the sector, however, they are fragmented, often part of policies in other sectors and in general their effect is relatively contained, at least compared to the results obtained in the power generation sector or in the industrial sector. This is not a problem of ineffectiveness of the single policies, rather it is due to the fact that the decisions-making process of this sector is too fragmented, since millions of different operators make their own choices in a very complex way. The sector is also characterised by a strong long lasting growth that is much higher compared also to the economic growth. High energy prices of fuels, especially after 2004, and huge externalities of road transport, constantly worsening, seem not to affect the demand of mobility; this gives an idea of the strength of the expansions.

All the measures taken in the transport sector could be grouped in four main categories:

- Promotion of vehicles with low or zero emissions;
- Regulation and control of town traffic;
- Cycle and motorcycle mobility;
- General transport and Logistics;
- Transport infrastructure.

Promotion of vehicles with low or zero emission is a measure that in Italy has been supported since the '70s when the oil price shocks made urgent to find alternatives to oil products in transport. This helped to develop a sector for the supply of vehicles using CNG and LPG already during the '80s that, more recently, became important for the most recent measures aim at reducing emissions. Additional measures were taken in order to improve the efficiency of vehicles, to boost the demand for hybrid and electric vehicles and to support the use of biofuels in transport. All together these measures are expected to be the most effective category with reduction in GHG emissions that could be estimated in 4.6 $MtCO_2$eq. in 2010, a figure that should increase slightly in the following decade.

	2000	2005	2010	2015	2020
Promotion of vehicles with low or zero emissions	2.8	4.3	4.6	4.7	4.8

Regulation and control of town centres' traffic is a category of measures that were taken mostly for reasons different from that of energy efficiency and more as a way to solve urgent urban congestion problems. However, their implementation is bringing positive effects also in terms of

emission reductions. Mobility management, road pricing, car sharing and reduction of access to the town centres are all measures which results have been frequently overestimated, however their contribution could be reinforced in the future. With the present measures the reduction of emissions could be estimated in 1 $MtCO_2eq$. in 2010, but is expected to increase to 2.8 $MtCO_2eq$. in the subsequent decade.

	2000	2005	2010	2015	2020
Regulation and control of town centres' traffic	0.0	0.2	1.0	2.4	2.8

Cycle and motorcycle mobility is a category of a relatively low number of measures with the aim to reduce road traffic with potential cuts of emissions that are expected to reach 0.5 $MtCO_2eq$. in 2020.

	2000	2005	2010	2015	2020
Cycle and motorcycle mobility	0.0	0.0	0.2	0.3	0.5

Like other measures, also those of **general transport and logistic** are related mostly to the attempt, going on all over the last three decades, to improve alternatives to road transport, like rail and ship transport. The strong advantage of road transport as far as flexibility is concerned and the fact that Italy is becoming a transit of goods from producing to consuming markets, are reducing the potential effectiveness of these measures. The total effect of this category is estimated in 0.9 $MtCO_2eq$. in 2010.

	2000	2005	2010	2015	2020
General Transport and Logistics	0.2	1.1	0.9	0.9	0.9

The modernisation of the country, especially in the South of Italy, requires the expansion of infrastructures, among which those of transport. This is happening at local level, with municipalities adopting their Urban Mobility Plan, and at national level, with the construction of new infrastructure that will help to ease traffic congestion and to move a share of transport from road to rail and ships. These measures are expected to enable a reduction of CO_2 emissions of 1.8 $MtCO_2eq$. in 2010, growing in the following decade to 4.2 $MtCO_2eq$ in 2020.

	2000	2005	2010	2015	2020
Transport infrastructure	0.1	0.5	1.8	3.8	4.2

Additional measures to be introduced in the transport consist in the elimination of vehicles built before 1996 with emission over 145 gCO_2/km (9.0 $MtCO_2$eq. reduction), the implementation of the EU directive on biofuels (6.0 $MtCO_2$eq. reduction) and other measures aiming at strengthening public transport (4.5 $MtCO_2$eq. reduction).

	2005	2010	2015	2020
Elimination of vehicles built before 1996 with emission over 145 gCO_2/km	0	9.0	9.0	9.0
Use of biofuels	0	6.0	6.0	6.0
Measures for new infrastructures in public transport	0	4.5	4.5	4.5
Total additional measures	**0**	**19.5**	**19.5**	**19.5**

3.1.1.4 Tertiary and residential

As in the industrial sector, also in the residential the stricter quality standards of oil products accelerated the switch to natural gas at detriment of oil products and small volumes of coal. The resulting GHG emission reduction could be estimated in 2.4 $MtCO_2$eq. per year.

	2000	2005	2010	2015	2020
Ministerial Decree 29 September 1995 (fuel oil quality)	2.4	2.4	2.4	2.4	2.4

The improvement of building techniques and the use of more efficient materials is recognised to have huge impacts in the residential sector in Italy giving the relatively low level of efficiency in every kind of buildings. The first step in exploiting this potentiality was law 449/97 that gave fiscal incentive for expenses done to refurbish existing buildings. The resulting effect was more efficiency and a reduction of emission of 2 $MtCO_2$eq. per year.

	2000	2005	2010	2015	2020
Art 31 of Law 449/97 (building renovation)	2	2	2	2	2

In the same direction the decree 27 July 2005 implemented old measures foreseen already in 1991 with the law implementing the National Energy Plan concerning rules for the construction of new buildings. The resulting effect was a reduction of emission of 1.3 $MtCO_2$eq. per year.

	2000	2005	2010	2015	2020
Decree 27 July 2005 (new building energy efficiency)	0	0	1,3	1,3	1,3

The most important measure concerning energy saving in the residential sector was taken with decrees of 20 July 2004 concerning the obligation on electricity and gas distributors to promote energy savings projects among their customers. The measure, that also introduced a market for white certificates, will be boosted in the next years, but so far it will permit a reduction of emissions of 6.3 $MtCO_2$eq. per year.

	2000	2005	2010	2015	2020
Ministerial Decrees 20 July 2004 (energy saving)	0	2	6,3	6,3	6,3

The possible extension, beyond 2009, of the decrees introducing energy efficiency targets in final energy uses may result in a further GHG emission reduction amounting to 6.5 $MtCO_2$.

	2005	2010	2015	2020
Extension of the decrees introducing energy efficiency targets in final energy uses	0	6.5	6.5	6.5
Enforcement of EU Directive 2002/91/CE (Buildings Directive)	0	5.0	5.0	5.0
Total additional measures	**0**	**11.5**	**11.5**	**11.5**

3.1.2 Industrial processes

As already explained in Chapter 1, the Italian manufacturing industry has reduced by around 20% its energy efficiency, compared to 1990 levels, thanks to continuous technology innovation. Process emissions are also among the lowest in the industrialised world.

Similarly, despite a continuous increase in the use of F-gases in final domestic and commercial uses, emissions of these substances are already declining in some industrial applications, mainly driven by high prices of these chemicals. For instance, SF_6 emissions from electrical equipment have already declined from 21 t in 1995 to 10 t in 2005, and are expected to further decline to 9.1 t in 2010 and 7.3 t in 2020, despite the consumption of this substance has not changed over the period 1990-2005 and is not expected to reduce until 2020. This can be explained taking into account the continuous improvements in production processes, technology and materials, as well as the rapid replacement of installed systems with others characterised by lower emissions.

The measures already described concerning the reduction of N_2O emissions from the production of adipic acid, the containment of F-gases emissions and the reduction of emissions from the use of solvents have been included in the reference scenario, since they are based on the implementation of legislation already adopted at the EU or national level, or programmes already approved by industrial companies.

	2005	2010	2015	2020
Reduction of N2O emissions from adipic acid production	***0.00***	***6.35***	***6.74***	***7.16***
Implementation of EU legislation on F-gases	***0.00***	***2.8***	***> 2.8***	***> 2.8***

Further measures, which require specific support to be implemented, consist in the following intervention:

- adoption of the emission standard defined by BAT-TA Luft (2,5 $kgN_2O/tHNO_3$) for N_2O emissions from existing nitric acid production plants;

	2005	2010	2015	2020
Reduction of N_2O emissions from existing HNO_3 plants	0.00	1.40	1.48	1.57
Total additional measures	**0.00**	**1.40**	**1.48**	**1.57**

3.1.3 Agriculture

In the reference scenario, we have assumed that the implementation of the CAP reform will continue to influence the main driving forces of GHG emissions from the agricultural sector, that is livestock number, crop surface and production and the use of fertilizers. Furthermore, as already foreseen by the National Plan 2003-2010 for the Reduction of GHG Emissions:

- the implementation of the Code of Good Agricultural Practice (CGAP) may lead to a 5% decrease in the consumption of nitrogen fertilisers;
- covered lagoons to store animal waste, equipped with devices allowing collection and use of biogas will be adopted in new animal farms;
- the surface area devoted to organic farming may increase, on the basis of current trends, up to 4.7% in 2010 and 6.2% in 2020 of total agricultural area.

In the scenario with additional measures, we have assumed that:

- the impact of organic farming and CGAP may result in a 2% decline in the consumption of urea and in a further 5% reduction in the consumption of nitrogen fertilisers;
- all major cattle and swine breeding farms (including some existing ones) will be equipped with covered lagoons and will generate electricity from biogas.

	2005	2010	2015	2020
Reduction in the use of nitrogen fertilisers	0.00	0.20	0.41	0.41
Collection and use of biogas from animal waste	0.00	0.10	0.12	0.15
Total additional measures	**0.00**	**0.30**	**0.53**	**0.56**

3.1.4 Waste

As already explained in Chapter 2, the reference scenario already includes the effects of the implementation of current legislation, both national and EU, and of the availability of new MBT and incineration plants. The resulting trends in methane emissions from landfills are shown herebelow.

	1990	1995	2000	2005	2010	2015	2020
Total CH_4 generated by municipal landfills	797.7	968.4	1092.5	1125.1	985.2	908.9	838.9
Amount of CH_4 which is collected	164.7	217.2	279.7	439.5	504.8	507.3	510.2
CH_4 emissions from municipal landfills	633.0	751.2	812.7	685.6	480.4	401.5	328.7

In the scenario with additional measures, we have assumed that, beyond the targets set by directive 99/31/EC, 100% of biodegradable waste in 2015 and 2020 is pre-treated in MBT plants, before being disposed of into landfills (which further reduces the CH_4 generation rate from landfills).

	2005	2010	2015	2020
100% of biodegradabile waste pre-treated	0,00	0,00	2,13	1,70
Total additional measures	0,00	0,00	2,13	1,70

3.1.5 Land use, land use change and forestry

The National Carbon Sinks Registry is the basic tool for the issue and use of credits from afforestation/reforestation activities according to Article 3.3 of the Kyoto Protocol and from forest management activities according to Article 3.4 of the Kyoto Protocol.

As concerns credits from forest management activities under Article 3.4 of the Protocol, SBSTA conclusion FCCC/SBSTA/2006/L.6 and related draft COP/MOP2 decision (FCCC/SBSTA/2006/L.6/Add.1), revise the cap to credits from forest management for Italy in the first commitment period from 0.18 to 2,78 Mt C (10,2 $MtCO_2eq.$) per year times five.

	1990	2000	2005	2010	2015	2020
Forest land remaining forest land	45.5	65.2	72.1	73.2	74.6	75.8
Land converted to forest land (A/R)	11.3	12.4	12.9	13.3	13.6	13.9
Total forest land	**56.8**	**77.7**	**85.0**	**86.5**	**88.2**	**89.6**

3.1.6 Cross-sectoral policies and measures

The Allocation Decision for the period 2008-2012, which coincides with the first Kyoto Commitment Period, will set emission caps for the energy intensive sectors of the Italian economy. The basis for the 2008-2012 Allocation Decision is the National Allocation Plan (NAP) which is currently being finalized the by the Ministry for Environment, Land and Sea and by the Ministry of Economic Development and will be submitted for review by the European Commission. As the final Allocation Decision regarding 2008-2012 as well as the corresponding emission caps will be finalised only by the end of 2006/beginning of 2007, the 2008-2012 Allocation Decision is considered an "additional measures". Current expectations for the extent of GHG reduction associated with such measure is around 10.5 MtCO2/yr compared to GHG emissions from the same installations in the reference scenario.

3.2 USE OF THE KYOTO MECHANISMS

3.2.1 Institutional arrangements

- Government use of the project-based mechanisms

The target for government use of the project-based mechanisms is 100 Mt CO_{2eq} over the 2008-2012 commitment period.

The Ministry for the Environment, Land and Sea acts as National Authority (DNA) for CDM and as Focal Point for JI in Italy. To date, the Ministry has granted Letters of Approval to Italian companies for 8 CDM projects in China, Argentina, India and Nigeria.

- Clean Development Mechanism and Joint Implementation

A number of instruments are being deployed by the Italian Government in order to acquire Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs). Firstly, in order to stimulate the implementation of CDM and JI projects, voluntary and not legally binding Memoranda of Understanding (MoUs) have been signed with some Host Countries: Albania, Algeria, Argentina, Belize, Brazil, China, Congo Brazzaville, India, Israel, Macedonia, Morocco, Mexico, Montenegro, Nigeria, Panama, Russia, Serbia, Tunisia, Uruguay. Secondly, the Government is participating in the World Bank's Community Development Carbon Fund (CDCF) with a contribution of $7 million and in the BioCarbon Fund (BioCF) with $2.5 million. In addition, a partnership agreement has been signed with the World Bank for the establishment of the Italian Carbon Fund (ICF). The Italian Carbon Fund was declared operation in March 2004 and, to date, has a total capitalisation of $156 million.

As of October 2006, the Italian Carbon Fund contracted 18.2 $MtCO_2eq$, for a total value of approximately $135 million. Of this quantity, 13.5 $MtCO_2eq$ will be delivered in the period 2008-2012.

The Community Development Carbon Fund and the BioCarbon Fund will respectively deliver to the Italian Government 856.000 $MtCO_{2eq}$ and 412.513 $MtCO_{2eq}$ by 2012.

In order to reaffirm its commitment to ensure the efficient and effective functioning of the flexible mechanisms of the Kyoto Protocol, in particular the CDM, in 2005 a pledge of 1.000.000 US dollars (of which 500.000 US dollars already paid) was made to support CDM Executive Board activities.

- Activities Implemented Jointly

Italy acknowledges that Activities Implemented Jointly (AIJ), introduced by the first Conference of the Parties in 1995 to help gaining experience with crediting mechanisms for reducing greenhouse gas emissions, provide an important opportunity for learning by doing.

Under the AIJ-pilot phase Italy has supported one energy efficiency projects in Jordan (Efficiency Improvement in Power Plants) and one in Morocco (Mohammedia Residue Gasification and Combined Cycle Power Plant). Both initiatives aim at reducing greenhouse gases with the specific objective of investigating the feasibility for industrial countries to carry out emissions reduction projects in developing countries.

In particular, the project in Jordan targeted efficiency improvements at two oil-fired fossil stations as a means of reducing CO_2 emissions. Conservative efficiency savings estimates of up to 1.5% are expected thus producing five-year emission reductions of 172,000 Mg of CO2 and 4,100 Mg of SO2.

The Mohammedia power plant concerns the construction of a residue gasification and combined cycle power plant in Mohammedia Industrial Area (central Morocco). The project is expected to deliver 1.1 Mt reduction per year over a period of 20 years. It is a result of private-public cooperation between both Governments and several local and foreign private companies.

3.2.2 Decision-making procedures

Decision-making responsibility for CDM and JI lies with the Ministry for the Environment, Land and Sea. The projects needs to comply with the Ministry's CDM project criteria, the CDM requirements as defined in the Kyoto Protocol, the Marrakech Accords, the guidance provided by the CDM Executive Board, the approval criteria of the Host Country and the World Bank own project selection criteria and environmental and social safeguard policies.

3.3 CONTRIBUTIONS TO THE FULFILLMENT OF THE KYOTO PROTOCOL TARGET

A synthesis of the contributions to the fulfillment of the Kyoto Protocol target is provided in Table 3.1. As the revision of the government's strategy has not yet finalized, it has to be emphasized that, the information presented in such report is subject to slight changes.

Table 3.1 – Contributions to the fulfillment of the Kyoto Protocol target

	$MtCO_2eq/year$
Base-year GHG emissions	519.5
Kyoto target (-6.5% compared to base-year emissions)	485.7
GHG emissions in 2010 in the "with measures" scenario	587.3
Overall gap between the "with measures" scenario and the Kyoto target	101.6
GHG emissions in 2010 in the "with measures" scenario and including credits from JI/CDM already bought (about 4MtCO2/year)	583.3
Actual gap (including credits from JI/CDM already bought)	97.6
Contribution of additional domestic measures	52.8
Contribution of domestic LULUCF activities (art. 3.3/3.4 KP)	16.2
Contribution of the implementation of the EU-ETS	10.5
Credits from additional JI/CDM project activities	16.0

4. PROGRESS ON OTHER COMMITTMENTS

4.1 INTERNATIONAL ACTION ON CLIMATE CHANGE NEGOTIATIONS

The threats posed by climate change demand serious, concerted action by the international community. Italy considers the UNFCCC and the Kyoto Protocol as the right framework to develop such concerted action.
Italy provided its contribution to the process since the beginning of climate change negotiations leading to the UNFCCC and Kyoto Protocol and in order to reiterate its trust in UNFCCC and the Kyoto Protocol and to help the international process to implement the existing agreement in 2003 Italy hosted COP9.
Considering that deforestation represents a major contributor to anthropogenic CO2 emissions and that effective action to reduce deforestation could contribute towards achieving the objective of Article 2 of the Convention, in 2006 the UNFCCC workshop on reducing emissions from deforestation in developing countries was hosted in Rome as the Italian contribution to make progress on such important issue.

Italy makes contribution to the core budget of the UNFCCC annually, and as of 2005 Italy also make a contribution to the Kyoto Protocol fund. Italy also makes a variety of voluntary payments to the Trust Fund for Developing Country Participation and the Trust Fund for Supplementary Activities (see section 4.8 of the present document).

Italy also takes advantage of its cooperation activities undertaken on climate change to help the dialogue on climate change negotiations thus contributing to confidence building with the aim of securing a future agreement on climate change.

4.2 IMPROVEMENT OF THE NATIONAL GHG INVENTORY

The compilation of the National Air Emission Inventory is carried out by the Agency for the Protection of the Environment and for Technical Services (APAT) as single national entity for Italy. APAT is also responsible for the institutional, legal and procedural arrangements for the national system and for the strategic development of the national inventory.

In particular, as National Reference Centre of the European Environment Information and Observation Network (EIONET), APAT is required to prepare the national atmospheric emission inventory and the greenhouse gas inventory in order to ensure compliance with international commitments on the protection of the environment (Framework Convention on Climate Change, Convention on Long Range Transboundary Air Pollution, European Directives on emission ceilings). The complete GHG inventory is officially communicated to the Secretariat of the UNFCCC 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.

APAT 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.

In addition, there are different institutions responsible for statistical basic data and publication, which are primary to APAT for carrying out emission estimates. These institutions are part of a National Statistical System (SISTAN), which provides national official statistics. The National Statistical System (NSS) assures the homogeneity of the methods used for official statistics through a coordination plan, involving the entire public administration at central, regional and local levels by the Italian Decree No 322/89. The system is coordinated by the Italian National Statistical Institute (ISTAT) whereas other bodies belonging to the National Statistical System are the statistical offices of ministries, national agencies, regions and autonomous provinces, provinces, municipalities, research institutes, chambers of commerce, local governmental offices, some private agencies and private subjects who have specific characteristics determined by law. A national statistical plan (Piano Statistico Nazionale, PSN) which defines surveys, data elaborations and project studies for a three-year period is approved and updated every year by a Decree of the Prime Minister. The latest Prime Ministerial Decree of the Prime Minister, which approved the three-year plan for 2004 to 2006, was issued on 23 April 2004 (http://www.sistan.it/strum/adempimenti2005.doc).

The main SISTAN products, which are needed for the inventory compilation, are:

- National Statistical Yearbooks, Monthly Statistical Bulletins, by ISTAT (National Statistics Institute);
- Annual Report on the energy and environment, by ENEA (Agency for New Technologies, Energy and the Environment);
- National Energy Balance (annual), Petrochemical Bulletin (quarterly publication), by MAP (Ministry of Production Activities);
- Transport Statistics Yearbooks, by MINT (Ministry of Transportation);
- Annual Statistics on electrical energy in Italy, by TERNA (National Independent System Operator);
- Annual Report on Waste, by APAT.

The national emission inventory itself is also a SISTAN product.

Further description of the national system will be available in the document that APAT is drafting on behalf of the Ministry for the Environment, Land and Sea for the establishment of a robust national inventory system (building on the base of SISTAN), with a sound legal basis.

4.3 ESTABLISHMENT OF THE NATIONAL REGISTRY

The national registry under Article 7 of the Kyoto Protocol has not been established to date. However, Italy is operating its registry under Article 19 of Directive 2003/87/CE establishing the EU Emission Trading Scheme and according to Regulation No. 2216/2004 of the European Commission, which require national registries to be compliant with the UN Data Exchange Standards specified for the Kyoto Protocol. Italy's National Registry is currently linked to the other operational EU member states' National Registries by way of the European Commission CITL (Community Independent Transaction Log).

The Italian registry is based on the GRETA registry software developed by the UK Department for Environment, Food and Rural Affairs (DEFRA) and used by many other Member States. Currently, the development of this software adheres to the standards specified in Draft #7 of the UN DES document. Italy has had the registry systems tested successfully with the EU Commission on 6 February 2006; the connection between the registry's production environment and the CITL has been established on 13 March 2006 and the Registry has since gone live, starting on 28 March 2006.
The Directorate for Environmental Research and Development of the Italian Ministry for the Environment, Land and Sea is responsible for developing, operating and maintaining the national registry under Directive 2003/87/CE. At the moment the Directorate for Environmental Research and Development of the Italian Ministry for the Environment, Land and Sea, while having the full responsibility for developing, operating and maintaining the national registry under Directive 2003/87/CE, has decided to delegate such tasks to APAT.

4.4 MEASURES FOR ADAPTING TO CLIMATE CHANGE

4.4.1 – Expected impact of climate change

In Italy sectors identified as most vulnerable to climate change are agriculture, forestry, water supply, tourism, human health and the service industries, particularly the insurance sector. The coastal and alpine regions are the most vulnerable. An increase in sea level could aggravate damage to infrastructure, property and the tertiary sector in the coastal and lowland regions. In northern Italy soil degradation could take the form of increased erosion due to an increase in rainfall intensity and flooding, while in the south climate change could cause more severe drought, salinization, and nutrient loss. Increase in temperature as a result of climate change is likely to move ecological zones northwards by 40–300 km and upwards by about 100–200 m in the mountainous regions. Human health is expected to be adversely affected, causing an average increase of 27 deaths per annum across Italy if summer mean temperatures rise by 1ºC.

- Impacts on the coastal areas

Coastal areas are highly susceptible to sea level rise, that is expected to constitute an increasing threat in the future. Specific studies related to the Mediterranean sea show that a sea level rise could be slightly above 1 mm/year. A sea level rise of 0.20-0.70 metres has been projected to 2100.
The major coastal areas at risk of sea flooding are the Padano-Venetian, Versilia, Fondi and Pontina plains with negative effects on the tourism industry (as for the Padano-Venetian and Versilia plains) and on the production activities (as for the Pontina and Fondi plains), due to the loss of seashore and damages to infrastructures and services.

Other concerns for Italy in relation to projected climate changes have been identified as follows:

- loss of humid zones nearby rivers estuaries;
- salt water intrusion into coastal fresh-water beds, with adverse impacts on agriculture and fresh-water supply;
- coastal erosion.

- Impacts on rural areas devoted to production activities

Climate change might cause general soil quality degradation, with a degree of severity depending on the local territorial context. In particular, in Northern Italy land degradation will be mainly caused by run-off erosion due to the increase of intense precipitations and floods. On the contrary, in Southern Italy degradation will mainly be due to the erosion because of dryness, salinisation, and nutrients loss as a consequence of precipitations decrease and increase of droughts. To this regard a particularly negative effect is anticipated at local scale in Southern Italy, where both vegetation and territory are already experiencing a marginal water supply regime.

In the past decades weather extremes have adversely influenced yield results. One of the most remarkable was the heat-wave in 2003. High temperatures and long period with low or no precipitation led to droughts in large parts of Italy with consequent drop in crop yields (for example wheat yield in 2003 dropped between -3.5% and -10% compared to 2002[4]).
The consequences of 2003 heat-wave are especially relevant because the extreme situation in 2003 is an example of what could be the average climate in the long term future.

[4] Joint Research Centre (JRC) MARS project (Monitoring agriculture with remote sensing unit), 2003.

- Impacts on biodiversity and ecosystems

In general, climate change might cause an overall migration of ecosystems northwards and upwards for the mountainous areas: for example a 3°C increase in temperature, within the range projected for 2100, corresponds to a shift in species distribution of 300-400 Km to the north (in the temperate zones) or 500 m in elevation. Many species will have difficulties in responding to such rapid change by migration or adaptation and are likely to become more restricted in distribution or even extinct. Keeping into account the Italian oro-graphic and geo-morphologic complexity, the whole balance of the natural landscape will tend to change in relation to the different local adaptation capabilities. Under the above scenario, the share of stable plant species in 2100, compared with 1990, might range between 60-80% in Northern Italy and Apennines, 20-40% in the Mediterranean area, 40-60 in Southern Italy.

Current plant species richness in the Mediterranean area might be reduced over the twenty-first century because of the projected decrease in precipitation, more frequent forest fires, increased soil erosion and the lack of species that could replace those that are lost.

Forest ecosystems are vulnerable to an increase in soil aridity and to coastal modifications. The already observed increased dryness in Central-Southern Italy and the projected higher risk of forest fires makes the Italian forests more vulnerable to biotic and abiotic disturbances reducing their resistance and resilience.

As far as concern alpine and mountain environments, a shift of the ecosystems towards higher altitudes and the melting of glaciers induced by higher temperatures may also alter the hydro-geological cycle in the mountains, with repercussions on both the water balance of rain collecting basins and the stability of mountain slopes.

- Impacts on water supply

Both underground and surface water are vulnerable to projected climate changes, because water uses are steadily increasing whereas meteorological contributions are either stable or decreasing. The future anthropogenic pressure on water resources and water employment and management will become more significant due to climate change. The risk of floods will tend to increase as well as the risk of losing adequate water resources, particularly in Southern Italy exacerbating the already existing difference between the Northern and Southern parts of the country.

- Impacts on productive sectors and social well-being

Climate change might enhance the anthropogenic pressure on the hydrological resources with a greater availability of fresh water in the North of Italy in contrast to a shortage in the South, emphasizing the already existing differences and development chances between North and South. In addition to the water factor, higher temperatures and CO_2 concentrations will increase the agricultural production in the North and decrease in the South. The northwards migration of ecosystems will also affect agricultural production.

As far as concern impact on human health, it has been estimated that a 1°C increase in summer mean temperature would cause an average increase of 27 deaths (due to cardiovascular and respiratory diseases) across the country.

4.4.2 – Adaptation measures

As climate change impacts have being become more and more visible, adaptation to climate change impacts is gradually gaining importance on the political agenda.
The focus of climate change adaptation is on mainstreaming actions into sectoral policies rather than developing a stand alone adaptation strategy. In such respect relevant ministries, local government and specific authorities work in parallel in their respective areas.

Adaptation is developed in particular in the fields of coastal protection, agriculture, and desertification. MATTM is responsible for adaptation measures of national importance such as biodiversity, natural reserves, marine environment and assessment of environmental impact.
Only a few and site-specific economic assessments on adaptation exist in Italy.

Several actions have been undertaken in recent decades to adapt to climate change. As an example, the National Action Plan to Combat Desertification, approved in 1999, requires regions and watershed authorities to identify the most vulnerable areas and define strategies for prevention, mitigation and adaptation.

Several studies on the implementation of adaptation measures have been carried out for the agricultural sector, focussing on management of seeding and harvesting methods and on allocation of water resources. The results indicate that even moderate adaptation policies may considerably reduce agricultural damage caused by climate change. Correct market signals are cited as being important in modifying human behaviour for implementing appropriate adaptation strategies.

In 2003, a network has been established for the prevention of the health effects of heat-waves, coordinated and financed by the National Department of Civil Protection at the national level. In collaboration with a centralized data centre, the Department coordinates a network of experts from epidemiological departments, local health authorities and regional agencies of the environment and civil protection. At the municipal level, local centres coordinate the work. The implementation of this plan includes development of a forecasting model; identification of intervention plans for each city; identification of the network of organizations /services to be involved; and evaluation of the effectiveness of the system in preventing excess mortality. The heat/health watch/warning system (HHWWS) is to be improved and its operation to be expanded to other Italian cities.

4.5 SCIENTIFIC RESEARCH AND SYSTEMATIC OBSERVATIONS

4.5.1 General policy on research

Several Italian Institutions such as Universities, Public Research Agencies, Private Agencies and Consortiums are engaged in the research on climate change and its related fields (see Appendix A). At the government level, MATTM and MUR (Ministry of University and Research) research centres play a leading role, while other government bodies participate in related areas, for instance the Ministry of Agriculture on forestry policy, the Meteorological Service of the Italian Air Force on meteorology and the Ministry of Foreign Affairs in supporting international research initiatives. In addition to domestic sources, the EC is a major source of funding for research programmes in Italy.

Research programmes cover mainly the sciences of climate change and to a lesser extent climate vulnerability, impacts and adaptation. The activities are characterized by intensive participation in

international and European programmes (see paragraph 4.4.3) and by clustering in some national research programmes (see paragraph 4.4.2).

In 1999 Decree 381/1999 established a new research organisation, the National Institute of Geophysics and Volcanology (INGV), with a special focus on the scientific aspects of climate change and carbon sequestration using a geo-engineering approach.

In 2000, the *Inter-ministerial Committee for Economic Planning (Comitato Interministeriale per la Programmazione Economica, CIPE)* approved the *National Research Programme (Programma Nazionale per la Ricerca),* which set up the features for the ***Strategic Programme for Sustainable Development and Climate Change*** *(Programma Strategico Sviluppo Sostenibile e Cambiamenti Climatici)* to meet research needs in fields such as:

- study of the evolution of climate variability and its impacts on urban, agricultural and forestry sectors;
- regional studies of climate variability and regional modelling and impacts on water ecosystems, fishery resources, biodiversity and soil degradation;
- regional studies on vulnerability of coastal zones and impacts evaluations;
- monitoring, assessments, simulations and predictions of the evolution of the agricultural systems in relation to climate change;
- carbon-sinks;
- studies of the oceanic carbon cycle;
- sustainability of the renewable resources.

This *Strategic Programme for Sustainable Development and Climate Change* has been funded by the *Integrated Special Fund for Research* (*Fondo Integrato Speciale per la Ricerca, FISR)*. Furthermore, this Programme includes the creation of a new research infrastructure, the ***Euro-Mediterranean Centre for Climate Change,*** *(Centro Euro-Mediterraneo per i Cambiamenti Climatici, CMCC)*, which is a network of Public and Private Research Centres focused on research on climate change and impacts of climate change over the Mediterranean area. This *Strategic Programme for Sustainable Development and Climate Change* and the *CMCC* start to be operative in 2006 and will have duration of 3 years.

4.5.2 National research programmes

In view of the potential impacts of climate change on agriculture, tourism, water resources, biodiversity and economy in general, research on influence of anthropogenic on climate, climate variability and impacts on the environment has gradually gaining importance on the research agenda.

Italy has in INGV, ENEA and ICTP (Abdus Salam International Centre for Theoretical Physics) groups actively involved internationally in the global and regional modelling of the climate. The main activities are on:

- global climate simulations with coupled atmosphere- ocean models the SRES/IPCC also on the basis of emission scenarios;
- analysis of the regional scale patterns of the climate change based upon the coupled model simulations ensembles;
- development and implementation of a regional climate modelling system (RegCM) to be applied to the regional climatic simulations;

- internal variability, decadal and multi-decadal, of the Mediterranean Sea.

Activities in the field of impact studies are mainly concentrated on the study of the effects of sea level changes due to climate change in the Italian coastal areas. In the last years Italy has made a relevant progress in the field of ecosystem modelling: in particular, an ecological model of the Adriatic Sea has been developed in order to estimate the impact of climate change. Italy is active with international projects aimed to the reconstruction of the desertification history in the Mediterranean through the analysis of proxy data. Furthermore other activities are related to the study of the response strategies to desertification and mitigation strategies for the management of water and agricultural resources under an increased environmental, social and economic stress. Italy is also actively participating to the Framework Programme of the European Commission and to several international projects, with positive results.

Italian participation at research programmes Italy continues to be active with the Framework Programmes of the European Union, in particular the "Environment" programme. The Italian research groups have been quite successful in getting European funding. Examples for national projects are NITCAR, PianosaLAB, SOMIT, CLIMAGRI, SINAPSI, AERORG. International projects include: PREDICATE, DEMETER, EARLINET, FUTURE-VOC, CARBOEUROFLUX, CONECOFOR, RECAB, PRISM MEDACTION, MWISED, MEDRAP, PREDESODI, DESERTLINK, WEYBURN.

As far as concerns influence of anthropogenic on climate, the *NITCAR* project *(Nitrogen and Carbon Balance – Strategic Project CNR, 1998-2000)* aimed to investigate the most important determinants of carbon and nitrogen cycling in agricultural soils. The project focussed on basic processes from the cellular to the ecosystem scale providing new information on mechanisms involved in the regulation and control of Nitrogen and Carbon uptake by crops as well as on ecosystem balance between sources and sinks of Carbon.

The *SOMIT* project *(Soil Organic Matter in Italian Agricultural soils),* funded by the *Ministry of Education and Scientific Research* brought together scientists of several Italian Universities (Pisa, Udine, Bologna, Padova, Perugia e Palermo) and Research Centres (Firenze, Foggia) that have access to the data of long-term agronomic experiments involving different rotations, fertilization schemes and cropping systems. The project had a strong modelling component, whose aim was to simulate the trends of accumulation of Carbon in agricultural soils in response to the different treatments

As far as concern monitoring activities, the *PianosaLAB* project*,* funded by *Agenzia 2000 – CNR,* aimed to the monitoring of the C-balance of the Mediterranean terrestrial ecosystem of the Island of Pianosa, Central Italy. The project used advanced technologies to monitor gas exchange of a mosaic of land-uses including eddy covariance and CBL (Convective Boundary Layer) budgeting techniques. It was an integrated effort involving 4 Universities and 9 laboratories of the *National Research Council*

The *CLIMAGRI* project *(Climate Change and Agriculture, 2001-2003)* is an example of current research activities on the impacts of climate change in the agricultural sector. It was co-ordinated by the *Central Office of Agrarian Ecology* in Rome, and it was funded by the *Ministry of Agriculture*. Research groups from *CNR, UCEA*, the University and the *INGV* were involved in the project. The objectives of the project were:

- to define climate variation and variability on a national plan, in terms of supply of reliable quantitative data, with particular reference to the agricultural sector;

- to provide support to political management, both at national and international level, increasing the objectivity of the Italian scientific assertions in several climate-related events;
- to promote public awareness in terms of environmental protection;
- to strengthen agro-meteorological structures with particular reference to agro-meteorological database and the MIPAF forecasting modelling.

The SINAPSI project (Seasonal INterannual and decAdal variability of the atmosPhere, oceanS and related marIne ecosystems, 2001-2004) is an example of activities in the field of ecosystem modelling. It was a cooperation among CNR, ENEA, INGC, the universities, the Zoological Station and OGS aimed to the interdisciplinary investigation of climate change with particular reference to marine ecosystems.

Among activities to improve the understanding of impact of climate change on water resources it has to be mentioned a *study to define the interventions to combat desertification in a pilot area of the Sicilian region* was a cooperation between *ENEA* and *INEA (National Institute of Agrarian Economy)* in the frame of the activities set in the agreement between *ENEA* and the *Ministry for the Environment, Land and Sea*. A map of the sensitivity on a regional scale of the territory to desertification has been developed in conformity with the available data. Further investigations were carried out involving the inhabitants of two municipalities (Licata and Cammarata) through the adoption of the Social Involvement Laboratory methodology. Possible interventions to mitigate present-day phenomena have been presented and debated with the Municipal and Provincial Authorities for implementation.

4.5.3 National systematic observation programmes

A monitoring system for GHG concentrations has been established in Italy; this has brought to an innovative development of measuring technologies. Furthermore, several oceanographic ships are active in Italy for an extensive program of research cruises. Italian scientific activities in Antarctica are continuing with a focus on climate change issues. The groups involved in these activities are: ENEA (Ente per le Nuove Tecnologie, l'Energia e l'Ambiente), INGV (Istituto Nazionale di Geofisica e Vulcanologia), ISAC (Istituto di Scienze dell'Atmosfera e del Clima) of CNR, (Consiglio Nazionale delle Ricerche) CESI (Centro Elettrotecnico Sperimentale Italiano), and Servizio Meteorologico dell'Aeronautica Militare.

The ***National Research Program on Antarctica*** (*Programma Nazionale di Ricerche in Antartide*), focuses on the following themes:

- Past climate changes
- Climate process
- Biodiversity and adaptation
- Human adaptation to extreme environments
- Marine ecosystem
- Permanent observatories
- Antartica and the global tectonics
- Space climatology and astrophysics
- Technological innovation for scientific research

Italy is also a member of the *Group on Earth Observations (GEO)*, which will establish the *Global Earth observation system of systems (GEOSS)* and through several institution it plays a big role in the *Global Monitoring for Environment and Security*[5] *(GMES)* initiative.

Finally, the National Group for Operational Oceanography (GNOO) was created in order to consolidate and coordinate operational oceanographic activities. Its role is to improve the efficiency of the monitoring and forecasting system. The activities of the group fit into the activities of the Global Ocean Observing System (GOOS) and of the Coastal Ocean Observing Panel (COOP). They also contribute to the support of the GMES European Initiative. In this context, the National Institute For Geophysics and Vulcanology (INGV), which is part of the GNOO, has implemented a Mediterranean Forecasting System which provides public access to forecast bulletins.

4.6 COOPERATION IN SCIENTIFIC AND TECHNICAL RESEARCH AND PARTICIPATION IN INTERGOVERNMENTAL OBSERVATION

4.6.1 Cooperation in scientific and technical research

Research activities in Italy are also characterized by an intensive participation in international and European programmes. Some examples of such participation are described below:

- *ENSEMBLE (ENSEMBLE-based Predictions of Climate Changes and their Impacts, 2004-2009)* has the goal to maintain and extend European pre-eminence in the provision of policy relevant information on climate and climate change and its interactions with society. This goal is fulfilled by developing an ensemble prediction system based on the principal state-of-the-art of modelling at global and regional scale, validated against quality controlled, high resolution gridded datasets for Europe, to produce for the first time, an objective probabilistic estimate of uncertainty in future climate at the seasonal to decadal and longer timescales.

- *PREDICATE (Mechanisms and Predictability of Decadal Fluctuations in Atlantic-European Climate, 1999-2003)* was funded by the *European Union*, and the *INGV* took part in the project. This project aimed at satisfying the need for a deeper understanding of the interactions between ocean and atmosphere, and to provide reliable forecasts previsions on climatic fluctuations in the Atlantic-European area on a decadal scale.

- *DEMETER* (*Development of a European multi-model ensemble system for seasonal to inter-annual prediction, 2000-2003*) was funded by the *European Union*, and the *INGV* took part in the project. The main objective of the project was to develop an European ensemble multi-model for seasonal and inter-annual climate forecasts. In particular a set of multi-model ensemble hind-casts has been created by using the re-analysis data for initialisation and assessment. The predictability of such phenomena as El Nino, the North-Atlantic Oscillation and other European weather seasonal events has been assessed too. The data produced by the project will be used as inputs in applicative models for forecasting the probability distributions of agricultural crop yield in Europe, and prevalent diseases in the African tropical regions.

[5] GMES represents a concerted effort to bring data and information providers together with users, so they can better understand each other and make environmental and security-related information available to the people who need it through enhanced or new services.

- *EARLINET-ASOS (European Aerosol Research Lidar Network - Advanced Sustainable Observation System, 2006-2011)* is funded by the *EC*. *EARLINET-ASOS*, starting on the *European Aerosol Research Lidar Network (EARLINET)* infrastructure, consisting of 20 lidar stations distributed over Europe, will contribute to the improvement of continuing observations and methodological developments that are urgently needed to provide the multi-year continental scale data set necessary to assess the impact of aerosols on the European and global environment and to support future satellite missions. The expected outcome is the most comprehensive data source for the 4-D spatio-temporal distribution of aerosols on a continental scale. The Italian partners are the *CNR*, *University of Lecce*, *University of L´Aquila* and the *National Institute of Material Physics (INFM)*.

- FUTURE-VOC (Biogenic volatile organic compound (BVOC) emission of European forests under future CO_2 levels: influence on compound composition and source strength, 2000-2002) was funded by EC – Energy, Environment and Sustainable Development. The aim of the project was to predict changes in the emission of volatile organic compounds (VOCs) by the vegetation in response to changes in the climate and the increase in atmospheric CO2 concentrations.

- The *CARBOEUROFLUX* project (2000-2003) was funded by the *European Commission* and it was part of the cluster of *CarboEurope* projects aimed at quantifying carbon budget in the European continent, including Eurasia and the Amazon region. The *CarboEuroflux* project focused on daily monitoring activities, carried out in 30 monitoring stations, of the flows of carbon dioxide, water vapour and energy in different European ecosystems. In Italy 7 permanent stations monitor the Italian forest ecosystems and 2 stations monitor the grassland ecosystems in the Alps and in the Central Apennines. The parameters collected concern the carbon flows between natural vegetation and atmosphere, and the meteo-climatic and ecological parameters needed for the interpretation.

- *RECAB (Regional Assessment of Carbon Balance within Europe, 2000-2003)* aimed to bridge the gap between the local scale flux measurements and continental scale inversion models by a generic modelling effort and measurement program, focussing on a limited number of selected regions in Europe for which previous measurements exists. This Project used novel techniques to measure and simulate CO_2 fluxes at the regional scale, such as the *Sky Arrows ERA (Environmental Research Aircraft)*, which is a new innovative instrumentated aircraft capable of measuring surface fluxes using airborne eddy covariance technique.

- *PRISM project (2001-2004)*: this project was funded by the *EC* to set up an European network for the development and integration of global numeric models. The Italian partner was INGV.

- *MEDACTION* (2001-2003) aimed to develop an information and decision network on desertification-related issues in the Northern Mediterranean area to assist policy makers (both at local and European level) in their decision-making processes. The output of MEDACTION has been the result of a dialogue among different social entities, meaning that a large number of policy makers will be involved in the planning of land use change scenarios, management options and policies. The *Italian Institute of Agrarian Economy (INEA)* has been the Italian partner in this project.

- *MWISED* (*Modelling within-storm soil erosion dynamics, 1998-2001*), co-ordinated by *CNR-IGES* (Florence), was developed by 8 research groups, 3 of which from Italy, and it

investigated on soil erosion dynamics responsible for accelerating the desertification phenomenon, which could be unsustainable in particular climate change and soil management/use conditions. The results of the project have been partially summarised in the improvements of two erosion assessment models (*EUROSEM* and *EUROWISE*) and in an *applet Java* (SEI) for the evaluation of soil physical and hydrological properties in conformity with easily available soil profiles and a rain event simulation model.

- *MEDRAP – (Concerted Action of the European Commission, 2001-2003)* aimed at supplying scientific support to the formulation of a Regional Programme to combat desertification in Northern Mediterranean countries. The project has been co-ordinated by the *University of Sassari*.

- *PREDESODI* (*Integrated approach for sustainable management of irrigated lands susceptible to degradation/desertification*), co-ordinated by the *University of Palermo*, aimed at assessing salinization and desertification risks in irrigational areas, where high-salinity waters are used in clayey soils, susceptible to crevice formations. The project was based on the definition of measuring campaigns focusing both on the identification of endangered areas and on the determination of parameters and properties to validate models.

- *DESERTLINK* was funded by the *European Commission* with the participation of the *University of Basilicata* for Italy. The objective of the project was to revise and improve the use of desertification indicators, to develop and use a database of present-day indicators, and to select and apply desertification indicators in pilot areas. The Italian pilot area has been the AGRI basin (Basilicata region). The project accounted for the participation of local stakeholders to identify most suitable soil management methods to combat desertification.

- *WEYBURN (International Weyburn Carbon Dioxide Monitoring Project, 2001 - 2004)* was funded by the *EC* with the participation for Italy of the *INGV*, the *University "La Sapienza" of Rome* and the *University "Ca Foscari" of Venice*. It focused on the study of CO2 sequestration during enhanced oil recovery (*EOR*) activities carried out at Weyburn (Saskatchewan, Canada), and on the effects of CO_2 sequestration on the reduction of greenhouse gas emissions. It also attempted to promote greater international co-operation with regard to the research in the carbon management sector.

- *Italy-USA bilateral agreement (May 2003 – October 2006),* a cooperation has been carried out to promote scientific research on climate variability, its uncertainties, and ecological, technological and health implications in the frame of the *Bilateral Agreement* between Italy and USA.

- *Italy-Israel bilateral agreement (April 2003 – April 2007)*, under this framework several projects are being implemented with the involvement of the academic and business sectors. The activities cover a wide variety of topics, such as air pollution, coastal management, solar energy, desertification and water conservation.

As regards scientific co-operation for the transfer of know-how, the Directorate General for Cultural Promotion and Cooperation of the Italian Ministry of Foreign Affairs, in cooperation with the Ministry of Education, University and Scientific Research supports bilateral agreements with developing countries and countries with economies in transition include environment related issues, such as climate change, terrestrial, coastal and marine ecosystems and clean energies and are aimed at the exchange of information, methodologies and research approach.

Finally, technical and scientific institutions such as ENEA and CNR support scholarship programmes for researchers from developing countries and countries with economies in transition in the field of global environment issues.

Support is also given to the work of IPCC. Four Italian scientists contribute as authors/reviewers to the fourth IPCC assessment report.

4.6.2 Participation in intergovernmental observation: Italian participation in European projects and GMES Services Element

Several Italian institutional bodies participate in EU and ESA (European Space Agency) funded projects:

- *MATTM* participates as end user in the following two *ESA* projects in the context of GMES Forest Monitoring services*: 1) Support to national UNFCCC and Kyoto Protocol reporting on LULUCF activities; 2) Forest Monitoring for Sustainable Forest Management and for Environmental Issues & Nature Protection*
- *APAT* participates in *HYDROADRIA (Surface and groundwater monitoring system for the Adriatic area),* in *GEOLAND* and in *NETWET 2 (Networking Perspectives of Transnational Co-operation and Participatory Planning for Integrated Water Resources Management through the promotion of new forms of Spatial Governance)*
- The *CNR* and *INGV* participate in *MERSEA* and *EURO LIMPACS*
- The CNR and the *National Civil Protection Department* participate in *RISK AWARE (RISK-Advanced Weather forecasting system to Advice on Risk Events and management)*
- The *National Civil Protection Department* is part of the *user Groups* involved in The *Risk EOS ESA GMES Services Element*.

Italy participates also in organisations whose activities are potentially relevant to GMES such as:

- *European Environmental Agency (EEA)*
- *European Environmental Bureau (EEB)*
- *European-Mediterranean Seismological Centre (EMSC)*
- *European Sea Level Service (ESEAS)*
- *European component of Global Ocean Observing System (EUROGOOS)*
- *European Centre for Medium-Range Weather Forecasts (ECMWF)*
- *Europe's Meteorological Satellite Organisation (EUMETSAT)*
- *Network of European Meteorological Services (EUMETNET)*

4.7 COOPERATION WITH DEVELOPING COUNTRIES IN ADAPTING TO CLIMATE CHANGE AND MITIGATING CLIMATE CHANGE

The protection of the environment is a global commitment: this is one of the principles that shall constitute the basis for the government's political strategies throughout the world. This represents the warning emphasized by the international community at the World Summit on Sustainable Development. Italy accepted the challenge by promoting both bilaterals with developing countries and countries with economy in transition and partnerships with institutions, enterprises, NGO, research Institutes, Universities and many other subjects, that offered economic resources and advanced technologies.
To this end the Law 1 June 2002, ratifying the Kyoto Protocol, allocated 68 millions Euro/year by 2003.

4.7.1 Multilateral cooperation on climate change

Italy cooperates with various multilateral partners such as UNEP, UNDP, the World Bank and the GEF. In particular, in 2004 the Ministry for the Environment entered into an agreement with the World Bank to create a fund to purchase ERs from projects that both benefit the global environment and transfer clean technologies for sustainable development to developing countries and countries with economies in transition. Until now the fund has a capitalization of 156 milion USD, of wich 110 milion USD from the Italian Ministry for the Environment. It has a portfolio of around 30 projects in various developing countries for a total amount of contracted emissions reductions of 35 million tons CO2 equivalent.
The GEF, in the period 2001-2006 received around 58 million Euro as a financial contribution from Italy for its activities related to climate change. In the year 2003, Italy started its financial support to the new climate change funds by giving 780.000 euro to the LDC fund. In 2006, Italy announced its contribution of 1,5 additional million USD in support to the LDC fund and decided to pledge 10 million USD for the Special Climate Change Fund.

4.7.2 Bilateral cooperation programmes on climate change

Within the Multilateral Environmental Agreements the Ministry for the Environment, Land and Sea implemented in the years 2001-2006 almost 237 projects with more than 45 countries. The objectives are various and ambitious: efficient use of energy and water resources, promotion of renewable sources, professional training and exchange of know-how, promotion of eco-efficient technologies.
Among its major cooperation activities the Ministry for the Environment, Land and Sea is developing cooperation programmes with China, with the Mediterranean region through the MEDREP (Mediterranean Renewable Energy Programme) and with the Central and Eastern European countries.

- Developing countries

The Italian Ministry for the Environment, Land and Sea started its Environmental Cooperation Programme with the People's Republic of China in 2000. Under this programme, 57 projects have so far been developed for environmental monitoring and management, strengthening Chinese national and local institutions, protecting and conserving natural resources, water management, waste-to-energy, developing renewable energy sources, energy efficiency, sustainable urban planning, environmental protection in the poorest regions, developing low-emission transport systems and technologies, sustainable agriculture, biodiversity protection, and forest management. Almost 32 projects are strictly related to climate change activities and have been identified in terms of the objectives and programmes established in the United Nations Conventions on climate change.

Within this cooperation programme since 2001, the Italian Ministry of the Environment and Territory has been co financing projects for 121 million Euro in the form of direct grants and the use of the Trust Funds established at the World Bank and Multilateral Funds. The Chinese institutions have co financed projects for EUR 24 million, Italian businesses have provided 25 million Euro for the cooperation programme, and the United Nations Foundation, the United Nations agencies - UNEP, UNDP, UNIDO, - the Global Environment Facility, the World Bank and the Multilateral Fund for the Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer have contributed 29 million Euro. Projects for approximately 190 million Euro

have so far been financed.

1800 Chinese experts have taken part in a training initiative promoted by the Italian Ministry of the Environment, Land and Sea concerning the implementation of the Kyoto Protocol.

The Mediterranean Renewable Energy Programme (MEDREP), launched by Italy has been developed to reduce the cost of renewable energy by expanding markets and creating a strong market environment for renewable energy. The two principal objectives of MEDREP are to:

- provide sustainable energy services particularly to rural populations; and
- contribute to the climate change mitigation by increasing the share of renewable energy in the energy mix of the Region.

Within these objectives, the programme aims to develop a sustainable renewable energy market system in the greater Mediterranean Region through three main activities:

- Tailoring financial instruments and mechanisms to support renewable energy projects;
- Strengthening policy frameworks and overcoming barriers to renewable energy deployment; and
- Building stronger private sector infrastructure while considering the positive role of "Tradable Renewable Certificates" and "Certified Emission Reductions".

Until today 28 projects have been developed with a total financial contribution from the Ministry for the Environment of 37 million Euro. Around 21 projects are strictly related to mitigation and adaptation activities on climate change.

Among its other bilateral activities the Italian Ministry for Environment is promoting several projects in Latin America and the Caribbean. In particular in Belize the regional Centre on Climate Change has been created. Its aim is to analyse the climate conditions of the Caribbean region, identify the measures to forecast extreme natural events and protect the small islands. In Brazil projects for the development and promotion of technologies for the use of solar energy and for the cultivation and use of biomass for energy production have been implemented. In Cuba, the Caribbean Risk Management Initiative has been co financed by the Italian Ministry for the Environment. The CRMI is designed to build capacity within the Caribbean region to adequately address the growing occurrence of natural hazards and environmental risks as well as to emphasize the concept of climate change and social vulnerability. The activities for the Initiative are implemented via the UNDPs' offices in Cuba, Barbados, Dominican Republic, Haiti and Jamaica.

In Thailand, the Italian Ministry for Environment promoted the "**C**oastal **R**isk **A**nalysis of **T**sunamis and **E**nvironmental **R**emediation" (CRATER) project, that aims at approaching and managing emergency efforts following tsunami events. This tool is applicable in many parts of the world with respect to the analysis of the coastal risks arising from tsunami impacts. CRATER prepares a numerical model about the movement of the Tsunami wave(s) toward the coastline; develops real time tsunami forecasting systems; assess potential damage on the coastline and screens a list of possible risk management alternatives, such as early warning systems. The project also defines reconstruction/remediation programs.

- Central and Eastern Europe

The Task Force for Central Eastern Europe, established permanently in Belgrade in 2004 by the Italian Ministry for the Environment, has been developing and coordinating the activities in the framework of environmental cooperation in different countries in the Balkans region and in the Eastern Europe, with the engagement of both Italian and Serbian experts.
Until today 53 projects have been implemented in Albania, Bosnia, Croatia, Bulgaria, Serbia, Montenegro, Macedonia, Poland, Romania, Turkey, Hungary, Kyrgyzstan and Tajikistan. The projects aim at:

- strengthening local and national capacities on environmental governance,
- transferring know how and technologies to prevent and control environmental pollution and water management,
- promoting renewable energy and energy efficiency.

The Italian Ministry of the Environment, Land and Sea has also organized a training course on the Kyoto Protocol for 500 experts from countries in Central and Eastern Europe.

In particular interesting activities carried out in this geographical area is the cooperation between Italy and Serbia which aims at supporting:

- the environmental governance and management in the public and private sectors;
- the identification of the environmental risks and "hot spots" in the industrial and urban areas;
- the implementation and the compliance with the international environmental Conventions and Protocols, starting from the Kyoto Protocol;
- the promotion of the best available technologies in reducing the consumption of the natural and energy resources, in protecting the water and air quality, in managing the urban and hazardous wastes;
- the use of renewable energies, to address the internal energy demand, using the innovative market mechanisms like the CDM under the Kyoto Protocol and Green Certificates according to the Italian energy regulations.

Furthermore, the Italian Trust Fund (ITF) was established in 2001 as a targeted contribution of the Italian Ministry for the Environment Land and Sea to the Regional Environmental Center for Central and Eastern Europe (REC).
The ITF operates within the framework of environmental improvement and cooperation in the countries of Central and Eastern Europe (CEE) developing projects, inter alia, in the following areas: renewable energy; sustainable agriculture; technical support in Central and Eastern Europe and South Eastern Europe; assistance to NGOs; support to international conventions; climate-change protection.

4.8 FINANCIAL RESOURCES AND TECHNOLOGY TRANSFER

Italy is well aware of the importance of technology based international cooperation and partnerships and provides support on climate change related technology transfer through its bilateral and multilateral activities and a range of different programmes. Most of such activities and programmes are described in section 4.7 of the present document. These activities will contribute to the Italian commitment to aid other countries address the challenge of climate change through the take-up of cleaner technologies. Table 4.1 shows the financial contributions of the Italian Government to the international cooperation on climate change. To this regard it should be underlined the recent contribution to the Special Climate Change Fund established under the UNFCCC of $ 10 million made in order to contribute, inter alia, to ensure adequate follow up on the further development and implementation of Technology Needs Assessment by developing countries as well as 1.5 million USD to the LDC fund.
Among the bilateral activities, the most relevant ones for the transfer of technologies are the Italian-Chinese agreement and the Italian-India agreement.

Among multilateral activities, a special mention has to be made regarding the active involvement in the field of renewable energies: in 2002 Italy launched the Mediterranean Renewable Energy

Programme (MEDREP) with the aim to promote renewable energies in the Mediterranean region and in 2006 the international partnership on bioenergy with the aim to promote the use of bionergy technologies. The Global Bionergy Partnership (GBEP) is aimed to enhance cooperation activities related to production, delivery, conversion, use and trade of bioenergy. Italy is chairing the GBEP and has also financed its Secretariat in FAO in Rome.

Italy also supports the Methane to Markets Partnership to develop strategies and markets for methane recovery (Landfill methane, coal mine methane, oil and gas systems) via research and development, demos, policy frameworks etc. and the International Partnership for Hydrogen Economy (IPHE) to accelerate the transition to a hydrogen economy.

In addition Italy participate in several multilateral programmes launched by IEA (IEA Advanced Fuel Cells, IEA Advanced Motor Fuels, IEA Assessing the Impacts of High Temperature Superconductivity, IEA Clean Coal Sciences, IEA Demand Side Management, IEA Energy Conservation and Emissions Reduction in Combustion, IEA Energy Conservation Through Energy Storage Develop, IEA Fluidized Bed Conversion, IEA Geothermal, IEA Hybrid and Electric Vehicles, IEA Hydropower, IEA Photovoltaic Power Systems, IEA Solar Heating and Cooling, IEA Wind Energy Systems, IEA Hydrogen).

Table 4.1 - Financial contributions from the Italian Government to the international cooperation on climate change (Euro)

	2001	2002	2003	2004	2005	2006[6]*
Bilaterals	1,318,572	11,650,592	24,182,477	40,261,143	49,561,272	35,628,503
Multilaterals	1,427,158	1,540,931	27,050,380	12,211,282	32,149,787	56,276,838
Contribution to the GEF	5,371,152	7,230,397	4,957,986	4,957,986	35,670,000	10,403,750
UNFCCC new fund			780,001			**9.051.558**
TOTAL	**8,116,883**	**20,421,919**	**56,970.845**	**57,430,412**	**117,381,059**	**111,360,648**

Italy makes contribution to the core budget of the UNFCCC annually, and as of 2005 Italy also makes a contribution to the Kyoto Protocol fund. Italy also makes a variety of voluntary payments to the Trust Fund for Developing Country Participation and the Trust Fund for Supplementary Activities (see Table 4.2).
Italy contributed to the IPCC with 150,000 Swiss Francs in 2001 and 373,200 Swiss Francs in 2004.

Table 4.2 – Italy payments to the UNFCCC 2001-2006 (US dollars)

	2001	2002	2003	2004	2005	2006
UNFCCC core budget	561,821	806,812	644,522	797,058	785,352	746,872
UNFCCC Trust	-	86,986	1,142,640	-	216,938	500,000

[6] In the year 2006 the indicated financial contributions are only from the Ministry for the Environment.

Fund for Supplementary Activities						
Trust Fund for developing country participation	-	-	-	340,000	-	-
KP Fund	n.a	n.a	n.a	n.a.	334,484	589,647
TOTAL	**561,821**	**893,798**	**1,787,162**	**1,137,058**	**1,336,774**	**1,836,519**

4.9 INFORMATION, AWARENESS RAISING AND PUBLIC PARTICIPATION

Formal education and training, including on environment and climate issues, depend on decisions autonomously taken by schools and universities at the regional level, under the general responsibility of the Ministry for Public Education (MPI).

MATTM takes a leading role in promoting and funding environment-related education, training and raising of public awareness. Governmental agencies, regional and local administrations, NGOs and the mass media are also active in this field.

In 1999, CIPE established a three-year information programme on climate change which contains a number of effective actions that have been taken by Italian institutions, including the dissemination of information on their work in climate change by central ministries, governmental agencies, local authorities, the private sector and NGOs.

ENEA (the National Agency for New Technologies, Energy and Environment) is particularly active in promoting public awareness and spreading information concerning energy efficiency and renewable energy sources. On the basis of law 10/91, ENEA also organises training courses for energy managers. In 2002, ENEA has established a climate museum in Arenzano for public information and awareness raising.

In 2006, MATTM and MED (Ministry for Economic Development) have launched an information campaign on energy conservation and clean energy sources, with the support of APAT and RENAEL, Italy's network of local energy agencies. Local electricity and gas distributors have been particularly active in this field, after the entry into force of the national scheme for white certificates, which provides credits for the implementation of actions aiming at improving energy efficiency in final uses.

On September 2006, MATTM launched the Campaign "Sustainable Energy Europe – SEE" in Italy. The SEE campaign is an initiative of the European Commission to raise awareness and to change the landscape of energy. With this campaign MATTM wants to implement the sustainability at local level (rural, urban, island areas) as visible demonstration of the change of the energy – environmental policy in the framework of activated Concerto/Sustainable Communities projects, in cooperation of SEE campaign partners under activation and in the framework of the implementation of the national Kyoto target.

Public participation in developing policies and measures has been promoted at the local level by ICLEI (International Council for Local Environmental Initiatives), Climate Alliance and the Coordination of Local Agenda 21.

As concerns training on climate-related issues, the University of Tuscia in Viterbo has organised in 2006 a Master in Protection of the Global Environment and International Policies; the master has been supported by the Ministry for the Environment, Land and Sea. The objective of this master is to develop skills in environmental negotiation and multilateral treaties on global environment issues, as well as to improve the capacity of students to develop concrete projects related to international environmental agreements.

Italian-based international NGOs, local environmental NGOs and associations launched a series of climate campaigns aimed at specific groups for actions and at the general public for awareness on negotiations under the UNFCCC. Since 2000, they have also been engaged in educational efforts at secondary school level for actions to reduce GHG emissions.

APPENDIX A - MAIN ITALIAN SCIENTIFIC INSTITUTIONS AND ORGANISATIONS ACTIVE ON CLIMATE CHANGE

> National Institute of Geophysics and Volcanology (INGV - Istituto Nazionale di Geofisica e Vulcanologia)

- web site: www.ingv.it, www.bo.ingv.it
- scope of research: national and International;
- activities: climate studies (global climate scenarios, theoretical studies, global stratosphere modelling), marine studies (ecological modelling and operational oceanography), volcanology, seismology and active tectonics.

> Italian National Agency for New Technologies, Energy and Environment (ENEA - Ente per le Nuove Tecnologie, l'Energia e l'Ambiente)

- web site: www.enea.it
- scope of research: national and International;
- activities: Basic and applied research in the fields of energy, environment and new technologies to support competitiveness and sustainable development, including: solar thermo-dynamic, hydrogen and fuel cells, global climate biotechnologies, protection of health and ecosystems, renewable energy sources and innovative energy cycles, advanced physics technologies, TRADE - TRIGA accelerator driven experiment, fusion, protection and development of the environment and territory and environmental technologies, materials and new technologies, Antarctica, radioactive waste management, protection from ionizing radiations, computing and modelling, sustainable development.

> Institute of Atmospheric Sciences and Climate - Italian National Research Council (ISAC - Istituto di Scienze dell'Atmosfera e del Clima – Consiglio CNR - Nazionale delle Ricerche)

- web site: www.isac.cnr.it
- scope of research: national and international;
- activities: Research, promotion and technology transfer in meteorology and its applications, climate change and predictability, atmospheric structure and composition, and observations of the planet Earth.

> **Environmental Protection and Technical Services Agency (APAT - Agenzia per la protezione dell'ambiente e per i servizi tecnici)**

- web site: www.apat.gov.it
- scope of research: national, international;
- activities: Water management, Air quality monitoring, Environmental emergency management, Research on Renewable energy, Research on Industry, technology, Infrastructure, Noise and electromagnetic pollution monitoring, Green Market, Nature and biodiversity protection, Global Atmosphere protection, Radioactivity and radiations monitoring, Waste management, Soil and territory protection, Sustainable Development.

> Abdus Salam International Centre for Theoretical Physics (ICTP)

- web site: www.ictp.it
- scope of research: International;
- activities: Research in the disciplines: applied physics, condensed matter and statistical physics, high energy, cosmology and astroparticle physics, mathematics, earth system physics including: Aeronomy and radiopropagation laboratory, Physics of Weather and Climate, Structure and Nonlinear Dynamics of the Earth, soil physics, and energy and environment.

> National Interuniversity Consortium For Marine Sciences (CONISMA - Consorzio Nazionale Interuniversitario per le Scienze del Mare)

- Local Research Unit: Department of Geological Sciences and Geotechnologies - Milano-Bicocca)

- web site: www.geo.unimib.it/Conisma
- scope of research: national and International;
- activities: Climate variability during the Eemian: Mediterranean paleo-ecosystem dynamics, The impact of the large explosive eruptions on environment and climate: Campanian Ignimbrite the most powerful eruptions of the last 200,000 years in the Mediterranean area.

> ENI Enrico Mattei Foundation (FEEM - Fondazione ENI Enrico Mattei)

- web site: www.feem.it/Feem/Func/Overview/default.htm
- scope of research: national and International
- activities: No-profit, no-partisan research institution carrying out research in the field of sustainable development. FEEM also supplies technical support and advice to the public and private decision-making process in the economic and environmental field.

> Institute of Biometeorology of the National Research Council (IBIMET CNR – Istituto di Biometerologia)

- web site: www.ibimet.cnr.it
- scope of research: International;
- activities: scientific research and training in the field of meteorology, climatology and their applications such as agro-meteorology, remote sensing and environmental analysis.