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STRATEGIES AND RESEARCH TOWARDS LCS IN ITALY

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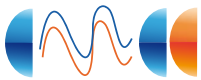
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SUMMARY The report offers an outline of the main low carbon society (LCS) activities undertaken by the Italian government and of what is still missing in order to complete the transition. In detail, it provides an overview of how the debate is framed in Italy as well as the citizens' perception and awareness about this issue. A sectoral analysis of the main actions undertaken is introduced by the challenges given the country's specific economic and social features. While analysing local actions, proactiveness emerges at the Municipal, Provincial and Regional levels. This provides good practice examples, as much as in international cooperation programmes and projects, which are strong parts of Italy's commitment to LCS. Finally, an overview of the main research centres and activities is given together with an analysis of their involvement in the policy-making process.

Keywords: low carbon society, transition, emission reduction, Italy

JEL: I28, K32, O13, O38, Q01, Q54, Q55, Q58

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INTRODUCTION

Italy in the International and European context: how is the debate over LCS framed?

In Copenhagen, Italy followed the European position which aims at limiting a global average temperature increase to below 2°C above pre-industrial levels by means of an international agreement. Additionally, as a G8 country, it sought to work with the other developed countries to lower emissions by 25-40% by 2020, and 80-95% by 2050, with respect to 1990, towards a low carbon world.

As a member of the European Union, Italy is committed to the Kyoto Protocol, where its burden-sharing goal is equal to -6.5% with respect to 1990 emission levels for the period 2008-2012. Even if Italy rapidly prepares and implements a comprehensive strategy of domestic measures, among the EU 15 Member States, it needs to achieve further emission reductions from domestic policies through both/either the use of Kyoto mechanisms and/or removals from carbon sink activities, in order to meet its target (EEA, 2009).

For the long-term low carbon vision, the European Union's (EU) Climate Action and Renewable Energy Package¹ greatly increases the challenge facing Italian policy makers. The 2020 targets relating to greenhouse gas (GHG) mitigation, renewable energy and energy efficiency will strongly influence its path towards a low carbon society. On the basis of this package, Italy will have to reduce emissions from the sectors outside of the EU-ETS by 13% below 2005 levels by 2020. In addition, under the Directive there is a target for 17% of Italy's energy consumption to be from renewable sources by 2020, and a 10% target for renewable energy in transport.

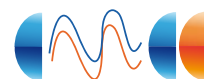
Last June, Italy sent the EU Commission its National Renewable Energy Action Plan where it

clearly stated the country's energy consumption by 2020, defining a target covering 17% (in line with the EU request) of renewables (progressing from the 5% share of renewables five years ago). Reaching the new target will require a large amount of effort and Italy will have to buy green energy abroad for about 1.2 Mtoe (according to the EU Commission², Italy will experience the biggest shortage of domestically produced renewable energies). However, the government is calling for a revision of the 2020 targets - as recently witnessed by the Senate's action against the EU package (February 2010)³ - since it often judges the goals too difficult for the country to achieve.

Despite the presence of numerous and high-level research centres, uncertainties inherent to climate change discussion constitute one of the major challenges in Italy regarding the development of strong and continuous LCS activities.

National Climate Change Strategy: short and long-term planned strategy to fulfil its commitments

After the Kyoto Protocol was ratified in 2002, an overall national climate change strategy according to the indications provided by the ratification law was approved (CIPE deliberation 123/2002). The strategy identifies policies and measures mainly aimed at: (1) increasing energy efficiency and fostering the use of renewable energy sources; (2) increasing carbon dioxide removals deriving from land-use, land-use changes and forestry; (3) implementing the Clean Development and Joint Implementation mechanisms; (4) fostering R&D work in order to promote hydrogen as a main fuel in energy systems and in the transport sector (5) and promoting the construction of biomass plants, solar thermal, wind and photovoltaic, waste and biogas-fuelled power plants (Ministero dell'Ambiente e della Tutela del Territorio e del Mare - MATTM, 2009).



In compliance with EU Emissions Trading Directive 2003/87/CE, in April 2006, Italy adopted the Decree 4/4/2006 n° 216, which established emission reduction obligations for its 1100 industrial installations. For this purpose, the Italian Ministry for the Environment, Land and Sea, through the adoption of National Allocations Plans, carries out the allocation of emission allowances. With the first National Allocation Plan, the Italian government allocated an annual average of 223.2 Million tCO₂ between 2005-2007 (MATTM, 2006). In the following National Allocation Plan (2008-2012), finalised in early March 2008, Italy planned to allocate an annual average of 201.63 Million tCO₂ emissions (Ministro dell'Ambiente e della Tutela del Territorio e del Mare e Ministro dello Sviluppo Economico, 2008). This plan will make it possible to cut the 13.65 Million tCO₂ emissions currently needed to achieve the Italian Kyoto target.

The White Certificate system is one of the key instruments that Europe foresees to support energy efficiency improvements. It does not replace existing policies and measures but rather complements them. The White Certificate system is a representative of a set of market-based instruments in the European internal market, and builds upon experiences with similar types of systems like the EU-ETS and the Green Certificates system (tradable commodity proving that certain electricity is generated using renewable energy sources).

The Green Certificate system supports the development of new renewables capacity (IEA, 2009a). Its notable achievements include the reorganisation and continued reform of the electricity and natural gas sectors as well as the implementation of incentive systems for renewable energy. Other accomplishments include new investments in carbon capture and storage (CCS) research, development and deploy-

ment schemes, and the adoption of simplified planning procedures for essential new energy infrastructure (IEA, 2009b).

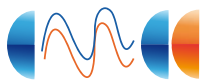
With regard to these instruments, the Italian government has made substantial progress in a number of sectors. The most important Italian cross-sectoral initiative is represented by the White Certificate, which was adopted in 2005. It aims at promoting energy efficiency and delivering emission reductions in every sector using energy (Bertoldi and Rezessy, 2006). This legislation also improves the energy performance of buildings, as well as strengthening their thermal demand requirements.

Who is responsible?

The Central Government is mainly responsible for the implementation of the Kyoto Protocol and the delivery of the agreed emissions reduction. A National Competent Authority (Italian Ministry for the Environment, Land and Sea, Ministry of Economic Development, Ministry of European Affairs and of Regions - the latter two with consultative functions) was established in order to implement the Directive 2003/87/CE, to coordinate emissions reduction efforts, to increase participation in the Kyoto mechanism (integrated with representatives of the Ministry of Foreign Affairs), and to assign allowances to plants covered by the EU ETS Directive.

The approval of the national programme for GHG emissions reduction is given by the Inter-Ministerial Committee for Economic Planning (CIPE, chaired by the Ministry of Economy); while financial support and legislative instruments are both identified through the Financial Law, and are then allocated at the central and local bodies with respect to their competences.

The Ministerial Technical Committee (CTE), established in 2002 (CIPE deliberation 123/2002) is responsible for policy monitoring and evaluation. The CTE reconstituted integrating repre-



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representatives of the Prime Minister's office in 2009, in order to enhance its institutional framework (CIPE deliberation 16/2009). It includes representatives from the Ministries of Economy, Economic Development, Agricultural, Food and Forestry Policies, Infrastructures, Transport, University and Research, Foreign Affairs. The Italian Ministry for the Environment, Land and Sea leads the committee. Its main tasks are monitoring and implementing the policies and measures outlined in the overall national strategy as well as identifying further potential measures to meet the Kyoto Protocol target. On this basis, CTE proposes an update of the strategy to CIPE.

Although the Central Government is mainly responsible, regional and municipal authorities are playing a major role in the promotion and definition of the low-carbon Italian pathway, and they have concurrent responsibilities in many affected sectors (e.g. energy production, transport and distribution).

COUNTRY PROFILE

Existing LCS actions along with a comprehension of the challenges affecting Italy's transition to a low carbon society, has to be seen within the broader context of its particular economic and social dimensions.

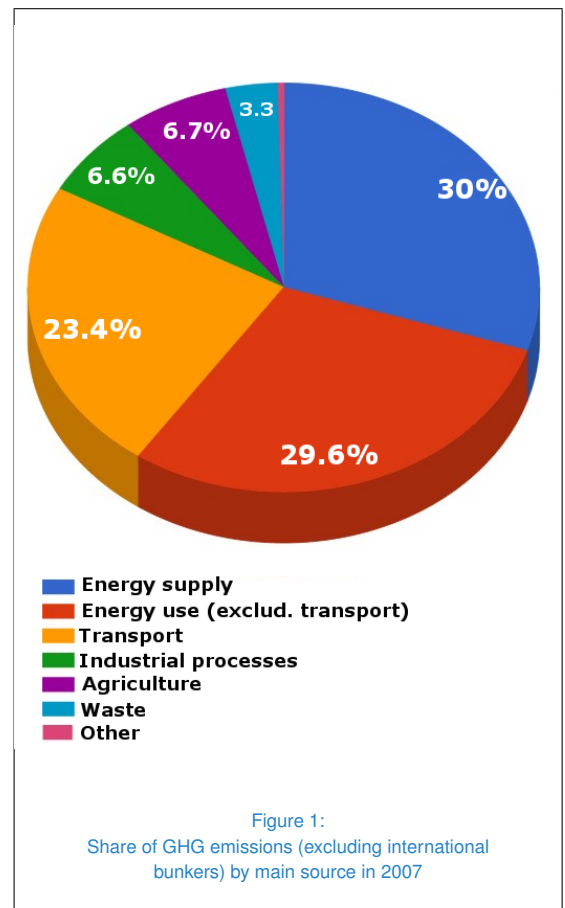
Economic profile and social dimension

Italy is the world's seventh largest economy; in 2008, the GDP at current prices was 1,572,243 million euros against 1,544,915 million euros in 2007 (MATTM, 2009).

The Italian population was of over 60 million at the end of 2008, with an increase of 0.7% compared with 2007. Italy's total CO₂ emissions including LULUCF were 500,361 Gg CO₂-eq in 2007, while in 2008, they decreased to 454,187 Gg CO₂-eq (UNFCCC Time Series-Annex I).

Finally, Italy's per capita emissions were equal to 9.3 in 2007, well below the EU-15 and EU-27 average both in 1990 and 2007 (Table 1).

In 2007, the greatest part of total GHGs emissions was attributable to the energy sector, with a percentage of 83%, (Figure 1) including transport (MATTM, 2009).



Source: IEA Energy Statistics, 2009.

Compared with other European countries, Italy's energy primary consumption is characterised by a major use of oil and gas, structural electricity imports, a weak coal contribution and the absence of nuclear power (Andrews and Karaisl, 2010). The share of renewable energy in the energy supply mix is higher than the OECD's average, mostly due to hydroelectric power, which has always historically repre-

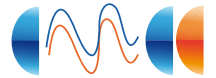


Table 1
GHG emissions per capita (tCO₂-eq/per capita)

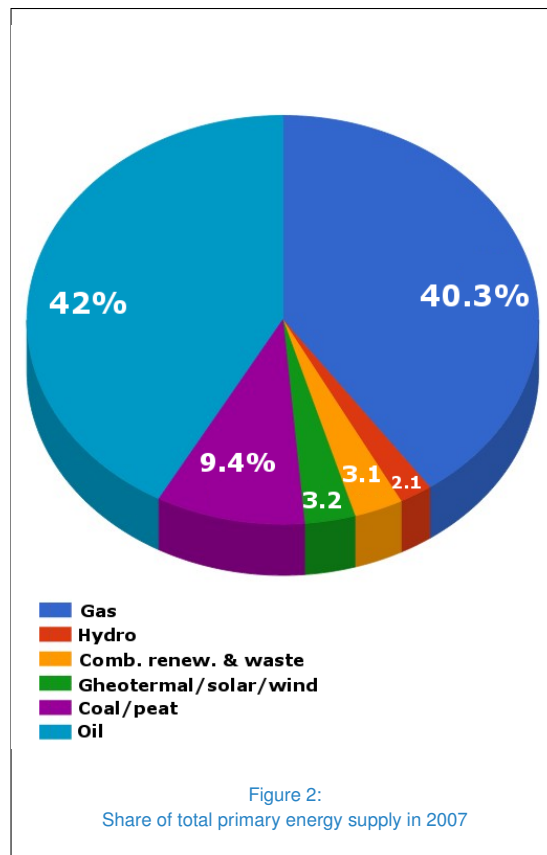
	Italy	EU-27	EU-15
1990	9.1	11.8	11.6
2007	9.3	10.2	10.3

sented an important share of energy sources (Figure 2). Indeed, the Italian energy position remains vulnerable in several aspects. In particular, energy security remains a major concern.

Growth in electricity generating capacity has been largely gas-fired, leading to increased dependence on imported gas. Conversely, this dependence could potentially decline in the longer term should plans to develop nuclear capability succeed. The import capacity of natural gas pipelines has expanded but interconnections to other European natural gas markets remain limited (IEA, 2009b).

The share of transportation emissions continuously increased from 1990-2007 by 25% due to the increase of vehicle fleets, total mileage, and consequently fuel consumption. Critical points emerge due to the high use of private cars, a weak network of public transportation, congestion, and a drastic increase in air pollutants (NO_x, COVNM, PM₁₀, PB, C₆H₆). Finally, Italy's transport sector is almost entirely dependent on oil (Andrews and Karaisl, 2010).

With respect to other International Energy Agency (IEA) member countries and major economies, Italy's energy intensity has traditionally been low (in terms of Total Primary Energy Supply (TPES) per unit of GDP). However, while the energy intensity of many other IEA countries has constantly improved over the past thirty years, Italy's energy intensity has remained relatively stable since the early 1980s.

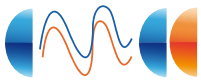


Source: EEA, 2009.

Hence, it is now at a level similar to the average for IEA European countries (IEA, 2009a).

Indeed, the government needs an integrated long-term vision that will translate into effective development of the energy sector towards low carbon measures, also taking into account the energy security issue.

There are also several factors affecting the



GHG emissions profile of Italy and its increase over time. Particularly, the mobility demand for work and study, which is due to a mismatch between residential areas and concentrated areas of economic activities; the gradual aging of the population, which determines a greater need for climate-control during both winter and summer that could increase the energy demand for residential use; and finally, migratory movements that counterbalance the negative natural trend in national population growth (even if in the short term the immigrants contribute to lower per capita emissions because they have less intensive models of consumption with reference to the Italian people⁴).

Small average family size is another characteristic which affects efficiency consumption patterns and emissions. Small families imply greater consumption because of a larger acquisition and use of durable goods such as household appliances, cars, etc., previously shared among a greater number of people. To give an idea, in 2004 Italy had 590 vehicles per 1,000 people (WRI Database). In 2007, Italy recorded the world's highest concentration of private cars per capita (1.7 inhabitants per car) (MATTM, 2009).

With regards to urban environmental quality, attention to environmental sustainability is growing, but the foreseen strategies and their implementation still prove to be very weak throughout the country. The annual Legambiente Report provides the most detailed review of improvements and deficiencies related to air pollution, public transport, waste management and electricity consumption.

Temperature anomalies

Italy is already experiencing temperatures anomalies. For example, in 2008 (compared with the 1961-2008 period) it was warmer than average (+1.09°C). It was the 17th consecutive

year during which anomalies were registered. Highest anomalies were in the northern regions (+1.28°C), followed by +1.07°C in the centre and +0.95°C in the southern regions and in the islands. In the last ten years island temperature anomalies were higher compared to the mainland (+0.53°C) (MATTM, 2009).⁵

DESCRIPTION OF EXISTING LCS ACTIONS

Sectoral analysis

Italy's approach to a low carbon society can be summarised using the five points presented in the National Climate Strategy briefly described above.

Such approaches have been implemented through several actions and measures put in place by the Italian government in different sectors (see Table 2).

Initiatives at the Municipality, Province and Regional levels

As abovementioned, regional and municipal authorities are playing a major role in the promotion and definition of the low-carbon Italian pathway, so that most of the best practices were driven by local pro-activeness in searching for innovative policies. Many low-carbon projects are currently ongoing in Italy at the Municipality, Province, and Regional levels, where public organisations are engaged in developing a more sustainable lifestyle. Low carbon activities mainly include local action plans, education and awareness raising projects. They often aim at improving sustainable mobility, for example providing bike-sharing services. The table 3 and 4 show the most relevant initiatives.

Public awareness and acceptance in the country

Environmental education and communication

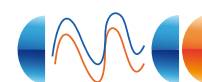


Table 2
Main measures and policies put in place by the Italian government

Area	Actions in act or proposed
Renewable*	Supporting the production of renewable in energy production via incentives/subsidies
Energy**	Supporting the expansion of photovoltaic plants via incentive tariff
Industry***	National energy efficiency action plan set an overall energy efficiency target of 9.6% by 2016
Building	Supporting energy saving through cogeneration
Transport****	Supporting energy saving in the industrial sector
Waste*****	Installation of highly efficient electric motors, pumps, inverters through minimum mandatory standards
LULUCF*****	Accelerate the deployment of more advanced, efficient and energy-saving technologies
Agriculture*****	Improving energy performance of new and existing buildings
	Supporting biofuels use
	Shifting from private road traffic to public road traffic
	Fleet update 130 g CO ₂ /km
	Municipal solid waste regulation set a recycling target of 65% by December 31, 2010
	Scheme for plans against forest fires (Piani Antincendi Boschivi - AIB) for the State natural protected areas
	Recovery of biogas from animal storage systems

Source: All information was retrieved from IEA Database, 2010 and (*) REN21, 2009; (**) Ministero dello Sviluppo Economico, 2007 and IEA, 2009a; (***) MATTM, 2009; (****) EC, 2009; (***** D.lgs 152/06; (***** L.n. 353/200; (***** Ministero dello Sviluppo Economico, 2010.

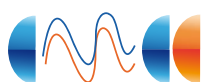


Table 3

Some important municipal emission reduction projects

Place	Project	Short description
Municipality of Firenze	RACES - Raising Awareness on Climate and Energy Saving (financed by EC Programme LIFE+) (2009-2011, ongoing)	RACES project is mainly targeted to address the issues of climate change and sustainability, with a particular focus on urban climate and cities mitigation and adaptation strategies. In order to reach significant results at national level and to be replicable in Europe, RACES involves 5 Italian areas, which accurately represent the different urban environments and the way they could adapt to climate change. The project aims to help the local environmental governance by promoting and supporting a bottom-up participation model, which gathers local stakeholders (families, teachers and local administrators), in order to encourage a collaborative sharing of different interests and perspectives on relevant local aspects related to climate change. Five raising awareness campaigns are planned in Florence, Trento, Modena, Potenza, Bari.
Municipality of Milano	Piano di Azione per l'Energia Sostenibile e il Clima (Climate and Sustainable Energy Action Plan)(The Plan has not been implemented yet)	The main goal of this Plan is to reduce municipal emissions by 20% wrt 2005, levels by 2020. The Plan foresees efficiency measures on transport (more than 50% total reduction), household, energy production and waste.
Municipality of Milano	Ecopass (January 2008 - ongoing)	Included in the municipal action plan for sustainable mobility, environment and citizens health, Ecopass foresees the payment of a fee on vehicles in some areas of the city center. In order to discourage the use of more pollutant vehicles, cars are charged in proportion to their environmental impact. Thus, the project aims to reduce traffic and emissions as well as to raise funds for investment in public transport.
Municipality of Roma	Roma per Kyoto (2004-2008)	In the context of the City of Rome Action Plan for Kyoto Protocol implementation, the project adopted actions to reach 6.5% CO2 emissions reduction by 2012 wrt 1990 emissions, lowering citys GHG concentration and incrementing absorption capacity.
Municipalities of Ravenna, Modena, Ferrara, Faenza, Padova since 2000. Currently extended to 92 Municipalities all around Italy	Centro in bici Bike Sharing (2000 ongoing)	Centro in bici is a bike-sharing project aiming at improving sustainable mobility within citys centers. It allows the unlocking of all the bikes in 92 Municipalities with a single encoded key. Bikes are located in different places in the city, usually near parking lots and railway stations.
Municipality of Trento	Piano Energetico Comunale Trento per Kyoto Trento for Kyoto Municipal Energy Plan (2008 ongoing)	The Municipality of Trento has decided to relaunch energy planning and bring together all the participants active in the municipal territory social, public and private sector. The Plan foresees the identification of some project ideas aimed at the selection of priority actions to be implemented (sustainable design and energy efficiency for buildings).

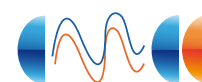
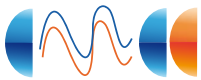


Table 4
Some important provincial and regional emission reduction projects

Place	Project	Short description
Provincial Environmental Agency of Bolzano (ARPA Bolzano)	School-Climate Environmental Education Project, initiative linked to the Alliance for the Climate Program (2008-2009, on going)	The project School-Climate is aimed to make children and teenagers aware of the necessity to protect the climate with, educational activities and interactive tools. Its focused on the following initiatives: 1. Going to school without car Walking together for climate 2. The climate for us Energy saving at school 3. Together for the climate Interactive exhibition.
Province of Ferrara	Forum Agenda21- Ecoidea Desk (1998-ongoing)	The process of Local Agenda 21 in the Province of Ferrara took its first steps in 1998. This process has led to excellent results both from an organisational point of view in the early stages of the process, as well as an implementation point of view when the Action Plan was put into place. In 2003, the Province of Ferrara created the Ecoidea Desk in order to spread information on the best practices.
Province of Trento	Council regulation of 20 October 2006 implementing the EU Energy Performance of Buildings Directive	The Trento Provincial Council, developed a methodology to classify and calculate the energy performance of buildings according to Trento climatic conditions, consistent with local energy consumption patterns. The resolution implements previous urban planning regulations with specific requirements on the energy performance of buildings, building interventions subject to certification, in coordination with Bolzano province energy certification, and supervisory measures.
Regional Environmental Agency of Emilia- Romagna	Local Action Plan on drought and desertification (PAL) (April 2008 - November 2009)	The aim of this action carried out by the hydrometeorological service of ARPA-SIMC is to diffuse data on climate change at the local scale and make stakeholders more aware of adaptation strategies to CC in agriculture, focusing on irrigation of fruit orchards.
Regional Environmental Agency of Valle d'Aosta (ARPA Valle d'Aosta)	Envie d'Environnement Initiative on Communicating Climate Change and consequent environmental effects (2007-2008)	In the Envie d'Environnement initiative, the experts narrate, illustrate, and analyse the main environmental themes among climate change, by means of educational laboratories, games, conferences, informative panels, videos, theatres, and cinema. The initiative involved several age groups and stimulated respect for the environment with practical activities.



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are considered essential tools to support sustainable development policies and aim to promote public consciousness of environmental matters and behaviours in harmony with nature and human beings. Both public and private organisations at national and local levels are actively engaged in the field of education for environment and sustainable development, specifically focusing on promoting public awareness.

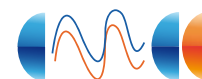
In addition to the initiatives outlined in Table 3 and 4, remarkable projects have been developed on the national level, sometimes in collaboration with international organisations. From this perspective, two initiatives summarise what has been done. From a national initiative, an information communication and education campaign on renewable energy sources was carried out in 2005, by the Ministry for Economic Development, Environment, and ISPRA National Network for Local Energy Companies (RENAEL). The campaign aimed at providing information on renewable sources of energy, energy efficiency and energy saving. It provided citizens with practical information on how to save energy in households and on how to obtain incentives for the use of renewable energies (private companies and local administrations). From an international initiative, Italy hosts the UNESCO National Week of Education for Sustainable Development every year (developed within the broader UN Decade of Education for Sustainable Development). In 2007, the Week was dedicated to climate change and on November 2010 the event focused on Sustainable mobility.⁶

The survey "Europeans' attitudes towards climate change", carried out by the Directorate General for Communication of the European Commission between March and May 2008 provides an overview of the Italian citizens' attitudes towards climate change. Inquiries focused on:

- i) Measuring the impact of the terminological differences between global warming and climate change in citizens' perception.
- ii) Citizens' perceptions of the seriousness of global warming / climate change.
- iii) The extent to which citizens feel informed about climate change.
- iv) Citizens' attitudes towards climate change and ways of combating it.
- v) Actions aimed at fighting climate change.
- vi) Targets for reducing emissions and increasing the share of renewable energy.

Considering the aforementioned topics, the Italian perspective does not substantially differ from the European one: people recognise the importance of climate change issues. Nearly two-thirds (65%) of the population do not think that the seriousness of climate change has been exaggerated, and a majority of citizens (54%) disagree with the statement that CO₂ emissions have only a marginal impact on climate change. However, while Italians seem to be more willing to pay for green energy, concrete actions seem to be stopped by the higher lack of knowledge revealed by the percentage (43%) of respondents who feel unable to offer an opinion.

Despite their willingness to act, Italian citizens do not seem to be knowledgeable about the impact of sectors consuming the most energy in their country nor the level of their energy dependency. In addition, Italian citizens appear to be less familiar with renewable energy sources, in particular with hydroelectric, ocean and biomass energy, while nuclear energy provokes the most opposition among traditional sources' acceptance (Eurobarometer, 2006 and Special Eurobarometer 300, 2008).



Good Practice in Research: The ENEA Solar Thermodynamic Research Programme

In 2001, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), in cooperation with other Italian companies, undertook a research programme with the aim to improve and diffuse the power production from concentrated solar energy.

Concentrated solar power (CSP) technology, has been utilised since the 1980's in USA, but some technical problems reduce the convenience of these kinds of facilities. Because of the utilisation of thermal oil as a heat carrier, the highest operating temperature is no more than 390 degrees Celsius, with the requirement to overheat the steam by means of fossil fuel or to use low efficiency steam turbines. Moreover, in case of leakage, thermal oil involves risk of firing, explosion, or spreading into the ground.

The new solar technology developed by ENEA is based on 3 main items:

1. increased solar energy gathering efficiency through an advanced coating on the receiver surface, and also with an optimised design of the receiver tube and of the solar collector;
2. a mixture of molten salts (sodium nitrate and potassium nitrate) as a heat carrier, that allows to increase the operating temperature to 550 degrees Celsius. This material is not inflammable, nor explosive and easily recoverable in case of spillage;
3. a heat storage system with high efficiency and low cost.

Nevertheless this solution implies various technological challenges, due to the decreased resistance of the materials at very serious operating conditions. The risk of the salt mixture solidifying inside the pipelines of the solar plant should lower the temperature to below 230 degrees Celsius. ENEA overcame these problems through difficult research and lab tests, which allowed the construction of an industrial scale demonstration facility within a period of only 10 years. Recently ENEL, the main Italian electric company, constructed in Priolo, Sicily, a 5 MW electric power demonstrative plant based on ENEA solar technology. The solar plant is integrated with a thermoelectric station fuelled with natural gas. The steam generated with solar energy can be added to the steam produced with natural gas and expanded in the same turbines to produce electric power. This is a possible consequence of innovative features regarding solar technology.

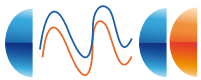
This solar plant produces 9.2 GWh each year with electric power saving more than 2,000 oil equivalent tons, and reducing emissions by more than 6,000 CO₂ tons.

This installation is important because it spreads the solar thermodynamic technology to the southern region of the Mediterranean Sea and to The Middle East. These regions have the most favourable conditions: high solar rate throughout the year and available free areas.

In Italy, solar projects are increasing their role within the renewable energy context for instance, the photovoltaic plant project, developed by SunEdison and Banco Santander in Rovigo (Veneto province). This project will lead to the creation of the largest photovoltaic plant in Europe. Covering a surface of 850,000 m², the 72MW plant will start to produce power generation from the second half of 2010. It is expected to provide electric energy to 17 thousand families, saving nearly 41 thousand tons of CO₂ emissions. The photovoltaic project will create 350 new jobs during the construction phase.

The theoretical potential of solar power is very interesting: the area in the Sahara desert required to produce all the electric energy consumed in Europe can be estimated at large as 26 000 km² (i.e. 160 km by 160 km). The electric energy consumed throughout the world would require 123 000 km², (350 by 350 km). The challenges of solar power are its high cost and the availability of suitable infrastructures that bring the electric energy to the consumer countries. If the scientific research is able to give suitable solutions to these problems, the solar thermodynamic technology could give a significant contribution to the energy supply as well as the reduction of climate altering gas emissions.

The research job performed by ENEA and by the Italian companies participant to the Solar Thermodynamic Research Programme is a significant milestone in this path.



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More recently, a joint inquiry conducted during the Copenhagen Conference submitted by Fondazione Formiche and Lorien Consulting, with the support of the Italian Environment Ministry, confirmed the general abovementioned trends, and provided an idea of Italy's awareness. The inquiry revealed a perception of the environment touching personal views (mainly due to environmental catastrophes), on which the international community should concentrate attention. In addition, it strongly revealed disillusionment with the politicians ability to deal with environmental problems and implement existing technological solutions.

Regarding the effects of the economic crisis, opinions are rather discordant: while some registered an increase in the attention paid to the environment (i.e. opportunities offered by green jobs), others felt it was taking a back seat, yet all are in favour of the combination of withdrawing from the recession and protecting the environment.

Research

i) Main challenges and strategies

Research related to mitigation activities and climate change should first be contextualised within the broader sphere of R&D in Italy. In fact, the country is affected by several gaps if compared with the main industrialised countries and within the European context. The following are a list of these gaps: lower intensity of research work (expenditure is 0.56% of GDP while the EU average is 0.65%); difficulties in establishing a governance system and therefore in promoting systematic policies (due to the plurality of legislative and executive centres); low degree of integration between public and private research and between public research and industry; lower innovation capacity with respect to other European countries; and poor internationalisation. The National Research Programme (PNR) 2010-2012

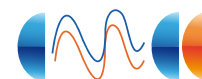
(draft version) recognises these deficiencies and aims at tackling them mainly through the Minister of Education, University and Research (MIUR), which operates through the Integrative Fund for Scientific and Technological Research (FISR). FISR was established with the financial law 296/2006, and aggregated funds under one main umbrella in order to simplify resource management. In 2009, 360 million were allocated to FISR.

The National Research Programme embeds the principle of sustainable development and recognises the necessity of moving towards a low carbon society. In fact, all the identified R&D priority activities for the country, whether or not directly related to the environment, should always consider both the eco-compatibility of products and the environmental sustainability of all actions. This emerges as a unifying principle. That said, the PNR clearly identifies R&D activities related to energy efficiency and sustainable mobility as fundamental for Italy's socioeconomic development.

Finally, MIUR and the Technical Committee foreseen by FISR, will have to pay particular attention to financing activities related to six General Purpose Technologies, whose development has been identified as crucial: among those, energy and environmental related technologies are present. Finally, also the Ministry of Economic Development "Industry 2015" programme (aiming at stimulating innovation and competitiveness in Italian industry) has already introduced these particular technologies in its planning.

ii) Environment and climate change research

Current research mainly focuses on climate observations and modeling; vulnerability assessment; socio-economic impacts on energy, industry, insurance, transport and tourism; soil degradation, water ecosystem, biodiversity, hu-



man health, human settlements, marine biology, forestry, agriculture, with a specific geographic focus on coastal zones, oceanic zones and the Mediterranean Area. The following are some of the major Italian research institutes focusing on environment and climate change:

Euro-Mediterranean Centre for Climate Change (CMCC), was founded by the Italian Ministry for the Environment, Land and Sea, of Education, University and Research, and of Economy and Finance in 2005, through FISR funding sources. CMCC represents the most ambitious initiative undertaken in Italy within the framework of the National Research Plan on climate. CMCC carries out integrated, multi-disciplinary and frontier research for understanding, controlling, and adapting to climate change.

Italian National Agency for New Technologies, Energy and Environment (ENEA), the Agency's purpose is "to research and innovate technology as well as provide advanced services to the energy sector, particularly regarding nuclear energy, and to develop a sustainable economy".

ENI Enrico Mattei Foundation (FEEM), was founded by ENI (the leading Italian energy company) and has been in full operation since 1990. FEEM's mission is to improve the quality of decision-making in public and private spheres through its research. This goal is achieved by creating an international and multidisciplinary network of researchers, by providing and promoting training in specialised areas of research, disseminating research results, and directly delivering to policy makers via participation in various institutional forums.

Institute for Environmental Protection and Research (ISPRA), was established by the Legislative Decree (No. 112) in 2008. It acts under the vigilance and policy guidance of the Italian Ministry for the Environment and the Protection of Land and Sea. The Institute combines the duties of three pre-existing institutions: the Italian Environment Protection and Technical Services Agency, National Institute for Wildlife and Central Institute for Scientific and Technological Research Applied to the Sea.

Abdus Salam International Centre for Theoretical Physics (ICTP), was founded in 1964 by the homonymous Nobel Laureate. The Centre operates under a tripartite agreement among the Italian Government and two United Nations Agencies, UNESCO and IAEA. Its mission is to foster advanced studies and research, especially in developing countries. Its activities today encompass most areas of physical sciences including applications.

International cooperation and technology transfer

Technology transfer is mainly driven by the Italian Ministry for the Environment, Land and Sea and by national companies. So far, their activities have been focusing on tackling near-term mitigation and adaptation needs of Asia, the Balkan area and Mediterranean region (Table 5 and 6). International cooperation and technology transfer are both promoting and supporting programmes on scientific research addressing the R&D phase of key technologies. Often, projects are implemented thanks to collaboration between the Ministry and international organisations (like UNIDO), or with research centres (like CMCC).

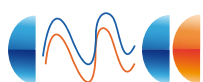


Table 5

International cooperation - some examples

Project/Partners	Purpose	Founding and Implementation
Egyptian-Italian Environmental Cooperation Program (Phase II)	Institutional support to the Egyptian Environmental Affairs Agency (EEAA) to improve planning capabilities for rehabilitation and protection of natural and cultural environmental resources and implementation of pilot-projects.	Founding: Ministry of Foreign Affairs (Directorate General of Cooperation for Development - DGCD) Implementation: UNDP, EEAA
U.S. - Italy Co-operation on Science and Technology of Climate Change	Research on global and regional simulations, atmospheric processes, carbon cycle, socioeconomic impacts, health scenarios, low-carbon technologies.	Founding: Ministry for the Environment, Land and Sea Implementation: CMCC
Italian-Israeli Cooperation in the Environmental R&D sector. Italian Ministry for the Environment, Land and Sea; Tel Aviv University.	Management of the emergency services like fire and the unwanted pollution by dangerous substances; develop a new PV concentrator system whose size and costs will be appropriate for use in urban areas; identify species for the production of biomass and carbon sequestration through forestation and afforestation; identify impacts of the climate change at the sea level and develop sustainable policy.	Founding: Ministry for the Environment, Land and Sea Implementation: CMCC
Italy - South Pacific SIDS Co-operation Programme on climate change and environment	Development of measures to adapt to the adverse effects of climate change; of local renewable energy sources and bio-fuels as well as the wide dissemination of their use to address energy security while increasing access to energy services, reduce emission of greenhouse gases, and strive for sustainable transport. Strengthening national capacities for the establishment of national energy policies, strategies, and markets.	Founding: Ministry for the Environment, Land and Sea Implementation: CMCC

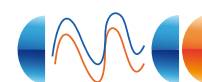
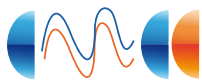


Table 6

International cooperation and technology transfer - some success stories

Recipient	Sector	Purpose	Funding	Period	Technology	Reduction expected
Tunisia, Libya, Congo, Algeria, Nigeria, Italy	Oil & Gas	Eliminate gas flaring in the Countries where Eni operates.	3,664 million euros	2009-2012	Construction of costly infrastructures such as new gas pipelines, highly efficient electrical plants and gas liquefaction facilities.	GHG: about 14 MtCO ₂ e by 2012, equivalent to 70% (2007) Nigeria (CDM): about 15 MtCO ₂ e by 2015.
Egypt, Morocco	Industrial	Fostering industrial co-operation and technology transfers among private companies.	470,000 Euros	2006-present	Renewable energies; water treatment; waste treatment and recycling.	NA
Thailand	Cement industry	Reduce the use of fossil fuels in cement kiln by substitution with Rice husk, which is carbon dioxideneutral.	700,000 Euros	2006-2009	Biomass feeding and burning technology - Technical assistance and training of local engineers.	318,111 (tCO ₂)
China, Italy Sino-Italian cooperation for environmental protection	Construction	Constructing a building adhering to the principle of sustainable development. It will become the centre for teaching, research and environmental technology exchanges, and will provide a model platform.	NA	2003/2004 - project design phase; 2004/2006 - project construction period.	NA	The building will generate 1,200 Tons of CO ₂ and 5 Tons of SO ₂ emissions each year.



CONCLUSION

European obligations are driving the Italian transition. As a member of the European Union and therefore part of the Kyoto Protocol and of the European Climate Action and Renewable Energy Package, Italy is and will be strongly and positively impacted in its efforts towards developing into a low carbon society.

Successful initiatives have been undertaken to promote energy efficiency and renewable energy. Improvements have been made in different areas. The White Certificate system, a cross-sector initiative aiming at promoting energy efficiency, was remarkably successful. Italy can also be praised for many projects constituting best practices in emissions reduction. The Archimede solar plant in Sicily and the hydrogen-generated power plant built near Venice constitute the most recent initiatives. Other important projects, many of which promoted on the local level prove the commitment and creativity of Italian authorities and firms. Furthermore, the Solar Thermodynamic Research Programme conducted by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) and several Italian companies, constitutes a milestone in project-oriented research.

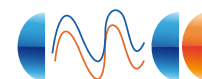
Italian commitment to low carbon society is intertwined with international cooperation. Italy is also strongly committed to international cooperation, taking part in a wide range of activities in collaboration with both developed and developing countries as well as international organisations. In particular, Italy plays an important role in a large number of international programmes and projects aimed at promoting the transfer of low carbon technologies and supporting developing countries through the supply of financial resources. In addition to public

commitment, these activities involve important private companies such as ENI, Enel and Italcementi, which are promoting the deployment of key technologies in both the energy and the industrial sector.

Local pro-activity suffers from a lack of national coordinated action. Notwithstanding the several aforementioned initiatives, Italy has mainly behaved in response to the EU strategy without promoting its own national climate change vision to be implemented through national policies and targets. Most of the best practices were driven by local and/or individual pro-activeness in searching for innovative policies. A more coordinated action would be required and local initiatives could be replicated in various contexts within a broader national framework.

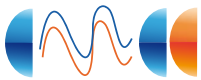
Research institutions could play a decisive role. The Italian research community is deeply involved in the international climate change debate and research network. A major contribution could be given in the formulation of a low-carbon national pathway. Traditionally, Italian research institutions have been less involved in the policymaking process, while by contrast, promoting a strong science-society-policy interaction along with a interdisciplinary approach, will strongly benefit the transition toward a low-carbon society.

Public awareness needs to be consolidated. The Italian public, coherently with the European trends, recognises the importance and seriousness of climate change, although a superficial knowledge of the issue limits the ability to undertake concrete actions. Improving general knowledge, not only on the existing risks but first of all on new development pathways, represents, for Italy, one of the greatest challenges to be faced.



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United Nations Framework Convention on Climate Change. Time Series-Annex I.

At http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3842.php unfccc - ghg data time series annex I

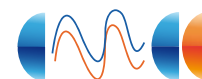
World Research Institute. Earth Trends Database.

At http://earthtrends.wri.org/searchable_db/index.php?theme=6variable_ID=1016action=select_countries.

FOR MORE INFORMATION

Best practices - some relevant projects of emission reduction

- "Archimede" solar thermal power plant - Priolo Gargallo
at http://en.wikipedia.org/wiki/Archimede_solar_power_plant
- Hydrogen-generated power plant - Fusina at <http://www.hydrogenpark.com/>
- "Piano di Azione per l'Energia Sostenibile e il Clima" of Milan
at http://www.comune.milano.it/portale/wps/portal/CDM?WCM_GLOBAL_CONTEXT=/wps/wcm/connect/ContentLibrary/giornale/giornale/tutte+le+notizie/mobilit+trasporti+ambiente/ambiente_energia+sostenibile_clima
- "LEAF Community - Life Energy and Future" at <http://www.leafcommunity.com/>
- Council regulation of 20 October 2006
- Province of Trento at http://www.energia.provincia.tn.it/certificazione_edifici/
- "Centro Riciclo Vedelago" at www.centroriciclo.com



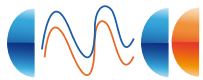
- "Roma per Kyoto" at <http://www.romaperkyoto.org/>
- "Ecopass" at <http://www.comune.milano.it/dseserver/ecopass/perchecopass.html>
- "C'entro in bici" at <http://www.centroinbici.it/index.htm>
- "Piano Energetico Comunale Trento per Kyoto" at http://www.comune.trento.it/comune/argomenti/ambiente/energia/trento_kyoto_index.htm

Main communication and education activities

- "RACES - Raising Awareness on Climate and Energy Saving" at <http://www.liferaces.eu/en>
- "Forum Agenda21" and "Ecoidea" desk at <http://www.provincia.fe.it/agenda21>
- Local Action Plan on drought and desertification (PAL) at http://www.arpa.emr.it/pubblicazioni/siccita/generale_1096.asp
- "School-Climate" at <http://www.energiesparen.it/it/kids.html>
- UNESCO National Week of Education for Sustainable Development http://www.unescodes.it/iniziativa/eventi/settimana_educazione_sviluppo_sostenibile
- Information communication and education campaign on renewable energy sources of the Ministry for Economic Development, Ministry for Environment, ISPRA, RENAEL at http://www.apat.gov.it/site/it-IT/IdeAmbiente/Sezioni/Articoli/Documenti/01_2005_art_06.html?PageID=8266

International cooperation and technology transfer

- Egyptian and Italian bilateral cooperation on environment at <http://www.eiecop.org/>
- Eni project to eliminate gas flaring at <http://www.eni.com/en.IT/sustainability/climate-change-energy-efficiency/carbon-management-strategy/gas-flaring-reduction/flaring-reduction.shtml>
- Italcementi project to reduce the use of fossil fuels in cement kiln at http://www.italcementigroup.com/ENG/Sustainable+Development/Success+stories/CO2+and+energy+efficiency/Thailand+biomass+utilisation_2007.htm
- Sino Italian cooperation for environmental protection at <http://www.sinoitaenvironment.org/ReadNewsex1.asp?NewsID=1930>



Notes

¹http://ec.europa.eu/environment/climat/climate_action.htm

²http://ec.europa.eu/energy/renewables/transparency_platform/doc/0_forecast_summary.pdf

³<http://www.senato.it/japp/bgt/showdoc/showText?tipodoc=Sindispleg=16id=459323>

⁴See the Italian Fifth National Communication under the UN Framework Convention on Climate Change (2009) at <http://unfccc.int/resource/docs/natc/ita.nc5.pdf>

⁵For further information see the Institute of Atmospheric Sciences and Climate (CNR) at http://www.isac.cnr.it/Climstor/climate_news.html; ISPRA also offers anomalies' maps at <http://www.scia.sinanet.apat.it>

⁶For further information visit <http://icss2010.net/?p=unesco-week-on-education-or-sustainable-mobility>

