



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

Environmental Challenges

Summary of the State of the Environment in Italy

Presented by Hon. Minister Stefania Prestigiacomo
on the occasion of the G8 Environment Ministers Meeting
(Siracusa, April 22-24, 2009)

MINISTRY FOR THE ENVIRONMENT, LAND AND SEA
Directorate General for Development and Environmental Research

ENVIRONMENTAL CHALLENGES

Summary of the State of the Environment in Italy
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Environmental Challenges

The great environmental challenge – both at national and global level – should definitely be considered by our society as a key issue for development, a criterion to measure overall policies, a keystone to plan development that cannot be other than “sustainable”.

Nowadays, environmental sustainability is rapidly overlapping with economic sustainability, especially in countries like Italy depending nearly completely on foreign energy supply conditional not only on import security but also on the price fossil fuels.

A deep change in the economic and environmental culture is therefore necessary, rather than convenient, leaving behind us the mere economic vision considering the environment only as a cost, and adopting a new perspective where environmentalism is an integral part of development policies, and the environment is the resource, the basis and the central issue for development of future society.

The concept of environment hampering development is part of an obsolete cultural heritage that has to be replaced by a wider vision able to couple environment and development, without neglecting environmental protection.

In our country, environment represents for sure the largest intangible infrastructure, a large resource to draw on, and it is our task to safeguard it through eco-sustainable development models. The challenge to be accepted therefore, as a part of the biggest challenge humankind is facing today, is to be able to live on our Planet with steadily increasing population in a decent and equitable way, without destroying the ecosystems that provide us resources to live on. This unprecedented challenge should be included in the agenda of all governments and should be the crucial target of the international community.

It is therefore necessary to convert the economy in a sustainable way, by organizing government environmental strategies according to a new philosophy, to reverse market economy trends, to protect land and human health integrity, and to allow at the same time environment to orientate the global economy.

The serious international economic crisis already required - and will require, both in the short- and long-term - considerable investments to maintain the high growth and socio-economic security levels attained so far also for the future. This huge effort however, also represents an opportunity to change the economic relations system, so as to promote sustainable growth in the long-term and enable the economic and financial system to face the environmental challenge by fully integrating environment and economy.

Within this scenario, the Ministry of Environment intends to take this great responsibility upon itself and play a guarantee role, thus becoming the main actor of the country's development policy planning.

The Summary of the State of the Environment in Italy, presented on the occasion of the G8 Environment

Ministers Meeting that I am honoured to host and to chair, therefore becomes a starting point of strategic importance to give renewed momentum to environmental policy in Italy.

Today, climate change and global warming are the most difficult issues at global level; UNFCCC country parties' response to the risks deriving from the introduction of climate-altering gases in the atmosphere is the measure of their capacity to take the necessary decisions, so as to start implementing an effective and eco-sustainable policy. Since this problem relates to nearly all human activities, it does not only impact our productive and industrial systems, but also directly affects our transport system, our urban setup and lifestyles, agriculture and biodiversity, water availability and land safety. For this reason, we must act on several levers which involve comprehensively our socio-economic organization.

We must therefore continue and incentivize support to production of renewable energy, from solar to geothermal energy, from wind power to biomass energy, from waste recycling to hydroelectric energy, also favouring the use of new technologies to capture and store CO₂.

Future technologies represent the economic bet to gain global leadership in the energy field in the next decades. By promoting and strengthening the industrial sector and supporting technological innovation, by adopting already available new techniques that allow sustainable use of natural resources and emissions reduction, it will be possible to look trustfully into the future, being sure that accepting the great challenge of sustainable industrial and energy development will allow us to keep on being competitive on international markets.

At the same time, new lifestyles should be promoted and our cities should be rethought together with local authorities, incentivizing the attainment of air quality standards, privileging an integrated approach in urban development policy, and the starting up of efficient energy saving policy and energy use.

Within this framework, cooperation and objective-sharing between central institutions and local authorities, as well as exchanging of good practices and experiences and profitable use of achieved results will be crucial. The Ministry for the Environment should become the laboratory of a new environmental deal among the national government, local and regional institutions and the citizens, built on the principle of sustainable resource use, by acknowledging the founding role of education, information, training and dissemination of self-responsibility principles to give birth to a new environmental consciousness.

Stefania Prestigiacomo
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Foreword

National governments all over the world are facing the challenge of the hugest economic crisis since many decades, to find solutions that may allow developed countries to maintain the welfare level attained so far, and developing countries to keep relying on solidarity and cooperation from donors for many years to come. Within this framework, the economic role of environmental protection as a driving engine for development becomes increasingly clear.

Environmental impacts linked to the prevailing development patterns have produced and still produce “hidden costs” that seriously affect natural and energy resources, both in terms of exhaustion and degradation, as well as in terms of expenditures to be met in order to support actions for the restoration and safeguard of environmental quality.

The shortage of natural, environmental and energy resources and the risk of their further depletion induce to adopt efficiency and innovation as reference criteria for economic growth, so as to “decouple” development and resource use.

The present Summary of the State of the Environment in Italy offers information and interpretative “keys” to update the strategy for sustainable development in our country, in the light of the global economic crisis, and to adapt environmental governance, so as to meet the increasingly demanding challenge of efficient management of water resources, biodiversity and energy that are in fact the reference “pillars” for policies and measures of mitigation and adaptation to global climate change.

Corrado Clini
Director General for Development
and Environmental Research



Climate Change and Energy

Climate change¹ is one of the most concerning environmental challenges of our time. Warming of the climate system is unequivocal, as is now evident from observations of increase in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level². Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate change, temperature particularly increase³.

Climate change is related to variation in gas concentration and aerosol with greenhouse effect in the atmosphere, in sun radiation and in earth surface characteristics, all of which change the energetic balance of the climate system.

The conclusion that the net global average effect of human activities since 1750 has been responsible for warming though natural phenomena such as the intensity variation of solar radiation is not to be ignored. The increasing in global average temperature, observed from the middle of the 20th century, is mainly due to the observed increase of the anthropogenic greenhouse gas concentration. Moreover, human activities influence also other aspects of climate such as ocean warming, the increase of continent average temperature, extreme temperatures and wind patterns⁴. We can therefore affirm that “a global assessment of data since 1970 has shown it is likely that anthropogenic warming has had a discernible influence on many physical and biological systems”⁵.

As a consequence, impacts of climate change will vary regionally but, aggregated and discounted to the present, they are very likely to impose net annual costs which will increase over time as global temperature increases⁶.

Atmospheric global concentration of the main greenhouse gasses (excluding aqueous vapour, including carbon dioxide-CO₂, methane-CH₄ and nitrogen protoxide-N₂O) has relevantly increased as a result of human activity. Global CO₂ concentration growth is mainly due to the use of fossil fuels and to changes in land use, while CH₄ and N₂O growth are mainly due

to agriculture. In particular, atmospheric CO₂ mean concentration at global level has grown from 280 ppm (parts per million) in the period 1000-1750 to 383 ppm in 2007, considering only emissions produced by the use of fossil fuels in combustion processes and cement manufacture⁷.

Energy consumption

Credit crisis impact on world economic growth, and the increase and subsequent fall of energy prices, influence the forecast updating of mid-term energy consumption and greenhouse gas emissions.

International fuel market trends, especially the oil market, have had high impact on the energy sector dynamics during 2007 and 2008. Price for a barrel of Waste Texas Intermediate⁸ (WTI) light crude oil exchanged at the New York Mercantile Exchange (NYMEX) ranged from \$60 in January 2007, to \$50 in February 2007, to \$100 in January 2008, to \$150 in July 2008, decreasing to \$70 in October 2008 and to \$40 at the beginning of 2009.

Energy consumption is therefore growing slower than predicted in previous years, but global trends have not substantially changed. We still have predominance of fossil fuels - oil, gas and coal - in the energy mix, and an increasing share of emerging economies in energy world consumption and global CO₂ emissions growth.

These trends highlight the great challenge to ensure energy supply at accessible prices and to quickly move toward an efficient low-carbon energy system with minimum environmental impact. The reference scenario is ecologically, economically and socially unsustainable. It is characterised by energy price increase, growth of dependence on imports, and growth of greenhouse gas emissions. Governments should implement radical actions both at domestic and local level, and coordina-

— 1 The term Climate Change, according to the Intergovernmental Panel on Climate Change (IPCC), refers to a change in the state of the climate, that persists for an extended period, due to natural internal processes or to human activities. This meaning differs from the one used by the United Nations Framework Convention on Climate Change (UNFCCC), where climate change is defined as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods — 2 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* — 3 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* — 4 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* — 5 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* — 6 IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* — 7 *Global Carbon Project (2008). Carbon budget and trends 2007* — 8 It is a type of oil that is used as benchmark in oil price

tion by means of suitable international processes is required in order to achieve a more secure and low carbon energy system. The scenario provided by the International Energy Agency (IEA - OECD body), suggests that the global demand for primary sources of energy will increase by 45% between 2006 and 2030. In 2030 fossil fuels will cover 80% of the mix of primary energy sources, slightly increasing if compared to the present composition. Oil will keep on as the main fuel in use, even though demand for coal is increasing more than for any other fuel. The share of natural gas out of total energy consumption will marginally increase. After 2010 renewables will be the second largest source of electric power after coal thanks to the fast growth of modern technologies for renewables (figure 1). Non OECD countries as a whole will contribute to the growth of energy demand by 87% in 2030. In that part of the world the demand for primary energy will grow from 51% to 62%. China and India alone will contribute more than half to such growth. The Middle East emerges as the new and main centre of energy demand; it contributes with an additional 11% to the in-

crease of incremental global demand (figure 2).

World demand for electric power is expected to grow at 3.2% annual rate in the term 2006-2015. From 2015 to 2030 an annual average growth of 2% is expected. This trend reflects economic changes in non OECD countries. They shift from heavy industry to service and production that requires less electric power. In OECD countries the demand for electric power is expected to grow at the annual average of just 1.1%, moving to less that one third of the global demand between 2015 and 2030.

On the contrary, the demand of OECD non-member countries grows at an average annual rate of 3.8% (figure 3).

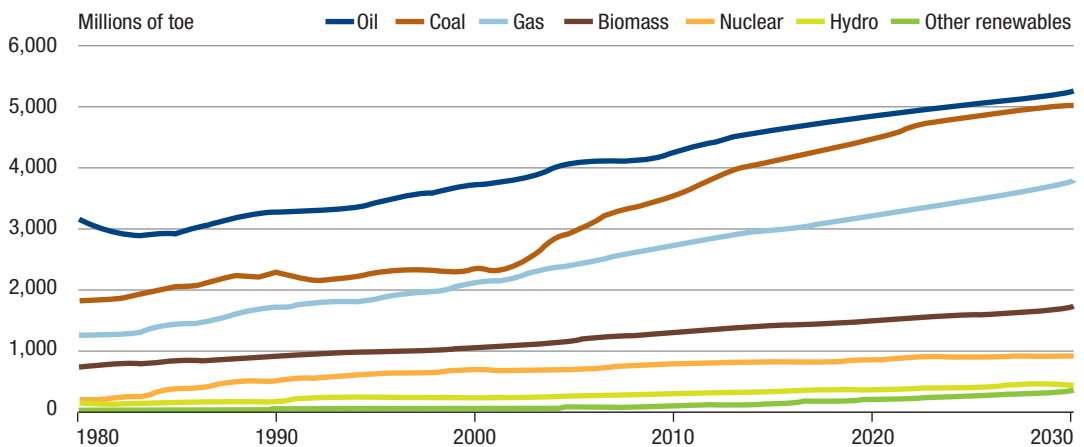
At the global level, coal will continue to be the main fuel for generating electric power until 2030. Its share out of the total will increase from 41% to 44%. The major growth in coal use will take place in non OECD countries. In those countries coal is going to be used for more than two thirds of all electric power plants while at present less than half of power plants make use of coal. Global efficiency of coal-fired plants will pass

Figure

1

World primary energy demand, 1980-2030

Source: International Energy Agency, 2008

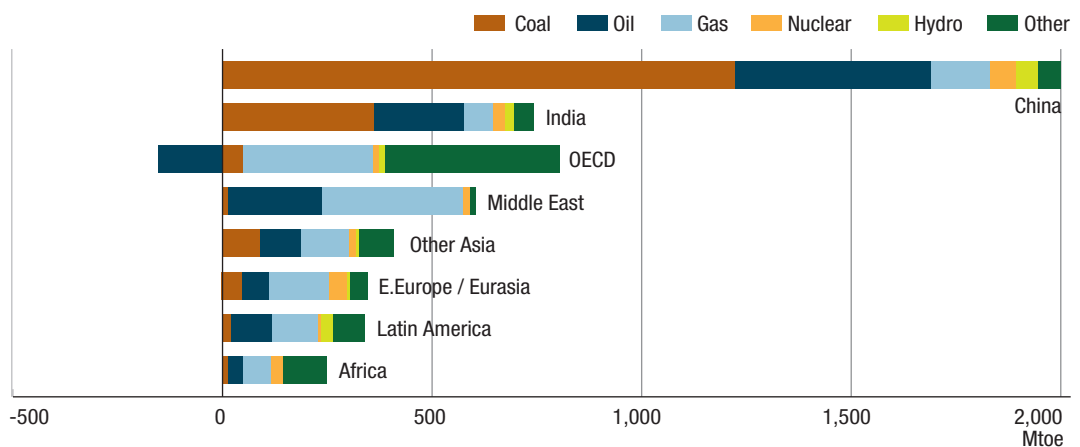


Figure

2

Incremental primary energy demand, 2006 and 2030

Source: International Energy Agency, 2008





Climate Change and Energy

from 34% in 2006 to 36% in 2015 and to 38% in 2030. Use of natural gas in the mix of fuels decreases because of higher prices. Nuclear power loses market shares, and moves from 15% in 2006 to 13% by 2015 and to 10% by 2030. The share of renewables will relevantly increase from 18% out of the total electric power in 2006 to 20% in 2015 and to 23% in 2030 (figure 4). Renewables are destined to quickly spread. That is due to cost reduction for mature technologies, that even though higher when compared to fossil fuel prices, makes them relatively more competitive, thanks also to a strong favourable policy. Thanks to its widespread development, the renewable energy sector has a chance to eliminate its dependence from incentives. By 2015 electric power generation from renewables, mainly from hydroelectric and wind sources, will overcome gas and will be the second major source of electric power in the world after coal. In OECD countries the total expected growth of renewable electric power generation is higher than the one based on fossil fuels and nuclear power together.

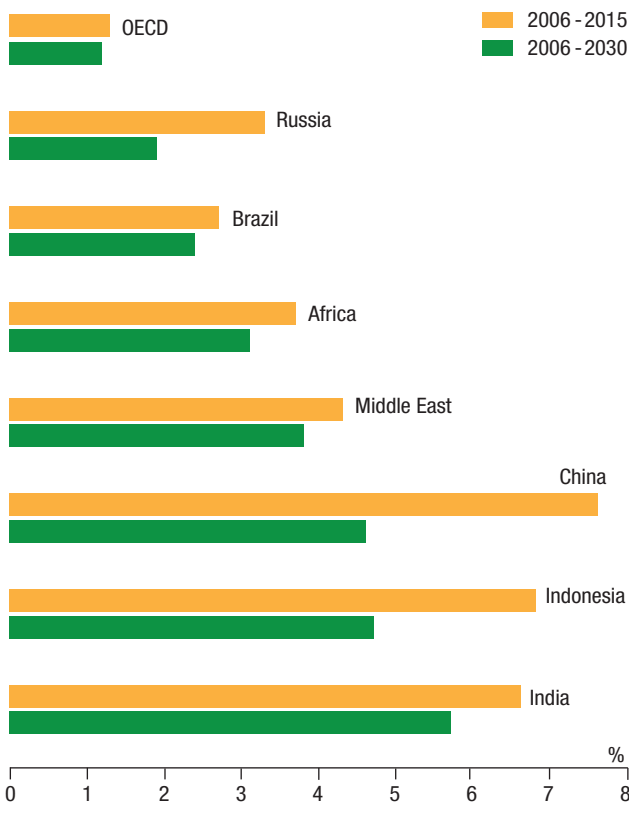
Overall generation of wind power is expected to grow by eleven times, and to become the second most important source of renewable energy, after hydro by 2010. The most relevant growth is expected in the European Union where wind power use will increase to 14% in 2030. Biomass, geothermal and solar-thermal have provided about 6% of the global demand for heating in 2006. This share is destined to reach 7% in 2030. Where there are plenty of natural resources and conventional energy sources are expensive, renewables may be highly competitive versus fossil-fuel-based systems. As regards the biofuel share out of the total of fuels for transportation, a growth is expected from 1.5% in 2006 to 5% in 2030. This boost is due to incentives and to oil price. The major growth takes place in the US, in Europe, in China and in Brazil. Second generation biofuels are expected to be commercially profitable, but by 2030 they will provide only a small contribution to the overall biofuel supply. The total of investment required on renewables in the term

Figure

3

Electricity demand growth rates by region

Source: International Energy Agency, 2008

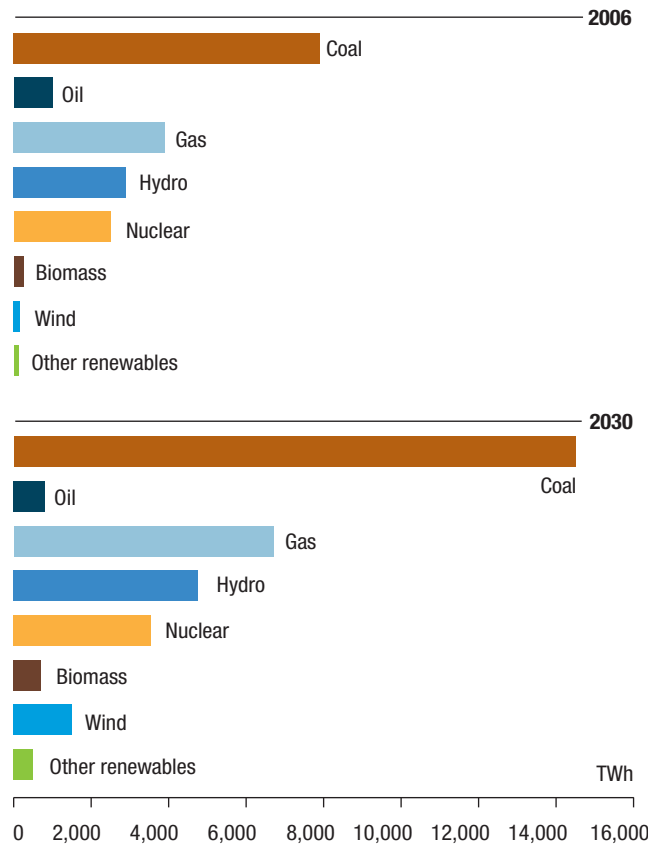


Figure

4

World electricity generation by fuel, 2006 and 2030

Source: International Energy Agency, 2008



2007-2030 is \$5.5 billion (dollars 2007). The majority of these investments are for electric power generation, which represents little less than half of the total investments in this sector.

As a result of the increased electric power demand, the global demand for oil is destined to increase to 2030, even though slower than in the last two decades. It will go from 85 million barrels in 2007 to 106 million in 2030.

All the expected growth of global demand for oil comes from OECD non-member countries. India sees the fastest growth, with annual average of 3.9% up to 2030, China (3.5%) and emerging economies of Asia and the Middle East follow.

Fall in demand by the three OECD geographical areas (North America, Europe and Asia-Pacific) is sharply in contrast, and

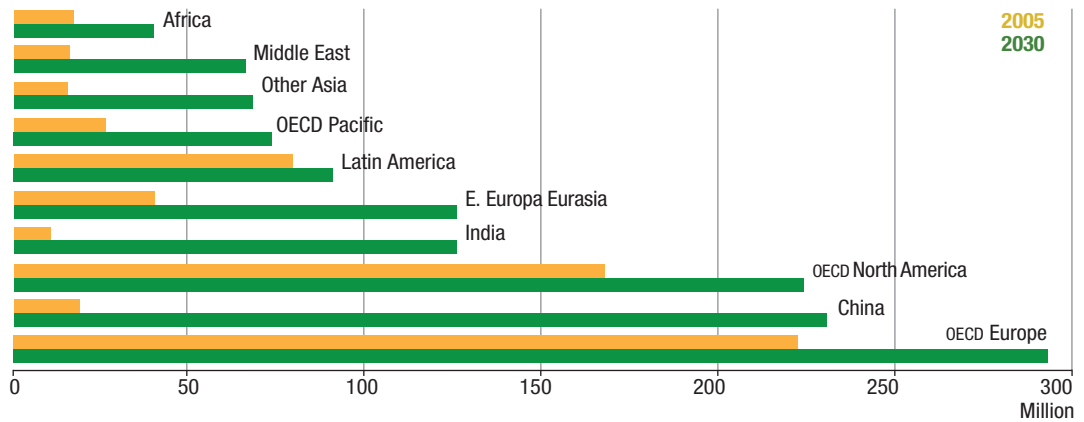
that is due to the decrease of demand in all sectors but transportation. OECD countries' share of the total oil demand goes from 57% in 2007 to 43% by 2030.

Almost three quarters of the expected global oil demand comes from transportation sector, and in the short term this sector will have little reaction to price variation. In spite of permanent improvement in energy efficiency, the enormous growth of vehicle fleet – from 650 million of vehicles in 2005 to the estimate of 1.4 billion by 2030 – is expected to continue and prefer the use of oil for transportation sector (figure 5). Eventually, as regards energy consumption per capita in 2030, inequalities between regions will be maintained. Middle East countries will see quick growth of per capita consumption. Russia will still have the highest energy consumption per capita (7.0

Figure

5
Light-duty vehicle stock by region, 2005 and 2030

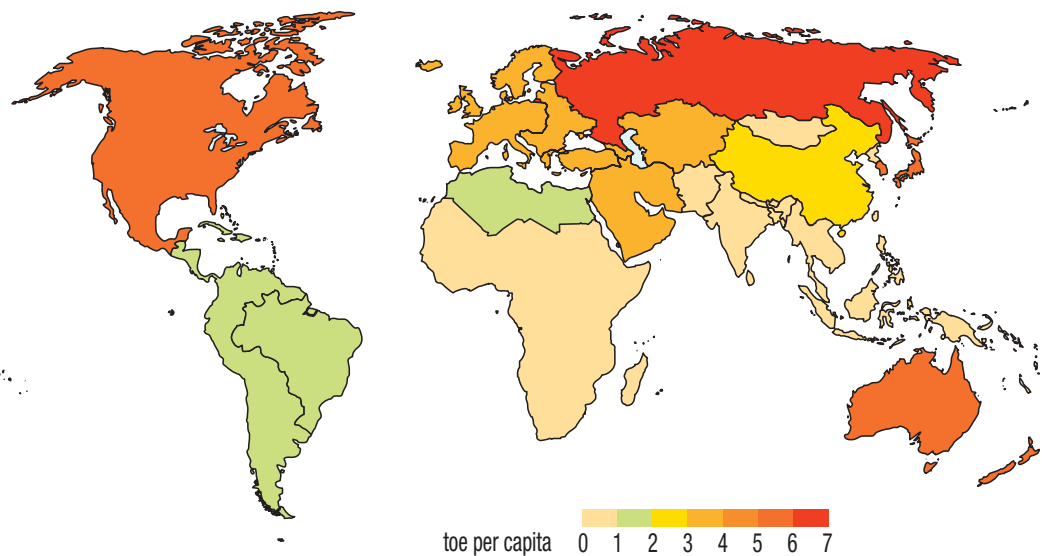
Source: International Energy Agency, 2008



Figure

6
Per capita primary energy demand by region, 2030

Source: International Energy Agency, 2008



toe in 2030) in spite of the limited growth of energy demand. In China per capita consumption will increase from 1.4 toe in 2006 to 2.7 toe in 2030, thanks to economy growth and a slow demographic growth (especially when compared to African and other Asian countries). Per capita consumption in India will be just 0.9 toe in 2030, starting from 0.5 toe in 2006. Per capita consumption in sub-Saharan Africa will have an average of only 0.5 toe in 2030, that is one third of consumption in Latin America and one ninth of consumption in OECD countries (figure 6).

Energy consumption in Italy

In Italy, the global energy price flow reduced the impact of the normative pattern evolution. The latter included liberalisation of energy markets and introduction of new forms to foster the use of renewables for power generation.

The trend to increase the contribution of renewables and of co-generation is also one of the causes of changes taking place in supplying, with the growth of natural gas versus oil product; and of the restart from 2001 of consumption of solid fuels, whose contribution to primary energy sources (primary electric power included) has passed from 8.6% in 2001 to 11.1% in 2007 (figure 7).

Changes in the mix of primary sources of energy have not reduced the high energy dependence in our country; it has increased, growing 82.8% in 1990 to 85.8% in 2007. The goal of reducing our economic system vulnerability due to the supplying pattern led the government to plan the re-launch of nuclear power generation.

A growing trend of overall consumption has been registered since 1990, with an increase of 19.9% in 2006, while in 2007 there was a decrease of 3.3% versus the previous year. The main sectors that have been highly growing in final consumption since 1990 showed a deflection in 2007: transportation -0.4%, residential/tertiary -4.2%, industry -2.6% and agriculture -3,6%. As regards the distribution of energy final consumption (non-energetic uses and bunker excluded), the transportation sector absorbs 34.3% of consumption, the civil sector 32.8% and industry 30.4%.

Italy is still one of G20 countries with the lowest energy intensity in terms of correct values and parity of purchasing power. Its energy intensity is less than the global and OECD average; this is because of the joint effect of consumption decrease and limited GDP growth (figure 8).

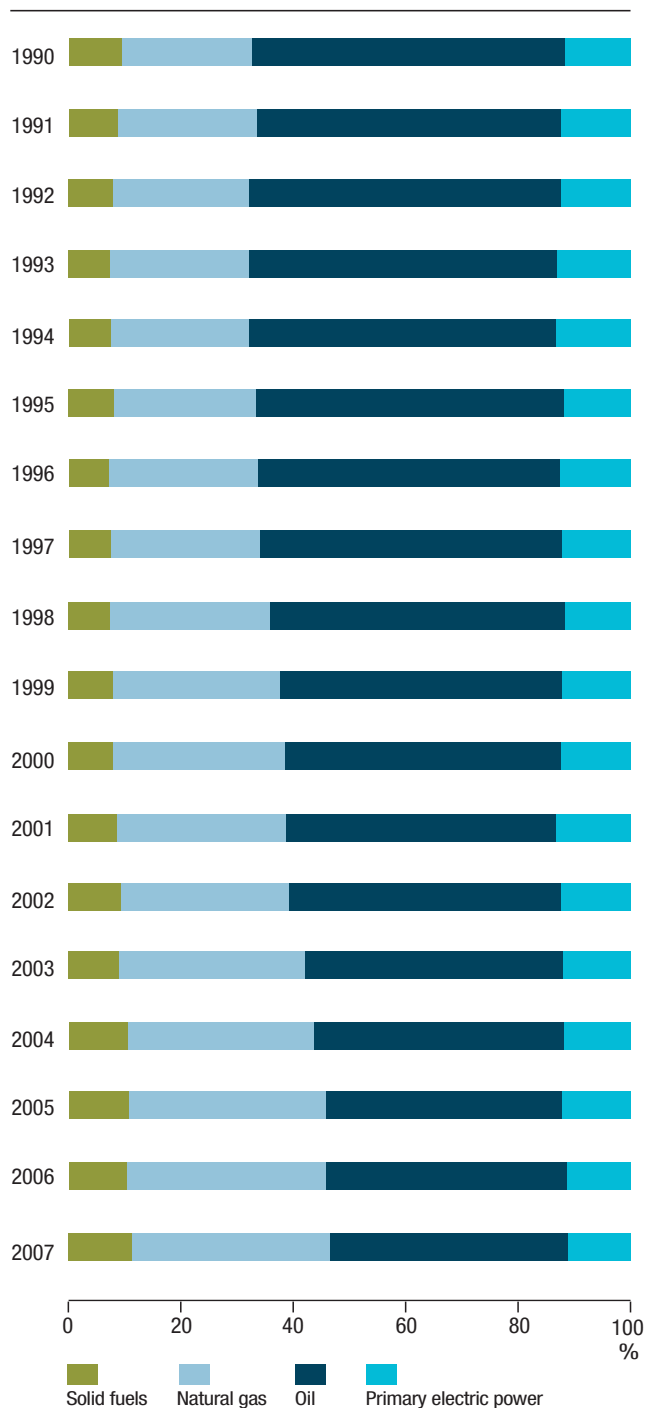
In Italy the growth rate of electric power generation has been relevantly higher than the rate of the overall energy consumption between 1994 and 2006. A slight decrease of 0.1% was registered in year 2007 only versus the previous year. Such a result shows the growing role played by electric power as energy vector in the national energy system.

Figure

7

Primary energy demand, 1990-2007

Source: data processing by ENEA on data provided by the Ministry of Economic Development, 2008

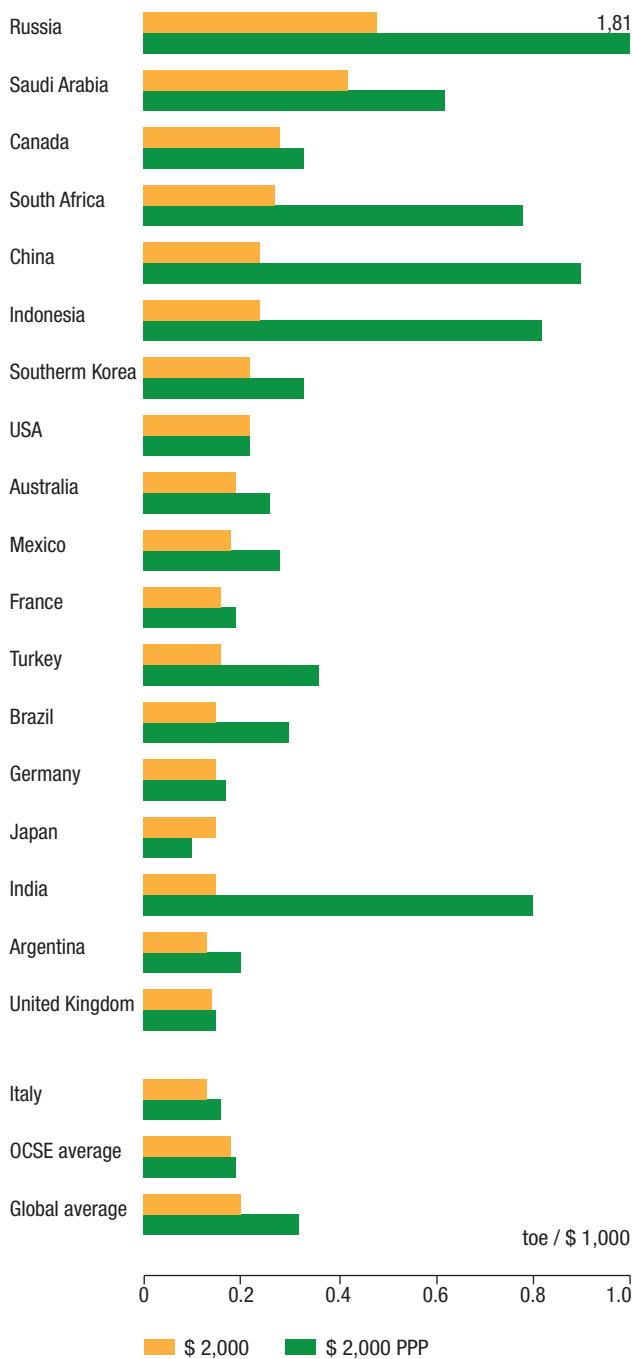


Figure

8

Overall energy intensity in 2006 for G20 Countries, referred to \$ 2,000 and \$ 2,000 adjusted at parity of purchasing power (PPP)

Source: International Energy Agency, 2008



Renewable energy production in the European Union and in Italy

In 2005 the electric power generation from renewables covered 14% of the EU27 gross domestic consumption of electric power, this percentage slightly increases (14,5%) if we consider EU15 consumption. The EU27 overall production in 2005 was 464.6 TWh (figure 9).

Last years trend shows the growth in electric power generation from renewables.

Hydroelectric energy gives evidence of some discontinuity due to different levels of rainfall in the considered period of time. Large hydroelectric plants have substantially exhausted their potentiality of development, but they are still strong for production of plants with nominal power ≤ 10 MW. In this case Italy was the second after Germany, and before France and Spain in 2005.

Source from wind energy are achieving the best growth. The production in the EU27 ranged from 3.5 TWh in 1994 to 22.3 TWh in 2000, and reached 70.4 TWh in 2005. Production distribution clearly shows the German leadership, followed by Spain and Denmark. Italy competes with the United Kingdom for the fourth position. The United Kingdom is highly committed to developing the off shore technology not yet experimented with in Italy and which has less theoretical potential of usage in the Southern rather than in Northern Europe seas. The second source is the biomass and biogas family whose level of electric power generation in the EU 27 was 78,2 TWh in 2005 of which 41.6 TWh generated by plants of solid biomass, 22.6 TWh by waste plants and 14 TWh by biogas plants. The distribution of electric power generation share from biomass plants gives evidence again of the primacy of Germany as the country with the best performance. Finland and Sweden follow as countries characterised by traditional use of wood biomass to fulfil energy consumption needs. In recent years the photo-voltaic solar energy connected to the network has been re-launched. Countries which have economically supported the introduction of this kind of energy saw the high speed of its penetration due to its easy use and the possibility of reselling non-consumed energy to the network provider. Italy is the first in power generation from geothermal source. In Europe geothermal heat is mainly exploited for thermal use, even though the temperatures used are lower because of less deep pits. Portugal is the only other country besides Italy which has undertaken a plan for developing geotherm at high enthalpy.

The demand for electric power has increased by just 0.7% in 2007 versus the previous year, even though Italian economy growth was 1.5%. The gap between power demand and GDP is due both to the 2007 mild temperatures and to the stagnation of industrial production.

Last year, as a consequence, electricity intensity has de-



creased after 20-year positive evolution.

On the basis of data published by the provider *Terna Rete elettrica nazionale Spa* 2007 the requirement was covered by the national production for consumption (86.4%) and for the remaining part (13.6%) by foreign balance.

Total gross output was kept substantially stable on the previous year level. Disaggregated data by source highlight the growth of thermoelectric production by 1.1%, about 258 TWh. Natural gas production increased of 6.4%, and at the same time power generation by oil products decreased (-23.6%). Production from renewables decreased (-3.5%), as well as hydroelectric production from natural sources. A sharp growth of wind power generation (39.5%) and of photovoltaic is to be registered.

The share of renewable energy in Italian power generation is 16%, a portion is covered by the use of natural gas (54%), by oil products (8%), by coal (14%) (figure 10). If the Italian mix of power generation is compared with the power generation of some EU15 sample countries we see high dependence on gas, relatively high share of oil products and lower or no incidence of other traditional sources (i.e. coal and nuclear). As regards renewables in the power generation mix, Italy is aligned with other EU countries.

The situation is still worse than in other European countries if we consider the relevant contribution of imports to cover the national power requirements, and the lower growth of new generation renewables (i.e. wind, solar, mini-hydro, biomass and renewable waste).

Further details on renewables in the term 2000 – 2007, show a decrease of hydroelectric production from natural sources (-24.3%), slight increment in geotherm (+18.4%), higher increment of biomass and waste (+277.8%), the latter achieving the second rank in importance for this sector items. Higher growth has involved photo-voltaic, though its contribution in the total is very small, and wind with an increment of 636.0% in the term (figure 11).

Greenhouse gas emissions

The growth of greenhouse gas emissions is due to the global growth of fossil fuel consumption. On the basis of the scenario provided by IPCC, the growth of greenhouse gas emissions not accompanied by change in government policies (business as usual), would double the concentration of these gasses in the atmosphere up to about 1,000 CO₂ ppm. That means an estimated increase of the global average temperature up to 6° C by the end of this century.

The International Energy Agency (IEA) estimates global CO₂ emissions related to energy consumption to grow from 28 gigatonnes (Gt) in 2006 to 41 Gt in 2030 (figure 12).

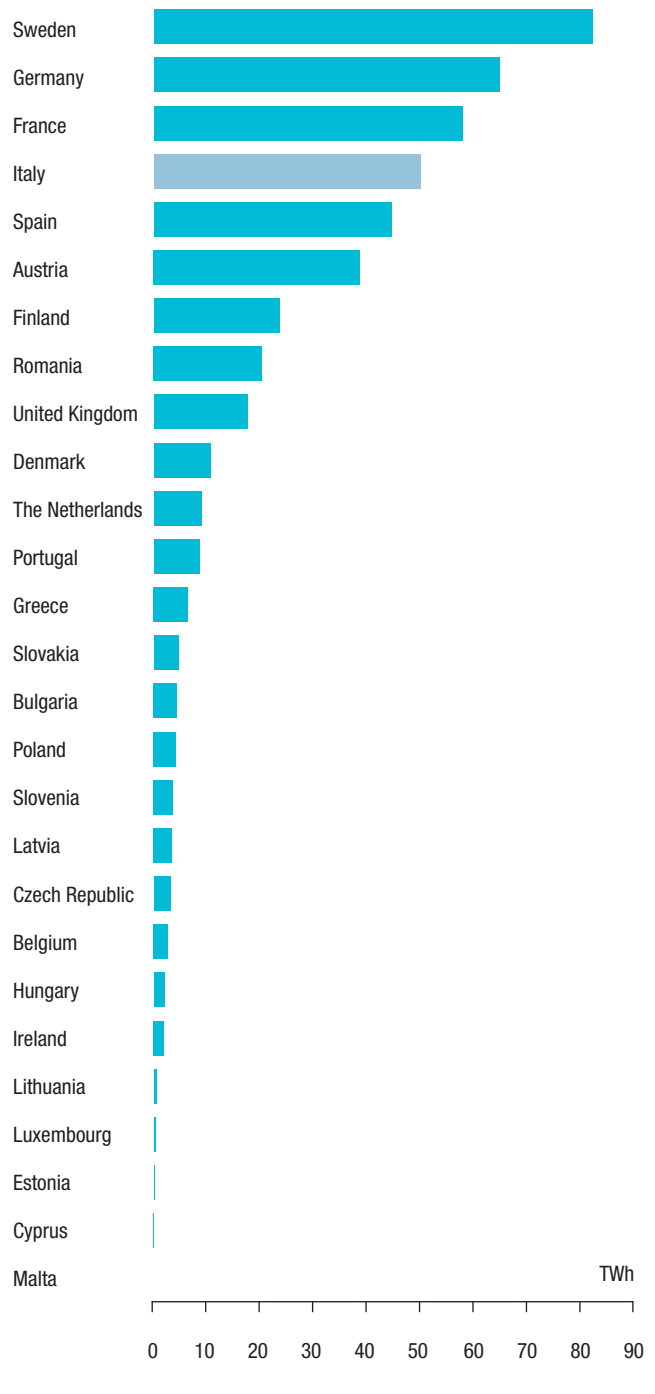
The global greenhouse gas emissions, including CO₂ emissions

Figure

9

Distribution of electric power generation from renewables in EU27 Countries, 2005

Source: Eurostat, 2008

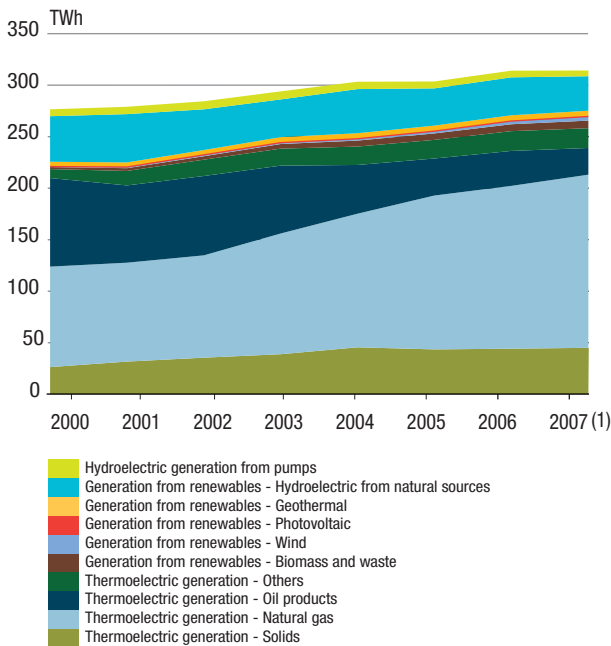


Figure

10

Power generation by source, 2000-2007

Note: (1) provisional data.
 Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by the Regulatory Authority for Electricity and Gas, 2008

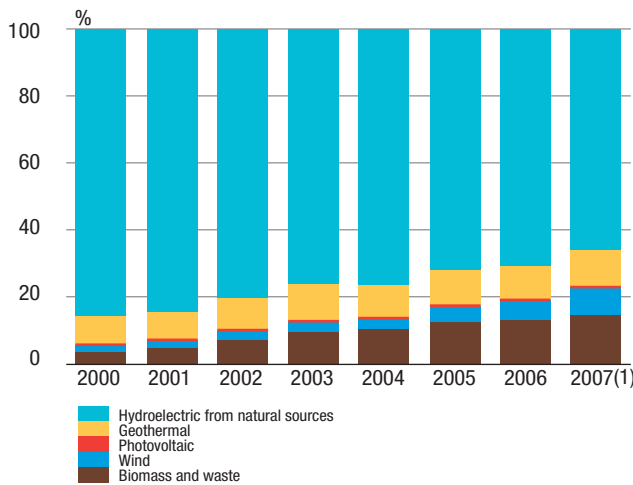


Figure

11

Power generation from renewables, 2000 - 2007

Note: (1) provisional data.
 Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by the Regulatory Authority for Electricity and Gas, 2008



not related to energy consumption and including the other five greenhouse gases, is expected to grow from 44.2 Gt CO₂ equivalent in 2005 to 59.6 in 2030 (figure 13). CO₂ emissions in industry are increasing as fast as energy sector emissions, while emissions related to land use are expected to decrease (above all because of deforestation).

Three quarters of the expected growth of CO₂ emissions related to energy is going to be produced by China, India and the Middle East. Emissions in OECD countries will achieve the highest level immediately after 2020 and will decrease afterwards. In Europe and in Japan only, emissions will decrease by 2030.

The largest share of CO₂ emissions for global consumption of energy is expected to be produced by cities, whose share will go from 71% in 2006 to 76% in 2030 in line with the urbanisation process. Cities' inhabitants tend toward higher energy consumption than rural area inhabitants. As a consequence the former have higher CO₂ emissions per capita (figure 14). A relevant aspect links greenhouse gas emissions with trade and exports, since the consumption of goods and services often takes place in a country other than the one where emissions were generated. This issue is concerning some emerging economies, among them the most export-oriented ones that often export energy-consuming finished products.

Exports percentage in terms of GDP can be used as a simple proxy for the share of CO₂ emissions related to energy consumption and incorporated in national output for exports.

Countries whose updated data on trade are available generate 83% of CO₂ emissions at global level. By grouping these countries in eight regions, the estimated share of emissions incorporated in exports in 2006 ranges from 15% in North America to 48% in the Middle East. The difference takes into account quantity and type of exports as well as carbon intensity for energy consumption (figure 15).

The decrease of global energy intensity (-33%) has affected global emissions in the term 1970-2004 less than the combined effect of global population growth (69%) and the growth of global per capita income (77%). Both are crucial factors for the growth of CO₂ emissions related to energy.

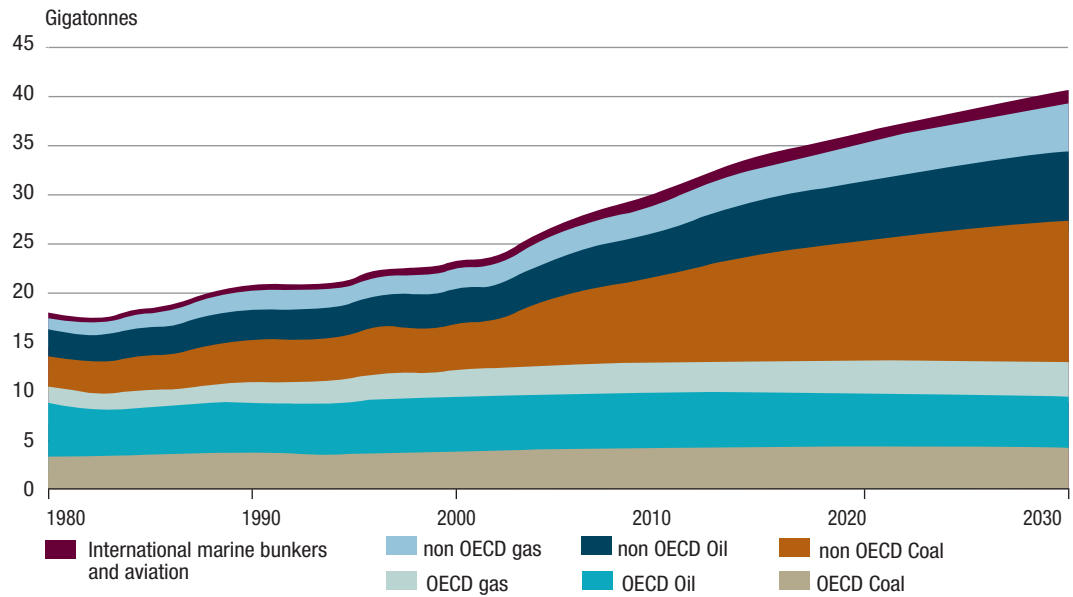
In the long term the trend of carbon intensity decrease in power generation, as CO₂ emissions per unit of generated power, has inverted after 2000. Differences among countries in terms of per capita income, per capita emissions and energy intensity are still important. In 2004 the 41 countries of UNFCCC Annex I covered 20% of the world population and produced 57% of the global GDP based on Purchasing Power Parity (GDP-PPP), and were responsible by 46% of the global emissions of greenhouse gasses (figure 16).

Two different scenarios are assessed: one in which the atmospheric concentration of emissions is stabilised at 550 parts per million (ppm) CO₂ equivalent and the second at 450ppm. The former scenario may lead to a possible increase

Figure

12
Energy-related CO₂ emissions, 1980-2030

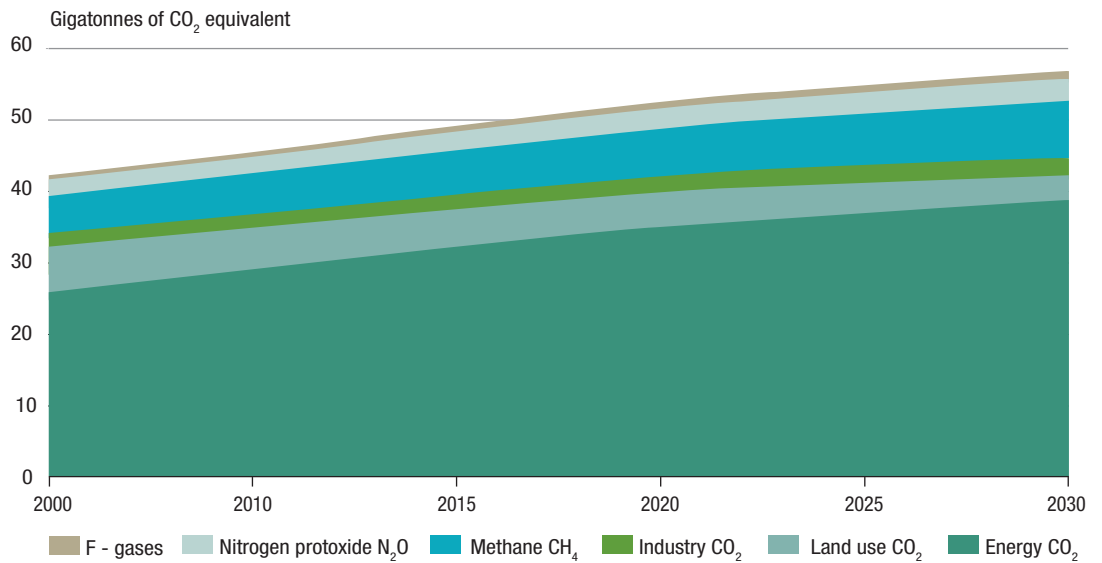
Source: International Energy Agency, 2008



Figure

13
World anthropogenic greenhouse-gas emissions by source, 2005-2030

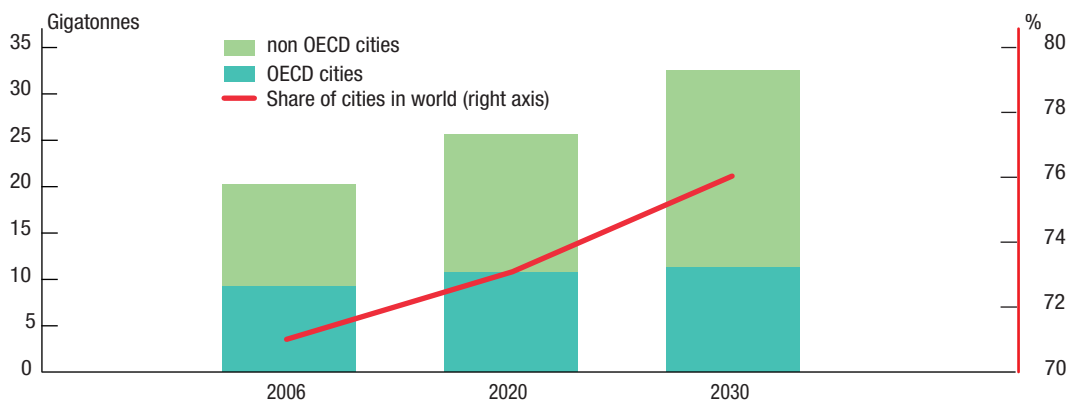
Source: International Energy Agency, 2008



Figure

14
Energy-related CO₂ emissions in cities by region, 2006-2020-2030

Source: International Energy Agency, 2008

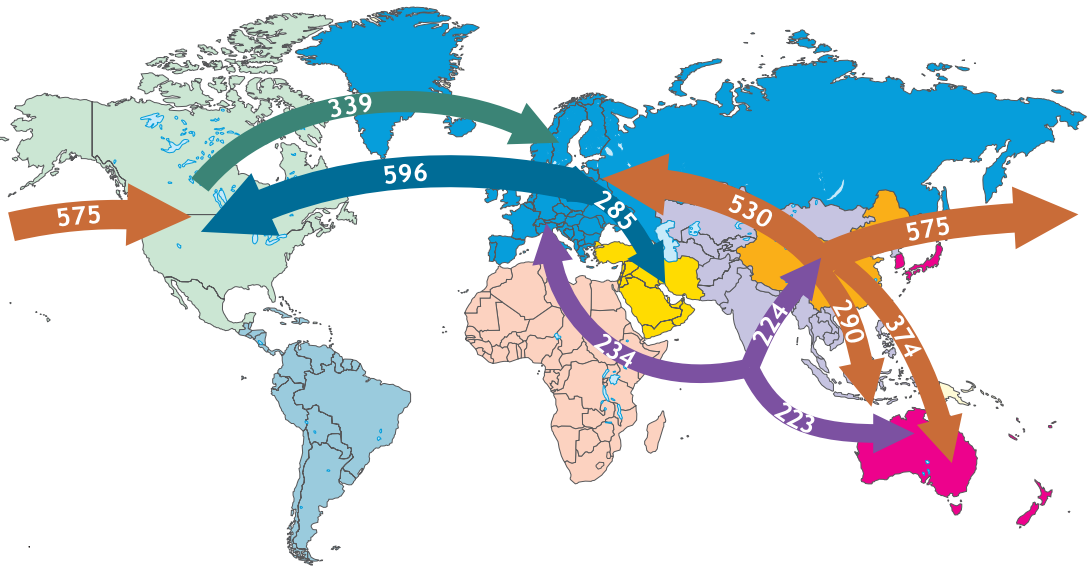


Figure

15

Ten largest inter-regional flows of energy-related CO₂ emissions embedded in exports of goods and services, 2006

Source: United Nations Conference on Trade and Development and International Energy Agency, 2008



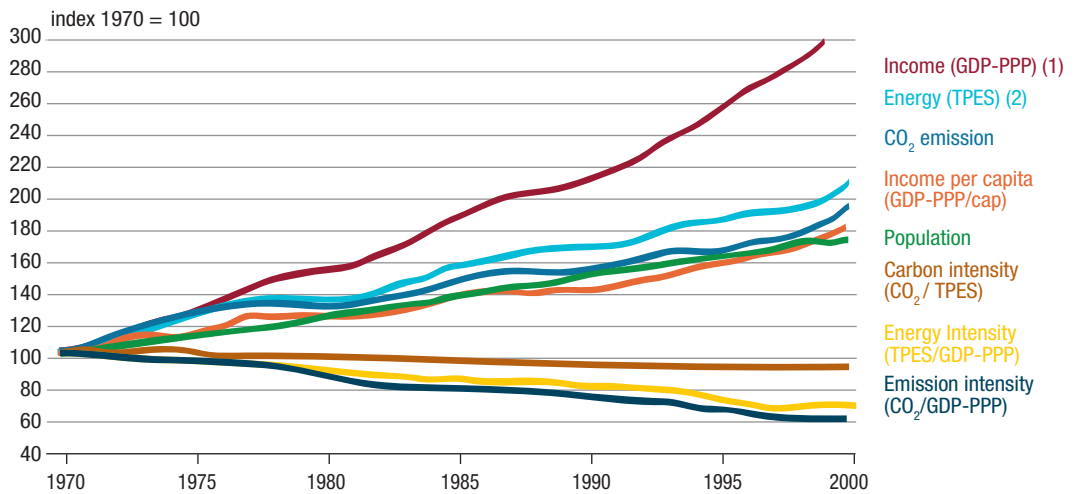
Figure

16

Main greenhouse gas emissions indicators, 1970-2000

Source: Intergovernmental Panel on Climate Change, 2008

Notes: (1) PPP = Parity of Purchasing Power (2) TPES = Total Primary Energy Supply



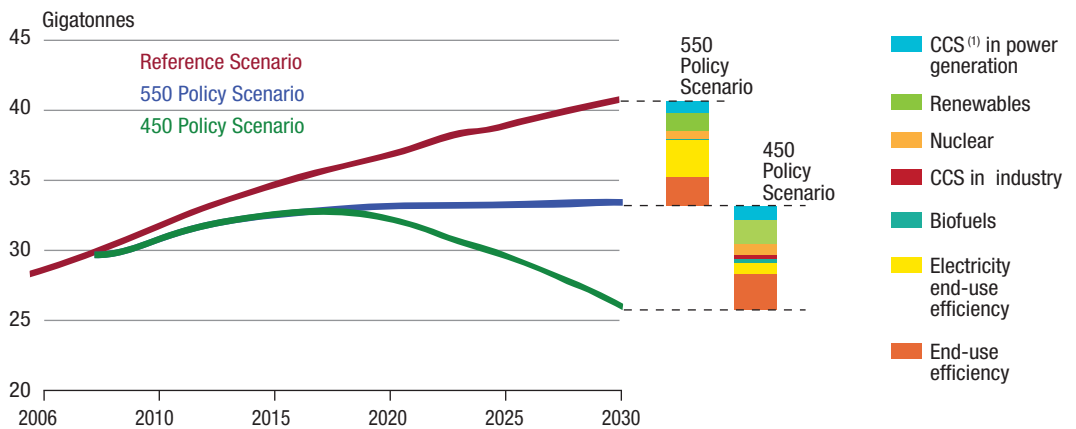
Figure

17

CO₂ emissions from energy sources in the 450 and 550 scenarios, 2006-2030

Source: International Energy Agency, 2008

Note: (1) Carbon Capture and Storage



of about 3°C in the global average temperature, the latter scenario to an increase of about 2°C. Both would have a similar trend of emissions until 2020, with a sharper decrease of emissions after 2020 for the scenario at 450ppm (figure 17). The economic implication of the scenario at 550ppm would be the GDP global decrease ranging from 0.2% to 2.5%, while

the GDP decrease in the scenario at 450ppm would be ranging from 0.5% to 3.0%.

Table 1 reports the cost estimates of climate change at the level of Gross Domestic Product (GDP) percentage according to the most recent studies.

Table

1

Cost estimates of global climate change related to future GDP levels

Source	Cost estimate related to		Specifications
	Global GDP	2006 GDP	
Stern report, 2006	1%	€ 385 billion or \$484 billion	Costs by 2050. Stabilisation goal: 450 ppm CO ₂ or 500-550 ppm CO ₂ eq
Vattenfall, 2007	0,6%	€ 231 billion or \$290 billion	Costs to limit concentration of greenhouse gasses at 450 ppm CO ₂ in 2030. Detailed assessment of opportunities related to lower cost
European Commission, 2007	0,5%	€ 193 billion or \$242 billion	Investments in low-carbon economy the term 2013-2030. Stabilisation target: 450 ppm CO ₂ eq
Intergovernmental Panel on Climate change IPCC, 2007	0,6% nel 2030	€ 231 billion or \$290 billion in 2030	Cost average at macro-economic level of greenhouse gasses mitigation in 2030 and 2050. Stabilisation at 535-590 ppm CO ₂ eq (440-480 ppm CO ₂)
	1,3% nel 2050	€ 501 billion or \$629 billion in 2050	
Stern report up-dating, 2008	2%	€ 771 billion or \$968 billion	Costs by 2050. Stabilisation target: 500 ppm CO ₂ eq
United Nation Development Programme UNDP, 2008	1,6%	€ 617 billion or \$774 billion	Cost annual average between 2007 and 2030. Stabilisation target: 450 ppm CO ₂ eq, 50% reduction of greenhouse gas emissions in 2050 versus 1990
Organisation for Economic Co-operation and Development (OECD), 2008	0,5% nel 2030	€ 193 billion or \$242 billion in 2030	GDP reduction below the estimated threshold of reference in 2030 and in 2050. Stabilisation at 450 ppm CO ₂ eq, reduction of greenhouse gas emissions by 30% in 2050 versus 2000
	2,5% nel 2050	€ 923 billion or \$1,210 billion in 2050	

Source: data processed by the Italian Ministry for the Environment, Land and Sea, 2009

Greenhouse gas emissions in Italy

Italy follows the same general trend in the growth of greenhouse gas emissions. Most recent data of the National Air Emissions Inventory report that emissions have passed from 516.85 to 567.92 million tons of CO₂ equivalent (Mt CO₂eq) in the term 1990-2006, with an increase of 9.9%. According to Kyoto Protocol, Italy should reduce its emissions of 6.5% versus 1990 emissions, that is at 483.26 Mt CO₂eq.

At the global level Italy is responsible for about 1.7% of the overall emissions caused by the use of fossil fuels. Italy is ranked as the ninth country among ten with highest levels of greenhouse gas emissions⁹.

Greenhouse gas emissions had a total growth of 51.0 Mt CO₂ eq in Italy between 1990 and 2006. During the same period fugitive emissions (due to leakage during hydrocarbon extraction and distribution), manufacturing emissions, agriculture emissions and emissions due to the use of solvents were reduced. On the contrary, emissions caused by industrial processes, waste, residential and service sector and above all by energy and transport industry have increased (+28,7 Mt CO₂ eq) (figure 18).

The growing trend of emissions has changed since 2005. In 2006 versus 2005 a decrease in emissions was registered for the majority of sectors, in spite of a growth for transportation, manufacturing and solvent use sectors. An overall reduction of emissions was registered versus the previous year -1.73% (-10,02 Mt CO₂ eq) for total emissions, and -0.91% (-4,34 Mt CO₂ eq) for emissions caused by combustion processes.

Italy will be probably unable to achieve the Kyoto goal only by means of national measures, due to the growth of emissions by energy industries. Our country should apply for credits generated by forest activity and by international cooperation interventions provided by the Kyoto Protocol as Clean Development Mechanism and Joint Implementation.

The reference framework

The most important measures deal with mitigation of greenhouse gas emissions and adaptation to present climate change. They can be either complementary, replaceable, or independent measures. From recent IPCC assessments, it is clear that, with the present policies for mitigating climate change, global emissions of greenhouse gasses are expected to grow in the next decades. As a result, adaptation measures will be required because of climate patterns inertia and changes already in progress, though mitigation measures have been adopted.

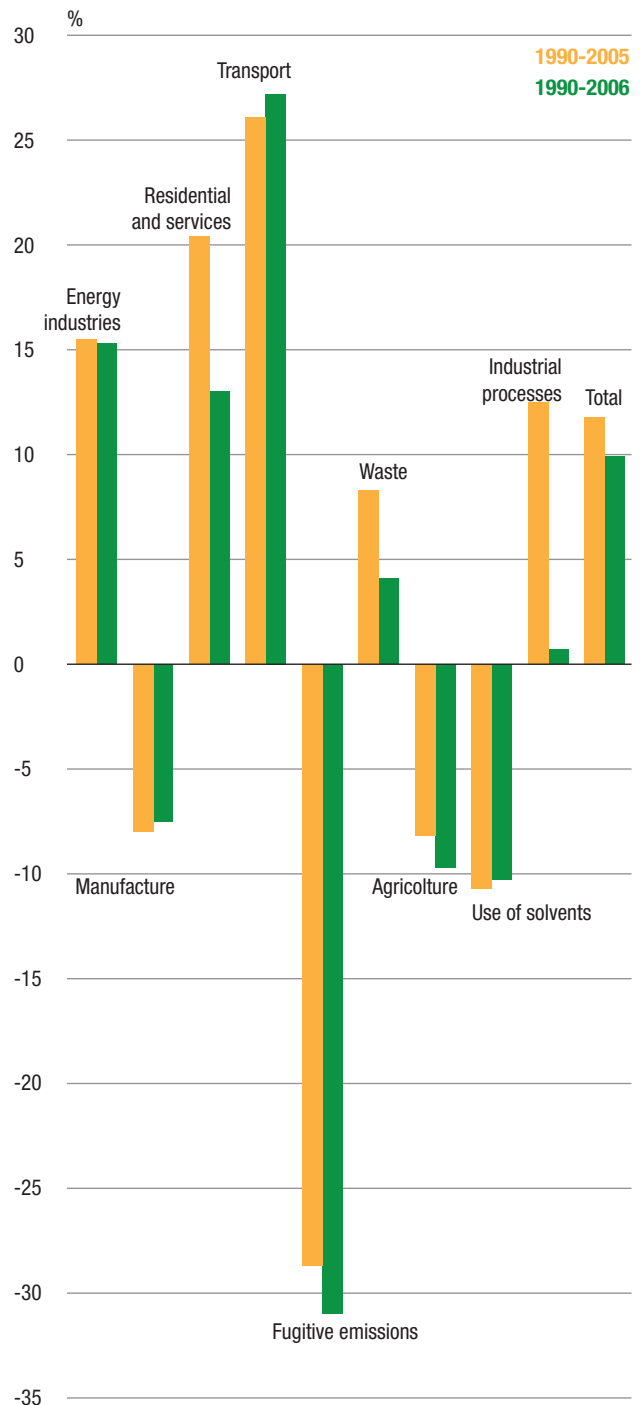
Still, we should consider that because of that inertia the benefits from mitigation measures adopted today may be seen only in the mid/long term and the potential of those measures

Figure

18

Percentage variation of greenhouse gas emissions by economic sector in 2005 and 2006 compared with 1990

Source: ISPRA, 2009



— 9 IEA (2007). CO₂ emissions from fuel combustion, 1971-2005



is higher than the one of adaptation measures adopted today. The international community's main response to greenhouse effect and to global warming is the United Nations Framework Convention on Climate Change (UNFCCC -1992). The major goal of the Convention is to stabilise greenhouse gas concentration in the atmosphere at such a level to prevent dangerous anthropogenic interference with the climate.

Since climate processes will react in the long term, though relevant actions are adopted for greenhouse gases reduction, climate change will be unavoidable in the future. Highly effective actions are to be undertaken to slow down as much as possible the phenomenon using mitigation strategies (on the causes) and adopting adaptation strategies (on the effects) in order to minimise the possible damages.

One of the UNFCCC operational instruments is the Kyoto Protocol. This Protocol demands industrialised countries (Annex I) to reduce by 5.2% their CO₂ emissions and of other five gasses contributing to greenhouse effect by the year 2012 versus 1990. Reduction of emissions of CO₂ and other greenhouse gasses was already effective in 1997 (the year in which the Protocol was signed) independently from the region of the planet where it was performed, and projections of emissions by industrialised countries to 2010 were generally higher compared to 1990. In consideration of this, the Protocol provided three so-called flexible mechanisms of implementation. The purpose of those mechanisms is to give global relevance to the commitments on reduction, and industrialised countries can use them to integrate their national measures by means of co-operation with developing countries.

A goal was established for each member State in the European context (EU15) on the basis of distribution criterion. Figure 19 highlights that many countries are not meeting the goals established by the Kyoto Protocol. Germany, Belgium and the Netherlands have met Kyoto goals while the United Kingdom, Sweden and France have reduced emissions beyond the established goals in the term 2008-2012. New accession countries (Slovenia excluded) have generally reduced their emissions much more than required by Kyoto goals. Cyprus and Malta have no obligation to reduce emissions since they are not included in the UNFCCC Annex I.

Beyond Kyoto

Important steps forward, at international policy level, were made during the negotiations at the Bali Conference in Indonesia in 2007, where the 13th session of the Conference of the Parties of the United Nations Framework Convention on Climate Change was held.

One of the main achievements of the Bali Conference was the adoption of the Bali Road Map.

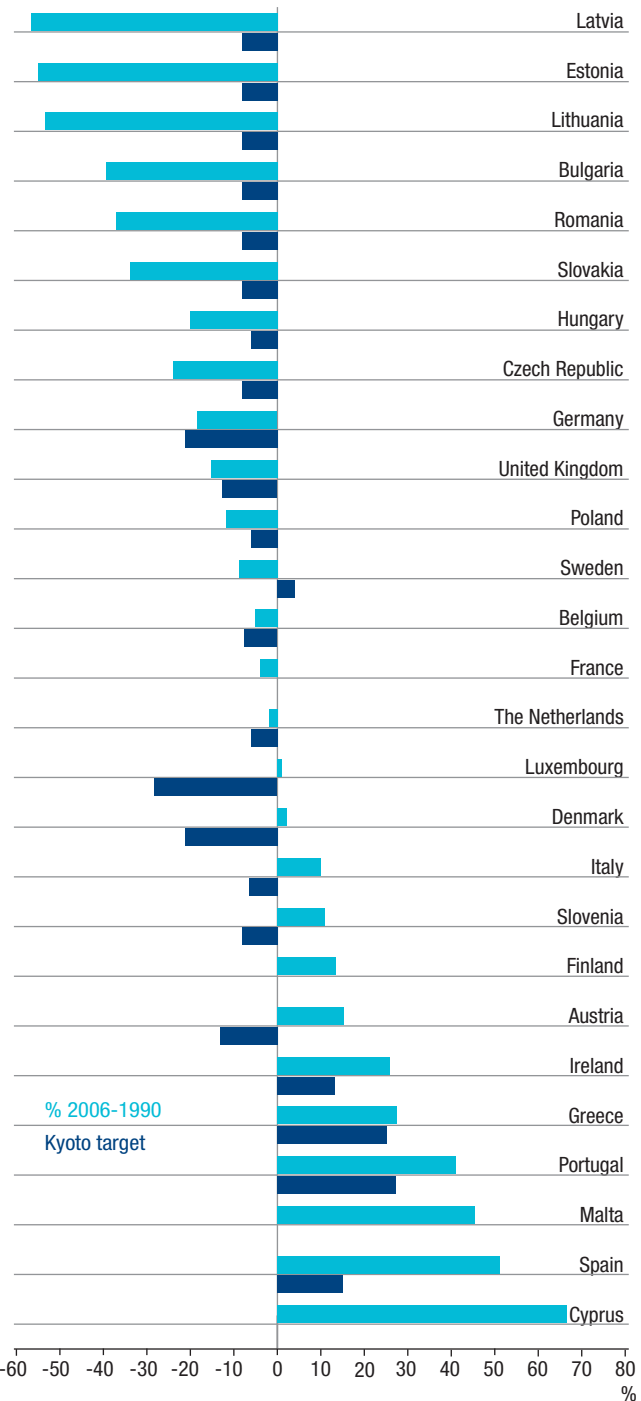
The document is made of quite a few crucial decisions to en-

Figure

19

Comparison of greenhouse gas emissions level in 2006 versus 1990 (base year) and Kyoto target for 2008-2012 in the European countries (UE27)

Source: data processing by ISPRA on data provided by the United Nations Framework Convention on Climate Change, 2008



sure a safe future climate.

The Road Map includes the Bali Action Plan, which outlines the path for a new process to enable the Convention full implementation by means of long-term actions. It includes five main topics of negotiation: a shared vision for a long-term cooperative action, mitigation, adaptation, technology transfer and development, and mobilisation of financial resources. During the following 14th session of the COP, held in Poznan

(Poland) in December 2008, the Parties agreed to plan subsequent negotiation sessions on some relevant topics to implement the Kyoto Protocol.

On that occasion Italy revealed the intention to use the G8 meetings, which include emerging countries, to favour the achievement of an agreement within the 15th sessions of the UNFCCC COP to be held in Copenhagen in 2009.

Box

1

The EU Climate Energy Package

On 8-9 March 2007 the European Council defined the strategic measures to reduce atmospheric emissions from the energy sector. The following goals by 2020 were therefore provided:

- a) reducing overall emissions by at least 20% as compared to 1990;
- b) increasing the share of renewables in energy use by 20%.
- c) reducing energy consumption at least by 20% below projections to 2020;
- d) target of 10% biofuel contribution to transport.

All these measures aim to combat climate change, improve energy security, ensure competitiveness of the European economy and promote a low-carbon economy. European Council conclusions provided as well the commitment to limiting the global average temperature increase to not more than 2°C above pre-industrial level.

On December 18, 2008 the European Commission achieved, after the serious debate of member countries, an important agreement on the package of proposals for achieving goals by 2020.

The Climate Energy package includes:

- a) strengthening and expanding *emissions trading*: the directive proposal provides that, by 2020, all sectors ruled by directive 2003/87/EC cut greenhouse gas emissions by 21% versus 2005 levels;
- b) reducing greenhouse gas emissions by 10% versus 2005 level for sectors not ruled by directive 2003/87/EC at European level, with the sharing of expenses among member countries. Italy's goal should be 13%;
- c) sharing among member countries of the Community goal on renewables. Italy's goal should be 17%;
- d) a juridical framework for the geological storage of carbon dioxide, in order to ensure a permanent limitation of this substance and to minimise possible risks for environment and health.

Referring to item c) on sharing among member countries of the goal on renewables, it is important to note that the Italian government is working to achieve it. The law decree 30 December 2008, n. 208, dealing with extraordinary measures on it water resources and environment protection, was converted into law with some modifications. It provides that the Italian Minister for Economic Development, in agreement with the Minister for the Environment, Land and Sea, and in understanding with the Permanent Conference among State, regions and the autonomous provinces of Trento and Bolzano, establishes the sharing among regions and the autonomous provinces of Trento and Bolzano of the minimum share of the increase of energy generated by renewables in order to achieve the goal of 17% of gross domestic consumption within 2020 and to meet further requirements the EU will propose.

Box

2

The call "Photovoltaic in architecture" by the Italian Ministry for the Environment, Land and Sea

The call for projects "Photovoltaic in architecture" by the Italian Ministry for the Environment, Land and Sea is aimed at paying grants for the construction of photovoltaic plants (size between 1 and 50 kWp), fully integrated into housing compounds. Over 2.6 million euros have been allocated in 2007; in 2008 one million euros has been allocated to the call among funds destined to the Ministry for the Environment,

Land and Sea by the financial law 2008. Forty-eight applications out of the 64 applications submitted were admitted to co-financing. The construction of these plants in the 48 local administrations participating in the programme will lead to produce 886.50 kWp of photovoltaic, with an expected annual generation of over 1.1 MWh and a reduction in emissions of about 570 tons of CO₂/year.

In the solar-thermal sector, the Ministry for the Environment, Land and Sea allocated to regions about 8.5 million euros for the start of the national programme to spread solar-thermal plants for sanitary hot water, swimming pool water warming, and building heating for private and public purposes. The programme, which is 50% co-financed by regions, is managed by the regions themselves.

On the basis of the amount provided by the financial law 2005, on December 23, 2008 was published the call for 10 million euros to support research projects aimed at energy efficiency interventions of and at the use of renewables in urban areas. This fund is aimed at co-financing by maximum 50% of the eligible costs studies and research on environment subjects and on renewables to improve environmental quality in urban areas.

Box

3

The United States economic stimulus plan

To tackle the economic and financial crises, the most developed countries have undertaken various actions to re-launch the economy on the basis of agreed and coordinated actions.

President Obama has proposed a stimulus plan to re-launch US economy. The plan is particularly significant both for the economic commitment and for the issues it deals with.

The plan¹ focuses mainly on policies to foster alternative energy development and provides an articulated program of goals and financial interventions to support America's energy transition towards a low-carbon economy. The target is the reduction of greenhouse gas emissions of 80% versus 1990 level by 2050. This effort aims to align the US economy with the goal of emissions reduction as indicated by the UN Intergovernmental Panel on Climate Change (IPCC).

The main goals of the plan are:

- Development and diffusion of alternative energies (\$15 billion investment per year for 10 years);
- Provision of a limit to CO₂ emissions by industries, and contemporary implementation of a cap-and-trade program similar to the EU Emissions Trading Scheme, to reduce greenhouse gas emissions of 80 percent by 2050;
- Production/use of one million plug-in-hybrid cars by 2015;
- Ensure that 10 percent of electricity comes from renewable sources by 2012, and 25 percent by 2025;
- Within 10 years save more oil than the amount currently imported from the Middle East and Venezuela combined.

This package of goals is expected to generate at least five million jobs and therefore to be the first real and high-scale demonstration of convergence between environment protection and economic growth.

The Plan has double value also for European policies. It is aimed at implementing programs and interventions in the domestic US market supported by a strong financial commitment, and with a timeline goal between 2025 and 2050, that enable implementation of long-term investment and policies. This choice provides a successful and profitable perspective to investment in new technologies, which requires medium-long term commitments. This option may also ensure to the United States the world leadership in the development of the most advanced solutions in energy technologies, in the production of low-consumption vehicles and in the production of alternative fuels. Since China and Brazil have recently indicated the international co-operation on finance and technology as the way to reduce emissions, the Brazil-China-US partnership may represent the reference axis for de-carbonizing the world economy in the next future. This scenario is partially discordant with the EU philosophy.

The Climate Energy package recently approved by the Council provides several indications on the "institutional architecture" of the European system to reduce emissions, but provides few and preliminary options for the financial system and the necessary investment. The EU risks therefore to be in a marginal position.

— 1 http://www.whitehouse.gov/agenda/energy_and_environment/

The second interesting aspect for European policies is that the Obama Plan offers EU institutions an opportunity to get out from the *cul-de-sac* of EU unilateral approach on climate change. The Plan may open a new partnership with the US, aimed at developing technological and financial solutions rather than the prevalent and exhausting search for agreement on rules.

The EU may support, by means of suitable incentive measures, joint programs of European and US enterprises for the development of new low-carbon technologies, while competing with US too in the partnership with China and Brazil.

As a consequence the EU may need to use immediately the revision clause of the climate and energy package to identify and include incentives to enterprises, to optimize all possibilities of a partnership with the US, and freeze those procedures that may prevent Europe from getting the opportunities offered by the new situation.

The first chance should be in the procedures referring to the commitments taken with the Kyoto Protocol, which divert resources from investing in new technologies.

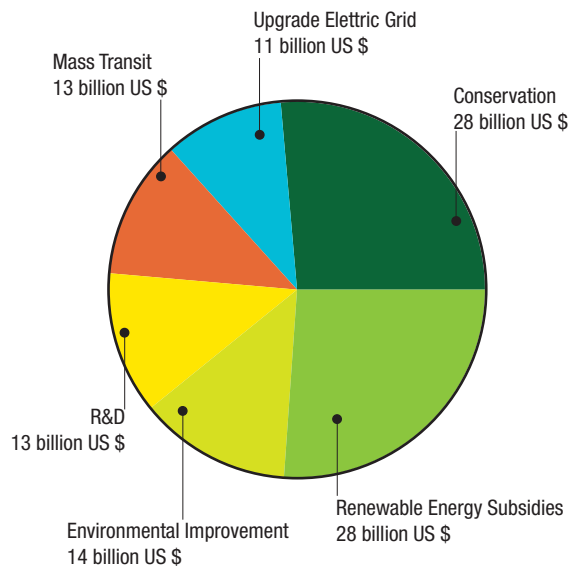
In this new background Italy is given a great chance by the presidency of G8 with the participation of Emerging Economies (Brazil, China, India, Mexico, South Africa), and considering that the electoral campaign President Obama proposed a Global Energy Forum composed by the G8+5 group.

Figure



Resource distribution in the US stimulus plan

Source: CNN Money, 2009



Box

4

Policies for energy efficiency in buildings

The European directive 2002/91/EC on energy performance of buildings has been implemented by Italy through the law decrees 192/05 and 311/06. Regulations provide the compulsory energy certification of buildings to issue building permits in case of new buildings, to perform real estate transactions and to have access to the sector incentives. They also provide threshold values of Energy Performance indicators (EPI) in existing buildings¹. The use of renewables to generate thermal energy and electric power is now compulsory for all new buildings².

The majority (40%) of existing buildings are more than 50 years of age and actions in this sector are for extraordinary maintenance and re-qualification. The energy performance of buildings is low, especially as regards the thermal insulation of the cover and the management of heating equipment.

As regards average national consumption, a 90/100 sqm. residential unit made with mean finishing and traditional construction characteristics, is estimated to require, for winter heating only, about one ton of oil equivalent (toe) per year. If we assess building sustainability in terms of Extended Life Cycle Cost, and we consider all ordinary and extraordinary costs to be met from creation to demolition and possible recycle, the required energetic cost for a house is about 5.5 toe. Therefore in 5 years the amount of energy used during all construction stages is equal to winter heating alone. Summer cooling and the use of air-conditioning equipment has been an additional factor of increased energy consumption in recent years. As a consequence, the pick of consumption for summer electric power absorption is now systematically higher than the winter one.

The European Commission with the directive 2006/32/EC provides that member countries should achieve a binding national target as an indicator of energy savings equal to 9% by 2016. Member countries are also required to adopt Action Plans for Energy Efficiency (APEE). In the Action Plan submitted by Italy, the target was increased to 9.6% of energy saving by 2016. The main contribution is expected from the civil sectors (residential and tertiary), that have the major share. The energy saving expected by 2016 is 126.3 TWh/year, and is composed by 56.8 TWh/year (45% of the total) by the residential sector, and 24.7 TWh/year (19.5%) by the tertiary. Measures to be adopted for reducing consumption mainly deal with insulation of wall surface of buildings, use of double-glass windows, use of efficient equipment of air-conditioning and heating, and replacement of appliances with those of higher energy class (table).

The *Progetto Efficienza Industria 2015*³ (Plan for Industry Efficiency 2015) and the financial law 2008 have been implemented to achieve the goals.

The financial law 2008, while extending measures issued in 2007 and based on the law decree 192/05, prolonged the incentives provided by the previous financial law to 2010. In particular it provides fiscal deduction of 55% of expenses for intervention of energy re-qualification on existing buildings. Additional 20% deduction is provided for purchasing high-performance refrigerators or freezers and for the installation of electric engines of the same kind.

Since 2009 the issuing of building permits has been bound to the installation of electric power plants from renewables (generating at least 1 kW per each housing unit) and to the energy certification. The *Conto Energia* (energy account) is in force for electric power generated by photovoltaic.

As regards all other renewables the financial law introduced the possibility of applying for the incentive in *Conto Energia*, for wind powered plants with less than 200 kW, and for all other sources with less than 1 MW power. This simplifies and makes more competitive the implementation of small-size projects, such as mini wind-power and geotherm plants to be used in buildings. Issues related to urban design are still being debated, and new technologies have hardly yet become acceptable energy options to citizens.

Promotion of ideas and initiatives in the field of energy sustainability applied to the building sector and urban planning is the subject of the alliance between urban planning and the environment. This alliance is made operational by the national competition *Energia sostenibile nelle città* (Sustainable Energy in Cities) promoted at the national level by the Italian Ministry for the Environment, Land and Sea and by the National Institute for Urban Planning in the framework of the campaign Sustainable Energy Europe (SEE).

Since 2006 the Italian Ministry is the national focal point for the SEE campaign and co-ordinates actions for the active involvement of Italian cities also through the Covenant of Mayors. This initiative, carried out in collaboration with the European Commission, commits the most ambitious Italian cities to adopt an Action Plan for the reduction of their greenhouse gas emissions by 20% and more.

— 1 Primary energy demand for winter heating only, and in the case of thermal insulation threshold values of thermal transmittances of the covering structures — 2 In case of new constructions, when thermal equipment are to undergo extraordinary maintenance or in case of new installation, at least 50% of primary energy requirement for hot water generation has to be generated by the use of renewables — 3 The plan is implemented by specific calls for proposals of technological innovation. Among other, the promotion of industrial innovation itself in the sector of efficient and renewable energy technologies.

Table

Goals of the Italian Action Plan on Energy Efficiency

Source: Ministry of Economic Development, 2007

Measures to improve energy efficiency	Annual energy saving expected in 2010 (GWh/year) 3%	Annual energy saving expected in 2016 (GWh/year) 9%
Residential sector		
Insulation of flat surfaces in residential buildings built before 1980	3,489	12,800
Replacement of single-glass with double-glass windows	233	930
Replacement of incandescent lamps (GLS) with compact fluorescent lamps (CFL)	1,600	4,800
Replacement of dishwashers with class A apparatus	305	1,060
Replacement of refrigerators and freezer with class A+ and A++ apparatus	1,210	3,860
Replacement of washing machines with class A superlative apparatus	31	410
Replacement of electric heaters with efficient ones	700	2,200
Use of efficient air-conditioning	180	540
Use of efficient heating equipment	8,150	26,750
Thermal chimneys and wood boilers	1,100	3,480
	16,998	56,830
Terziary sector		
Use of efficient heating equipment	5,470	16,600
Incentive to use efficient air-conditioning equipment	835	2,510
Efficient lamps and control systems	1,400	4,300
Efficient lamps and light flow regulation systems (public lights)	425	1,290
	8,130	24,700
Industry		
Efficient lamps and control systems	700	2,200
Replacement of electric engines powered 1- 90kW from class Eff2 to class Eff1	1,100	3,400
Installation of inverters on electric engines powered 0.75 – 90 kWh	2,100	6,400
High co-generation performance	2,093	6,280
Use of mechanical vapour compression	1,047	3,257
	7,040	21,537
Transport sector		
Emission limit at 140g of CO ₂ /km (average of sold vehicle fleet)	3,490	23,260
	3,490	23,260
Total expected energy saving (national goal)	35,658	126,327

Transport and Mobility

The transport sector plays a fundamental and strategic role in the economic development of the country, while representing at the same time one of the economic sectors with the greatest impact on environment and natural resources. Indeed, the environmental impact of transport is critical under many points of view, such as energy consumption from non-renewable sources, air and acoustic pollution, soil consumption, land fragmentation and interference on ecosystems and biodiversity, as well as damaging of historical, artistic and landscape heritage.

In Italy, the demand for transport of freight and passengers has rapidly increased in the last decade and will likely keep growing during the next decade too, although these estimations could need revision due to the serious economic crisis since the second half of 2008 and to the close relation between the transport demand and the short-term economic trend. However, the most likely scenario for transport demand anticipates an annual average growth of 1.4% for passengers and 1.7% for freight until 2030. Passenger transport mode in the future will still be characterised by the prevailing use of passenger cars and motorcycles; there will be, however, a stronger increase in air and railway transport, respectively 3.1% and 1.6% annually. Road transport will remain the prevailing method of freight transport in the future, with an average annual growth of 1.8% to 2030, while inland navigation

will increase by approximately 1% on an annual basis¹. Given this increase, the main objective of sector-based policies and actions of the Ministry for the Environment, Land and Sea is the definition and implementation of policies to control and mitigate external environmental factors due to the transport sector.

Infrastructures and demand for transport and mobility

The main causes for the steady increase in demand for transport of passengers and freight are: increase of available income, urban and metropolitan development with progressive scattering of housing, trade activities and production, as well as increasing internalisation especially in leisure time use. Between 2000 and 2007 the number of passengers per km in Italy rose from 957,000 to 976,000 with a demand increase equal to 2%; transported freight per km increased by 14%, from 216,000 to 243,000.

Since 1995, total transport of passengers has increased more than the GDP, with the exception of the last few years.

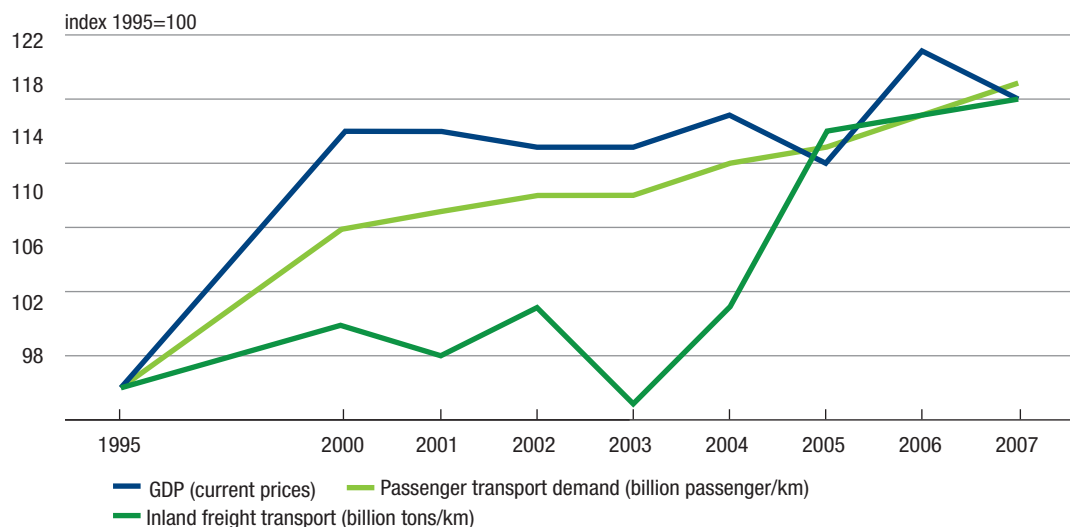
After showing a steady positive trend, freight transport in 2003 recorded a significant decrease of transported freight reaching the minimum level of 204,000 tons-km (figure 1).

Figure

1

Mobility of passengers and freight and GDP in Italy, trends 2000 - 2007

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by Ministry of Infrastructure and Transport - CNT, 2008



— 1 European Commission, DG Energy and Transport - Trends to 2030 - Update 2007

Transport and logistics

In 2006, an analysis of passenger transport modes in the European Union (27 countries) showed that passenger car transport is the most usual: it is used by 74% of Europeans and 80% of Italians.

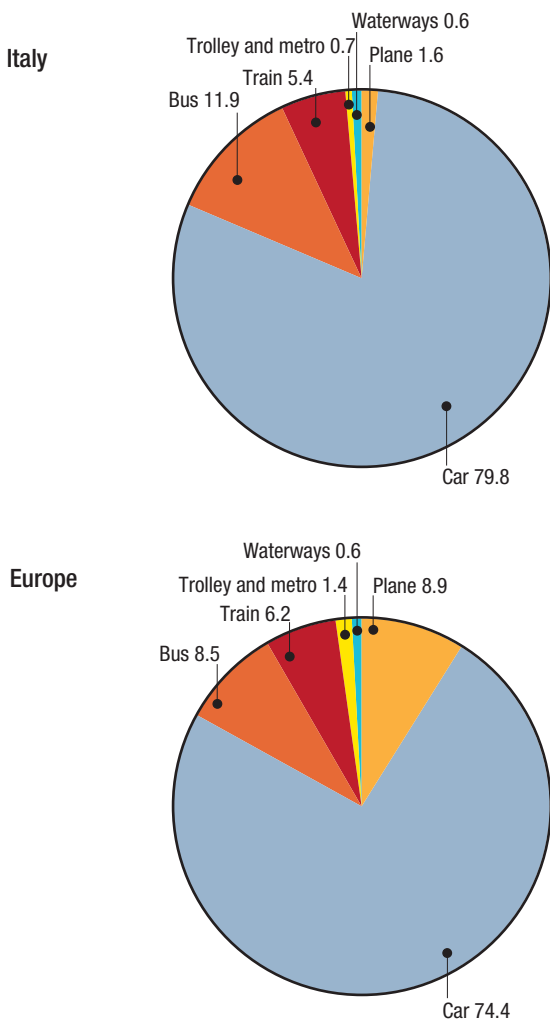
Buses are used by 9% of the European population and nearly 12% of the Italian population trains by 6% of Europeans and 5% of Italians, air transport is chosen by nearly 9% of Europeans and little less than 2% of Italians (figure 2).

Figure

2

Passenger transport modes in Italy and Europe values %, 2006

Source: European Commission, DG Transport and Energy, 2007



The National system is characterised by some areas with a high density of logistic activities (Padana area from Novara to Verona) and by a very fragmented and non homogeneous demand for transport of freight in other regions.

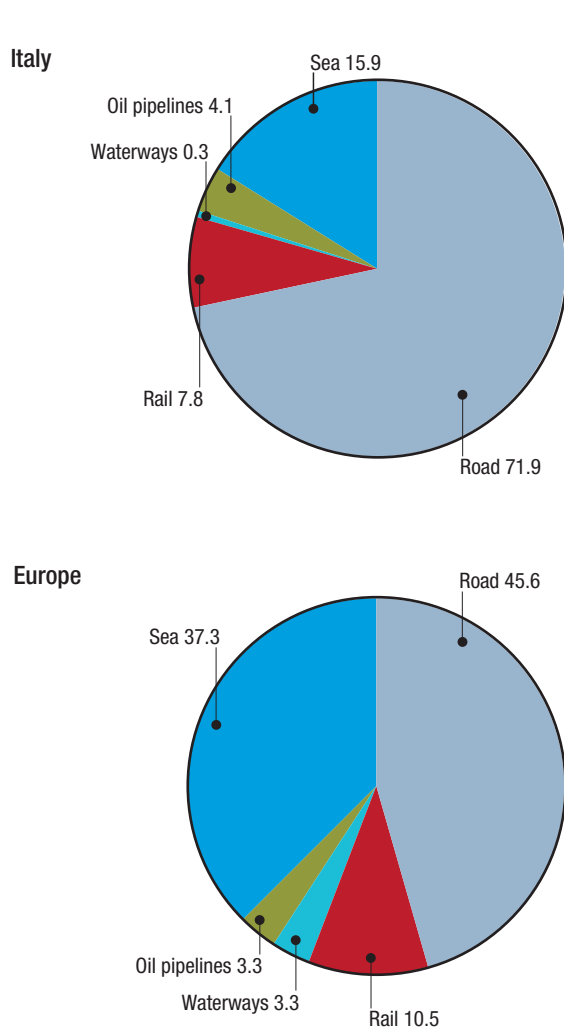
Logistic costs are estimated to account for up to 22% of industrial production value², compared to European average level between 14% and 16%, and transport represents the most important item of total logistic costs (50%)³. In 2006, in Italy about 72% of freight was transported by road, as compared to the European average of 46 %.

Figure

3

Freight transport modes in Italy and Europe values %, 2006

Source: European Commission, DG Transport and Energy, 2007



— 2 Logistic Plan 2006 — 3 Logistic Plan 2006, Italy's invoice 2000 of logistic services and transport of freight

In the same period in Italy 16% of freight was transported by sea compared to the European average of 37 %, and 8% was carried by train compared to the European share of 10% (figure 3). During the last decade, the demand for freight transport in the European Union has increased more rapidly than GDP with negative impact in terms of decoupling, i.e. between volume of transported freight and economic growth (figure 4).

Infrastructural setup

In the last twenty years, infrastructural setup has developed very differently in EU countries. Italy's increase in infrastructural development amounts to 25%, thus exceeding the share reported by the Netherlands (15%) and Luxembourg (8%); the other countries have performed better, with best values represented by Spain (+67%) and France (just under 70%). Infrastructural development has been therefore inadequate to meet the high increase of transport demand. In the same period, there has been an increase in the highways and roads network of 8.6% and of only 3.5% for rail networks.

In Italy, the railway network density, calculated as the ratio between railway line kilometres per 1,000 square kilometres, is equal to 54 km, very close to the French value (around 53 km) and lower than the United Kingdom (67 km). The average railway network density in the EU25 amounts to about 50 km.

The Italian railway network is 16,529 km long, versus 30,880 km in France and 35,000 km in Germany. Ten regions exceed the average value of 54 km density, with the highest value recorded in Liguria (higher than 90 km); only Valle d'Aosta, Trentino-Alto Adige and Sardegna show values lower than 30 km (figure 5).

The Italian motorway network includes 6,542 km with density equal to 21.5 km per 1,000 km² territorial area, lower than Germany's 34 km but higher than United Kingdom's 15 km, France's 19 km and the average density of the EU25 motorway network amounting to 15 km. As to geographical areas, in 2004, regions in the Northwest showed a higher density than the national average, accounting for 32 kilometres of motorways per 1,000 km², while regions in the Northeast registered values around 23.2 km.

In central regions, density decreases to 19.2 km per 1,000 km² and in southern regions to 20 km; the lowest value is registered in Sicilia and Sardegna islands, amounting to 11.7 km per 1,000 km².

The Italian airport system consists of 49 airports: 21 in the North, 10 in the Centre and 18 in the South and islands⁴.

Air traffic in Italy is characterised by higher growth than other transport modes: in the period of 1997 to 2006, the annual average increase rate of passenger transport was over 8%⁵, versus 3% related to road transport. In freight transport Italy recorded the highest increase rate among the main European countries (6.8%)⁶ in 2007, and today our country represents 6% of the European market versus 10% of passenger transport⁷. Figure 6 shows a remarkable increase in passenger traffic in Italian airports in the period of 1997 to 2006, growing from 75 million units in 1997 to about 120 millions in 2006, with an annual increase of about 8 %.

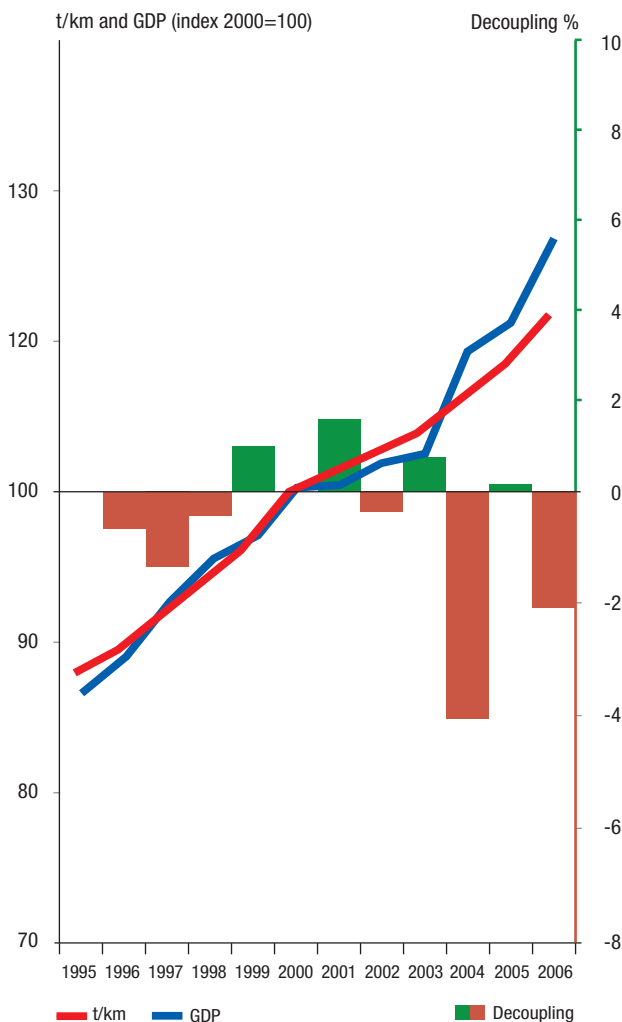
Freight transport has increased from 700,000 tons in 1997 to

Figure

4

Freight transport demand and GDP in the EU, trends, 1995-2006

Source: European Environment Agency, 2008



— 4 ISTAT, "Atlante statistico territoriale delle infrastrutture", July 2008 — 5 ISAE report on "Priorità nazionali. Infrastrutture materiali e immateriali", June 2008 — 6 ICCSAI – International Centre for Competitiveness Studies in the aviation industry, Fact Book 2008 — 7 *ibidem*

over 900,000 in 2006, with a very dramatic increasing trend from 2002 onwards.

The environmental impact from air transport can be studied from two different points of view, following the classical division of operation areas: "air side", linked to noise pollution and gas emissions created by the operation of aircraft and supporting facilities; "land side", linked to airport infrastructures themselves (changes due to new buildings, energy consumption, and waste production) and traffic on airport access roads.

Acoustic pollution is the most urgent environmental question, especially in airports located near populated neighbourhoods..

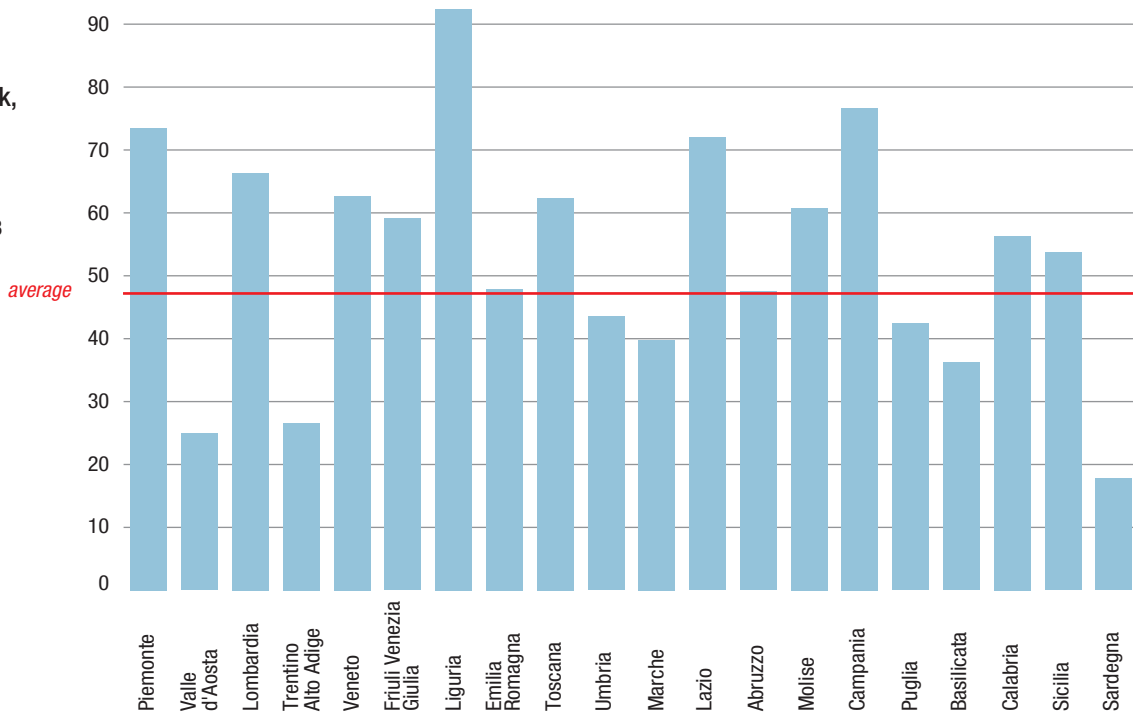
In order to face the noise pollution issue, the ICAO Committee on Acoustic Emissions of Aircraft published in 1968 a list of measures to prevent and mitigate noise that are still the basis of all policies aimed at reducing airport-related acoustic pollution.

Figure

5

Density of railway network, breakdown by regions, 2004

Source: ISTAT, 2008

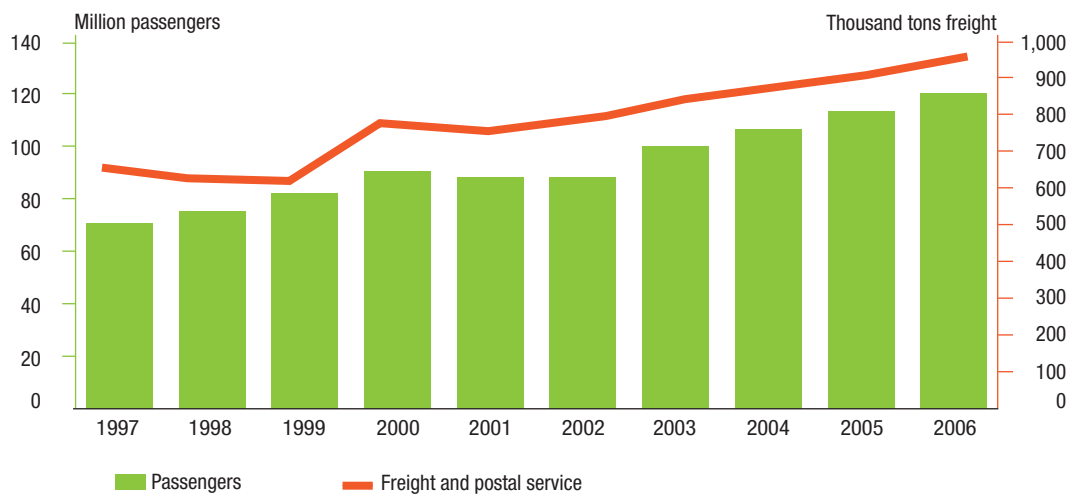


Figure

6

Transport of passengers and freight by plane in Italy, 1997-2006

Source: Italian Institute for Studies and Economic Analysis: National priorities. Tangible and intangible infrastructures, 2008



lution. Other tools to limit noise are monitoring programmes and specific takeoff and landing procedures issued by ENAC (the Italian Civil Aviation Authority).

The Italian port system and related logistic satellite activities supply a direct contribution to the GDP of over 6.8 billion euros, employing over 71,000 workers⁸.

Ports represent an important driving force for economic development; the port logistic sector seems to determine a multiplying effect equal to 2.8% for income and 2.03% for employment⁹.

In Italy in 2007 there were 263 ports, 178 of which were located along the southern and insular coasts of the country, while the remaining share were distributed among the central and northern areas.

There are 1,523 berths, 849 in the southern and insular coasts of the country, 289 in the centre, and 385 in the north.

The overall length of berths is 401,134 metres with an average length per berth of about 263 metres.

Thanks to targeted legislation, from 1997 to 2003, transport of freight with high individual value (especially containers) has increased more rapidly than the average of other European ports, reaching 10% and sustained by the ports of Gioia Tauro, Genova - Voltri, Taranto, and Cagliari. Between 2003 and 2007, a sharp decrease was registered, whereby the average annual development decreased to 4.4¹⁰ %, compared to the 11.7% of North Sea ports and 9.5% of French and Spanish Mediterranean ports.

This decline is due to the predominantly “domestic” feature of Italian ports, while the decrease in container traffic is affected by the national import-export trend (table 1).

Environmental impacts linked to port development relate

mainly to dredging sludge treatment, especially in ports accommodating deep-draught container ships (quite relevant in the case of Taranto), emissions from moving and moored ships (Civitavecchia), rinsing water management, noise, coastal erosion and setup.

Table

1
Traffic in Italy's 29 main ports

Year	Total freight thousand tons	Twenty-Foot Equivalent Unit- standard container volume measure	N. passengers
2005	492,914	9,711,973	45,674,779
2006	503,211	9,873,640	47,648,897
2007	511,724	10,249,968	48,730,401

Source: Assoporti, 2008

Circulating vehicle fleet

Traffic circulation has increased remarkably, growing from 45 million vehicles in 2000 to nearly 51 million in 2007. Motorcycles (+66%), tractor-trailers (+29%), buses, and passenger cars (both over 10%) highlighted the most significant increase; scooters show a reverse trend, decreasing by 17% versus 2005, when they showed their highest value (figure 7). Italy shows the highest number of circulating vehicles per 1,000 inhabitants among European countries (figure 8).

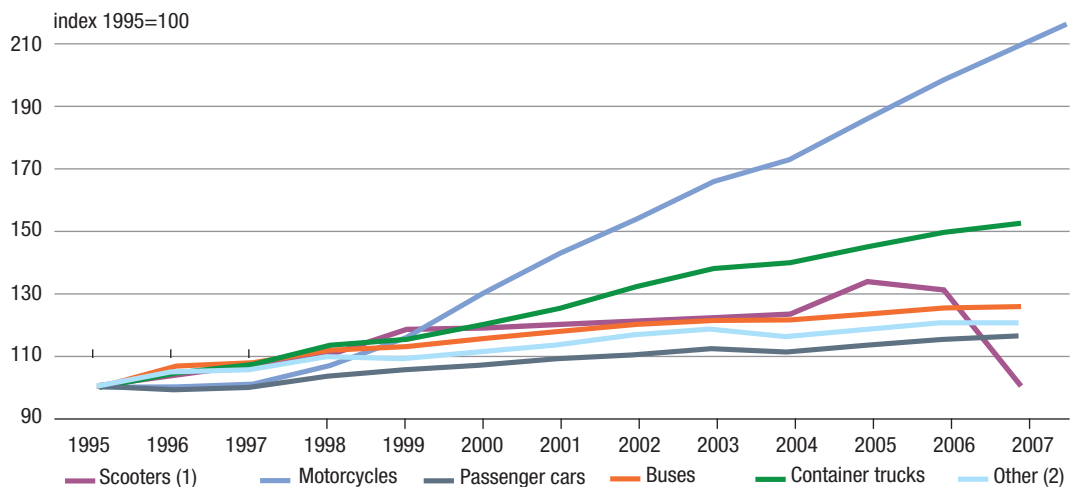
Figure

7

Composition of Italy's circulating vehicle fleet, 1995-2007

Note: (1) Estimated data. Since 2005 the source is ANCMA; (2) includes: three-wheelers, special trucks, tractors, and other vehicles

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by Ministry of Infrastructures and Transport - CNT, 2008



— 8 Censis – Assoporti (2008) — 9 According to Censis, new investments of one thousand euro or additional demand for services required from the port sector would produce 2,757 euros of wealth in the overall economic system; an increase of thousand workers in the maritime sector would generate employment of 2,032 workers in the overall economic system — 10 Data from Confetra - Italian transport and logistics federation

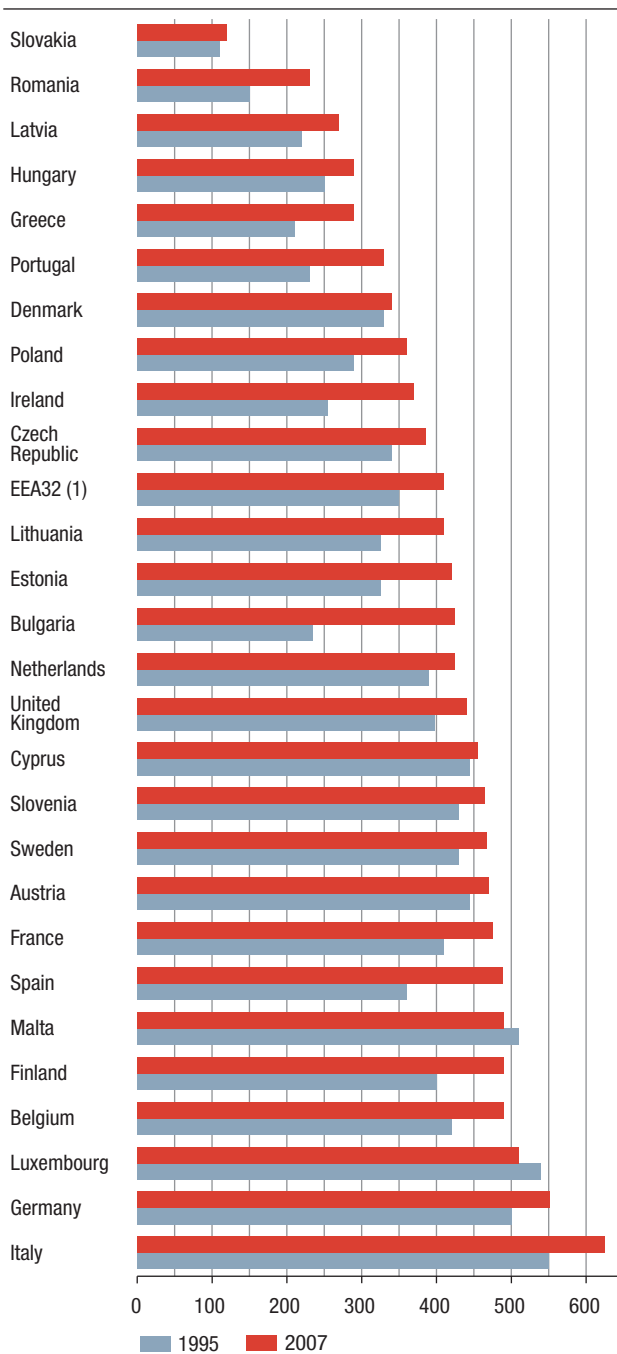
Figure

8

Passenger cars per 1,000 EU inhabitants, 1995-2007

Note (1): Average of EU27 and Iceland, Liechtenstein, Norway, Switzerland, Turkey

Source: European Environment Agency, 2008



— 11Data refer to 2006

Energy consumption and emissions

Transportation has the highest impact on the national energy balance. In 2007, transport related energy consumption was nearly 32% (44.9 Mtoe) of the total. Of this, slightly less than 88.6% was attributed to road transport (39.8 Mtoe), 9.5% to air transport (4.3 Mtoe) and the remaining 1.8% to other transport modes, such as rail and waterways. As a whole, the transport sector has increased energy consumption by 8% since 2000; however if we analyse the last twelve years this percentage reaches 19% (table 4).

Between 1995 and 2006, greenhouse gas emissions (carbon dioxide-CO₂, methane-CH₄, nitrogen protoxides-N₂O) and harmful substances such as nitrogen oxides (NO_x), non-methanic volatile organic compounds (NMVOC), suspended particulate matter < 10 µm (PM₁₀) and benzene (C₆H₆) in the transport sector show diversified trends: N₂O (+ 71%) and CO₂ (+ 12%) values increase, while the remaining pollutants significantly decrease, ranging from -22% for PM₁₀ to -78% for C₆H₆ (figure 9).

More specifically, total greenhouse gas emissions have constantly increased from 1995 to 2006, growing from 115 to 133 MtCO₂ equivalent, with an increase of 15.7%. CO₂ is by far the main contributor of harmful emissions, with 96.5% in 2006, though it is slightly lower than the 1995 value of 97.3 (figure 10). Other harmful substances such as nitrogen oxides (NO_x), non-methanic volatile organic compounds (NMVOC), suspended particulate matter < 10 µm (PM₁₀) and benzene (C₆H₆) in the transport sector are also responsible for air pollution, although there has been a steadily decreasing trend from 1995 to 2006 with values ranging from -42% and -62% respectively for NO_x and NMVOC and -23% and -79% for PM₁₀ and C₆H₆. This decrease has been attained thanks to policies adopted in recent years to reduce vehicle-related emissions (figure 11).

From 1990 to 2005, emissions from freight transport decreased by 24% for nitrogen oxide (NO_x), 39% for non-methanic volatile organic compounds (NMVOC) and 18% for suspended particulate matter (PM₁₀). Between 1995 and 2005, NO_x emissions from freight transport passed from about 370,000 t to little over 250,000t¹¹, NMVOC emissions from about 110,000 t to about 90,000 t, PM₁₀ from about 40,000 t to about 32,000 t.

In 2005, freight transport accounted for 46.7%, 13.7%, 56.7% on total NO_x, NMVOC and PM₁₀ emissions from transport.

The important contribution of freight transport to fine particulate is mainly due to road haulage (vehicles with weight higher than 3.5 t) and sea navigation; both activities are relevant for PM_{2.5} emissions too.

Table

2

Energy consumption by transport modes in Italy (thousand toe), 1995-2007

Transport modes	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rail	785	669	674	668	603	597	567	579	585	576	573	576	561
Waterways	450	447	451	219	232	206	260	239	232	252	252	246	235
Road	34,150	34,438	35,054	36,456	37,048	37,148	38,020	38,727	39,206	39,940	39,365	39,679	39,840
Air	2,455	2,667	2,761	2,929	3,336	3,558	3,480	3,249	3,655	3,620	3,771	4,039	4,290
Total	37,839	38,221	38,940	40,271	41,218	41,507	42,327	42,795	43,678	44,388	43,962	44,540	44,926

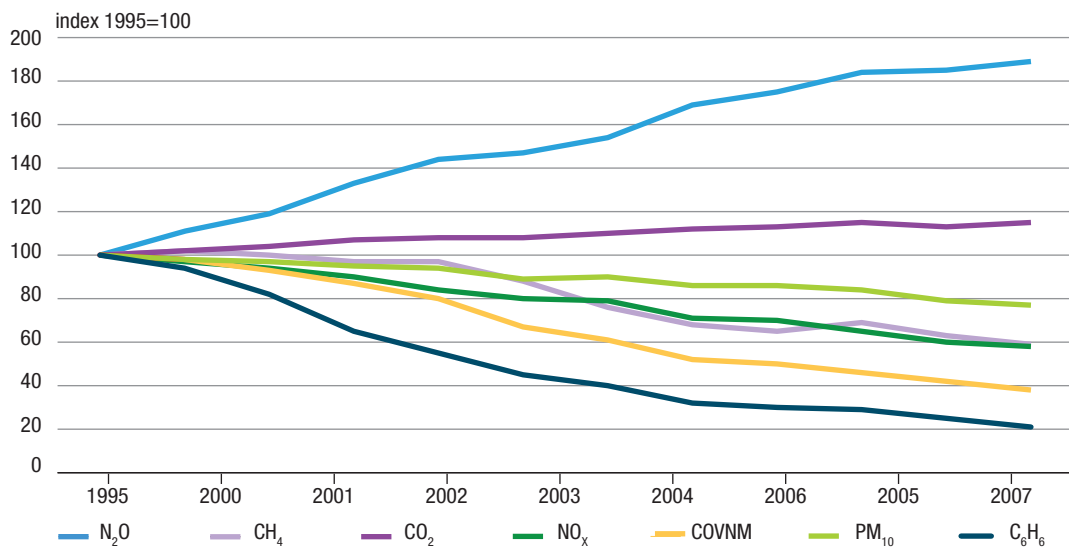
Source: Ministry of Economic Development, National Energy Balance 2008

Figure

9

Greenhouse gas emissions and main harmful substances in Italy's transport sector, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISPRA, 2009



Investment in transport infrastructures

The importance of infrastructures for transport and logistic policies was recently highlighted in the "Plan for Strategic Infrastructures" attached to DPEF 2009-2011¹² aimed at three main fundamental targets: reducing traffic congestion, decreasing saturation (especially of mountain passes), and promoting a one-mode approach in favour of rail transport. In its session on March 6, 2009, CIPE approved the intervention plan for the next three years for 16,500 million euros, as proposed by the Ministry of Infrastructure and Transport. This amount is divided into six intervention areas: Venezia Lagoon MoSE project: 800 million euros; Rail infrastructures: AV/AC¹³ Milano – Verona line, AV/AC Milano – Genova and Pon-

tremolese lines: 2,750 million euros; Road and motorway networks: CISA motorway; Brescia – Padova motorway; Cecina – Civitavecchia motorway; Milano East bypass; Pedemontana Lecco – Bergamo system; Perugia junction, motorway link between Napoli bypass and the coastal axis, Salerno – Reggio Calabria motorway and Ionica State Road; Agrigento – Caltanissetta axis; Licodia Eubea road axis; Maglie – Santa Maria di Leuca road axis. The total investment is about 10,000 million euros; Metropolitan systems in Palermo, Catania, Napoli and Campania Regional System, Bari, Cagliari, Roma and Milano, with special programs on related works for 2015 Expo. The total investment is about 1,500 million euros; Bridge on the Strait of Messina: 1,300 million euros; Actions related to the implementation of water plans in Southern Italy: 150 million euros.

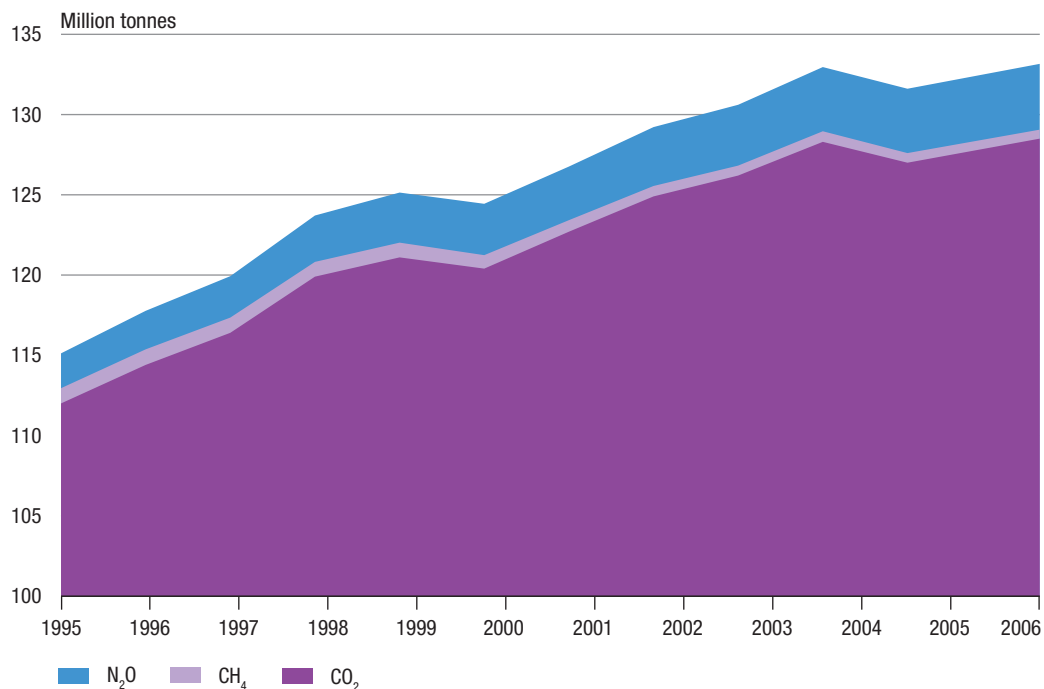
— 12 Document for Economic and Financial Planning, endorsed by CIPE (Interministerial Committee for Economic Planning) on 4 July 2008 — 13 High Speed/High Capacity

Figure

10

Greenhouse gas emissions: carbon dioxide (CO₂), methane (CH₄) and nitrogen protoxide (N₂O) in Italy, 1995-2006

Source: ISPRA, 2009

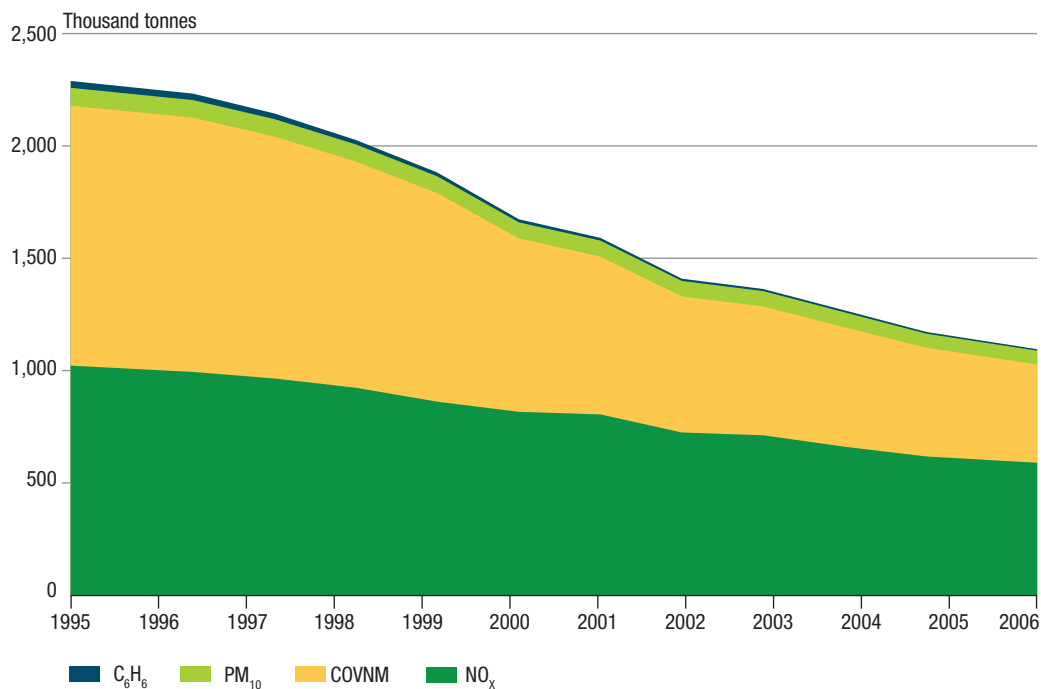


Figure

11

Nitrogen oxide emissions (NO_x), non-methanic volatile organic compounds (NMVOC), suspended particulate matter <10 µm (PM₁₀) and benzene (C₆H₆) related to road transport in Italy, 1995-2006

Source: ISPRA, 2008



Box

1

Sustainable Urban Mobility

With the Green Paper "Towards a new urban mobility culture"¹ the European Commission identified five challenges which European cities must face: keep traffic flowing in the cities; keep cities clean; find a more intelligent urban transport system; deliver an accessible and safe urban transport system.

The Green Paper proposes a number of options relative to the promotion of movement on foot and by bike, a better use of private cars by car sharing and car pooling, forms of virtual mobility such as teleworking and a specific parking policy.

The European Commission has often called attention to transport of freight in urban areas, to an innovative technology for engines and fuel, to the cost of managing the demand for mobility, and has underlined the need to adopt sustainable urban transport² plans aimed at meeting a series of environmental problems.

The Leipzig Paper on Sustainable European Cities 2007 has pledged all the member States of the EU to integrate the principles of a sustainable urban transport system in local development policies and to promote social cohesion, integration and employment with reference to emarginated areas and their access to services.

Regarding the theme of reducing the environmental impact of mobility, and in particular atmospheric pollution, the European position and indications of both a community and national character request interventions aimed above all at the road transport sector, which weighs most heavily in terms of emissions in the Italian cities.

There the priority is for 14 urban medium-large sized areas³ in which resides nearly 16% of the Italian population and where the concentration of atmospheric pollutants associated with traffic is often above the allowed level.

The transport sector is among the most important from the point of view of suspended particulate matter (PM₁₀) with 49% of total emissions production, followed by the industrial sector (27%) and the residential and service industry sectors for heating of buildings (11%).

The sectors of energy production, agriculture and forestry weigh, respectively, 4% and 9% of the total.

In the transport sector, road transport emissions amount to more than 65% of sector emissions⁴.

In the urban area, motorcars are the main source of emissions with values equal to 44%, followed by light and heavy freight vehicles with 40% and by motorbikes and scooters with 12%.

The 14 urban areas represent 37% of the national total number of cars with Roma, Milano, Napoli and Torino having the largest numbers. Diesel engine cars represent 34% of the national total, the cities with the highest numbers being: Bari, Roma and Firenze.

Regarding cars with a reduced environmental impact (gas, methane, hybrid and electric) the cities which exceed the 4% national value are: Bologna, Bari, Napoli and Venezia.

The numbers of cars of reduced environment impact still represent a very small percentage of the total due to the reduced network of methane supply and the still high cost of hybrid cars (petrol + electric).

Analysing the total number of cars, the national rate is 60 cars per 100 inhabitants: Roma has a higher rate (68), followed by Catania, Firenze and Torino.

Genova with 49 cars per 100 inhabitants presents the lowest ratio together with Venezia and Bari.

In the biennial 2006-2007 Catania had the highest increase in cars 1.8%, followed by Cagliari 1.7%, Messina 1.5%, Roma 1.4% and Palermo 1.3% above the national increase of 1.1%.

Milano, Trieste and Genova are the opposite with -0.5%, -0.4% and -0.2% respectively (table 1).

In the 14 metropolitan areas circulate 42% of the motorcycle total; Roma, Milano and Napoli have the highest numbers.

Considering the national motorcycle ratio (9 motorcycles per 100 inhabitants) Genova, Trieste and Firenze top this value with respectively 21, 17 and 14.

The average increase in the biennial 2006-2007 is of 5.7%; Bari, even if has a ratio of 6 motorcycles per 100 inhabitants, registers one of the highest increases of nearly 7%.

The growth of two wheeled vehicles is the result of urban traffic congestion, the lack of parking and of circulation limitations for cars in urban areas.

1 The document is the result of a long public consultation on the matter that should bring about the inclination towards a true and proper plan of action containing concrete measures on the matter — 2 Communication to the Council and European Parliament relative to a thematic strategy on urban environment (COM/2005/0718 def. — 3 According to law 142/90 the following cities are declared "metropolitan areas": Torino, Milano, Genova, Venezia, Trieste, Bologna, Firenze, Roma, Napoli, Bari, Catania, Palermo, Messina and Cagliari — 4 National Commission for Atmospheric Pollution Emergency (CNEIA) 2005

Table

1
Private vehicles in urban areas divided into fuel type, 2007

Urban areas	Motorcars				Motorcycles			
	n.	of which (%)		change % of 2006	car/ inhabitants x 100	n.	change % of 2006	motorcycles/ inhabitants x 100
		diesel	LPG methane electric					
Torino	1,403,896	32.5	3.2	0.9	62	177,368	5.5	8
Milano	2,252,643	31.2	1.3	-0.5	58	356,198	4.2	9
Genova	430,247	28.6	1.5	-0.2	49	188,207	-3.8	21
Venezia	434,122	30.7	4.5	0.5	51	59,378	4.4	7
Trieste	127,556	17.2	0.4	-0.4	54	40,868	5.0	17
Bologna	561,795	28.3	9.9	0.4	58	105,766	4.3	11
Firenze	635,503	36.0	3.0	0.7	65	134,909	3.8	14
Roma	2,751,498	36.5	2.6	1.4	68	485,846	6.0	12
Napoli	1,739,718	30.0	4.7	1.1	56	304,127	6.6	10
Bari	831,097	37.1	5.3	1.0	52	98,636	6.8	6
Catania	708,625	30.2	3.2	1.8	66	139,394	7.9	13
Palermo	703,183	28.5	1.6	1.3	57	151,242	7.8	12
Messina	384,804	28.5	2.0	1.5	59	72,300	6.7	11
Cagliari	326,460	29.7	2.3	1.7	59	38,065	5.7	7

Source: Ministry of Infrastructure and Transport – CNT, 2008

Table

2
Public transport in urban areas divided into transport type, 2006

Urban areas	Bus		Tram		Trolley bus		Underground	
	million seats x km	bus/ inhabitants x10,000	million seats x km	tram/ inhabitants 10,000	million seats x km	trolley bus/ inhabitants x1,000	million seats x km	underground/ inhabitants x10,000
Torino	4,510	12.5	1,013	2.6	0	0.0	495	0.4
Milano	3,680	7.7	3,359	3.3	574	1.2	9,490	5.6
Genova	2,841	12.8	2	0.0	5	0.3	174	0.3
Venezia	2,907	16.8	0	0.0	0	0.0	0	0.0
Trieste	1,269	13.3	12	0.3	0	0.0	0	0.0
Bologna	1,325	11.5	0	0.0	114	1.4	0	0.0
Firenze	2,515	14.3	0	0.0	0	0.0	0	0.0
Roma	13,892	10.7	1,231	0.6	159	0.1	6,463	1.7
Napoli	2,335	11.7	94	0.5	41	0.9	1,619	1.2
Bari	922	6.7	0	0.0	0	0.0	0	0.0
Catania	1,469	11.7	0	0.0	0	0.0	55	0.1
Palermo	1,881	8.9	0	0.0	0	0.0	0	0.0
Messina	1,450	2.8	1	0.5	0	0.0	0	0.0
Cagliari	1,061	14.2	0	0.0	355	3.2	0	0.0

Source: Ministry of Infrastructure and Transport – CNT, 2008

In public transport, in 2006 buses made up the best supply of urban transport: Roma registered the highest rate of seats per km per year (about 14 billion), followed by Torino, Milano, Genova and Venezia. Milano, in terms of seats per km, supplied the best numbers for trams, trolley buses and underground. Roma and Torino showed a good availability of trams. The underground service registered a good level also in Roma and Napoli. Coming to trolleybus, Cagliari, Bologna and Milano offered the best service (table 2). As for the number of buses available per 10,000 inhabitants, Venezia had the highest number followed by Firenze and Cagliari while Messina had the lowest. Only Milano, Genova, Roma and Napoli have all the types of urban transport considered.

To achieve substantial environmental results a number of integrated policies are necessary, which vice versa if singularly adopted would not produce the expected result. The presence of restricted traffic areas (in Italian, *Zone a Traffico Limitato* - ZTL), pedestrian areas, cycle paths and paid parking all subtract urban spaces from road traffic and represent a valid incentive for pedestrian mobility.

In 2006 the density of limited traffic areas (km² per 100 km² of municipality surface) registered the highest values in Palermo (km² 4.9), Firenze (3.6), Napoli (2.9) and Bologna (2.3). The largest available pedestrian areas (available pedestrian area in m² per 100 inhabitants) were in Venezia (m² 467) and Firenze (82), while Genova is the city with the least pedestrian areas (m² 1.8). The introduction of paid parking is among the urban mobility strategies adopted to limit long term parking: national figures give 45 parked paying cars per thousand cars in circulation and in 2006 Bologna registered 127 parked paying cars, Firenze 123 and Torino 89.

Even if it is considered one of the most sustainable forms of transport, the bicycle is still a little used form of transport, above all for the lack of cycle paths that on a national level is equal to 12 km per 100 km² of municipal surface. Torino has the highest figure with 92 km, Firenze 60, Bologna 52; Cagliari has the least (2.3 km), while Genova, Napoli and Catania do not have any⁵. Measures useful for a sustainable mobility could be many, complementing each other, with the goal of discouraging the use of private transport in favour of an eco-compatible alternative.

The Ministry of the Environment, Land and Sea has programmed interventions aimed at reaching the quality and quantity air standards with special reference to cities and urban systems, giving preference to an approach which is integrated with urban development policies (public transport, sustainable mobility and logistics)⁶.

The investments co-financed by the Ministry are addressed above all to the urban areas, within which moves the greatest percentage of Italian citizens (over 75% of the total movement of Italians is within a 10 km range)⁷.

Interventions towards which it is necessary to allocate the most resources, keeping in mind related environmental benefits, are investments in the local public transport sector (renewal of transport fleets with low emission vehicles and the adoption of technology to improve public information systems, such as for example information monitors on public transport vehicles, call centre services, waiting time indicators at stops, real time updating of services through internet and mobile services etc.).

Support to cycle mobility (cycle paths and bike sharing services), the realization of exchange parking and interventions to improve road safety and prevention of accidents are also priorities. In this sense, special attention must be paid to weaker social groups (children, pedestrians, and cyclists).

In terms of environmental benefits, studies produced by local institutions within urban mobility planning documents (Urban Traffic Plans and Urban Mobility Plans) show that changes in mobility habits by citizens can weigh heavily in terms of traffic vehicle emission reductions.

A signal of this is given by surveys carried out in Roma and Bologna showing that an average increase of one percent of daily movements by public transport (with a corresponding reduction of private transport) produces the reduction of one percent in vehicle traffic related atmospheric emissions.

In 2007 all the 14 urban areas⁸ approved an Urban Traffic Plan (PUT) except Catania and Palermo. In the same year the Ministry for the environment co-funded a programme for the realization of structural interventions for mobility rationalization in urban areas: the programme focuses on favouring freight distribution services in urban areas (City Logistics) and Bike Sharing services. Within this programme 37 projects have begun for a total co-funding of about 9 million euros.

Through the "Sustainable Mobility Fund" 2007-2009⁹ 88 interventions have been co-funded in the 14 urban

5 Source: ISTAT, Urban Environment indicators, 2008 — 6 Ministry for the Environment, Land and Sea, Policy General Directive of the Minister, 2009 — 7 Source: Higher Institute for Transport Training and Research (ISFORT) Audimob Report – Findings on the mobility behaviour of Italians. Data refer to first semester 2008 — 8 ISTAT, Urban Environment Indicators, 2008 — 9 Law 296/06 (Financial Law 2007), art. 1121. The total allocation amounts to 250 million euros for the period 2007-2009

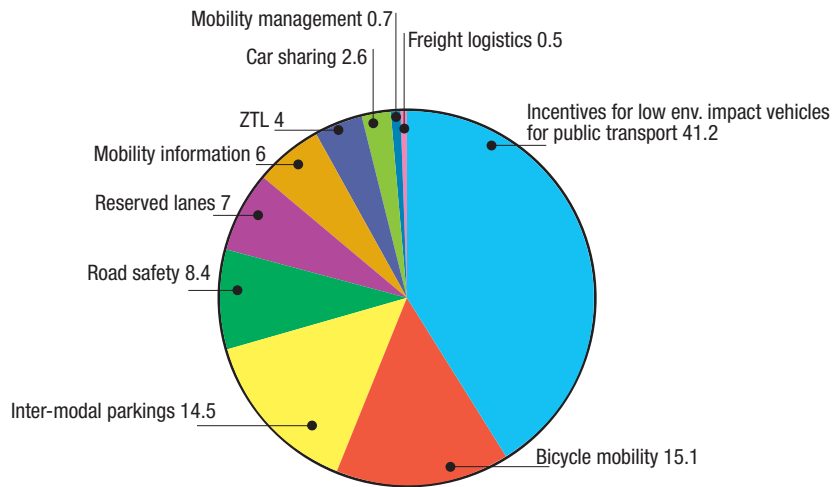
areas for a total of about 150 million euros in the biennial 2007-2008 (figure).

In 2009 the Ministry announced a national call for project on sustainable mobility funded with about 35 million euros reserved to municipalities that are not placed within metropolitan areas and nonetheless are listed among cities at atmospheric pollution risk.

Figure



Sustainable Mobility Fund 2007-2009 Allocation for interventions co-funded by the Ministry for the Environment, Land and Sea for the biennial values%, 2007-2008



Source: Ministry for the Environment, Land and Sea, 2009

Box

2

Internal Waterway System

The European system of canals and navigable waterways extends for over 40,976 km and is used for 30% of total cargo transport, whilst the Italian system develops over an area of about 1,562 km¹ and is concentrated mainly in the North of the country.

The “Padano-Veneta” waterway, nearly 812 km long, of which 564 km are used for trade², transports only 0.3% of total freight even if it crosses the most industrialized area of the country where 60% of freight is in movement and where 40% of the GDP is generated.

The waterway system of Northern Italy is a potential junction and intersection point between the trans-European corridors which go along the Italian territory. It is navigable for a section of corridor V Lisbon-Kiev, intersects with corridor I Berlin-Palermo and forms the ideal continuation of corridor VIII Bari-Varna and the South European coastal motorway.

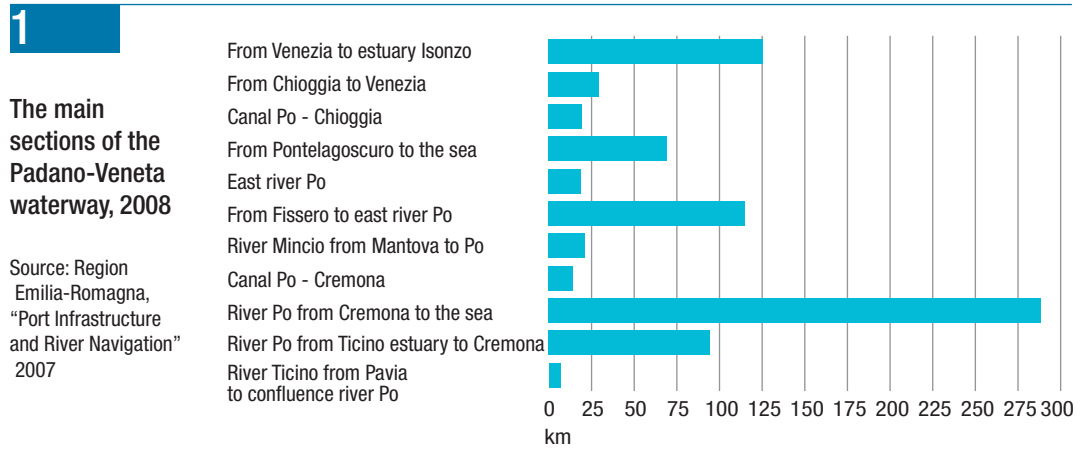
The European Union includes the Milano-Po³ canal and the Port of Cremona among the navigable waterways and internal ports of international importance. For reasons linked to orographic and morphologic conformation, and above all for the general lack of infrastructures, in Italy transport by waterway does not represent an alternative to traditional road and rail transport.

With a law approved in 2001⁴ a number of initiatives were taken aimed at developing this sector by im-

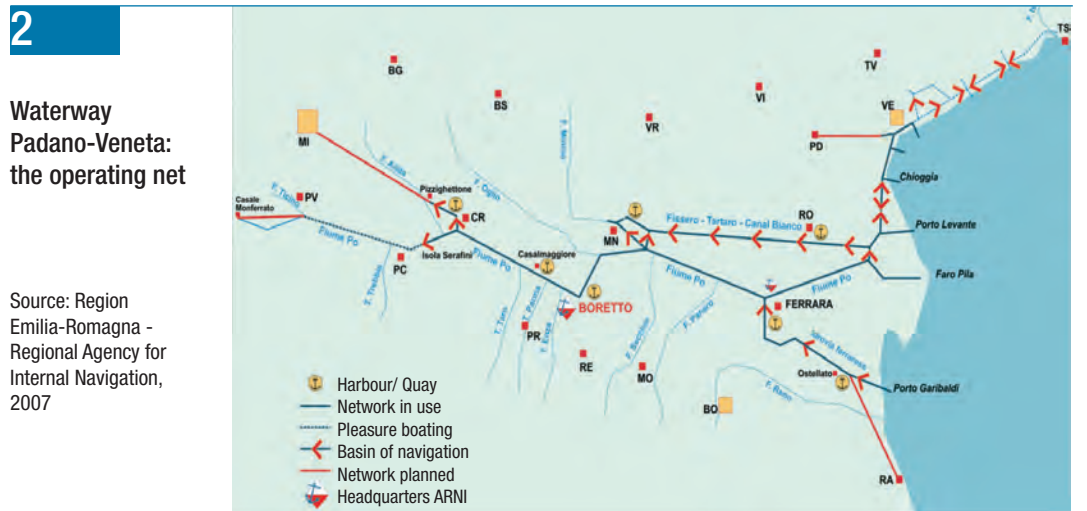
1 Ministry of Infrastructure and Transport: CNT 2006-2007 — 2 Emilia-Romagna Region, “Port infrastructure and waterway navigation” (2007) — 3 Decision 1692/96/CE Community orientation for the development of the transeuropean transport network — 4 Law 443 21/12/01 Government delegation in matters of infrastructure and production installation strategy for the re launching of proactive activities

proving logistic support infrastructures as port freight hubs, increasing the level of investment, and improving waterway infrastructures of high economic interest. As part of the natural environment, waterways assure significant advantages in terms of safety and of environment protection. It is estimated that external costs of waterway transport of 1,000 tons per kilometre, deriving from atmospheric and acoustic pollution, congestion and security, amount to about 10 euros, compared with 35 euros, for road transport and 15 euros for rail transport⁵. Air pollution generated by waterway transport is 85% less to that generated by road transport and the number of accidents is reduced by over 95%. Waterway transport safety depends on the reduced and uniform speed of the boats, by non-interference with other networks of transport, by

Figure



Figure



the rigorous and harmonized international rules by which it is regulated and the use of radar and radio. Land use by the waterway system is less than that of road and rail. Even if the average size of a water corridor (about 55 m) is larger than that of a double track railway line (about 14 m) and of a two lane each way motorway (about 25 m)⁶, waterway facilities impact (locks, bridges, berths) is minimal compared to side works necessary for roads and railways.

Furthermore, in the specific case of the Italian waterway system, natural river are used (Po River) or artificial canals built mainly for hydraulic security functions (Fissero and Idrovia Ferrarese) and later adapted

⁵ European Commission COM(2002)54 FINAL – Regulation relating to community financial contributions destined to improve environmental conditions in the transport of freight — ⁶ Ministry of Transport and Infrastructure – Department for circulation and road safety , decree 5 November 2001

for navigation. Energy consumption for internal navigation is both lower and competitive with regard to other means of transport; even by comparing emissions in terms of CO₂ equivalent the waterway sector is clearly the most favourable.

The European Commission through the “Navigation and Inland Waterway Action and Development in Europe 2006-2013” Action Plan (NAIADES) promotes waterway transport with the aim of transferring a greater volume of freight to the internal waterway system, to contribute to decongest the transport roadways and to reduce atmospheric pollution.

The programme foresees five strategic areas of action: strengthening of services for the market, renewal of the fleet also in ecological terms, training of new professional skills, and improving services provided through an adequate infrastructure.

Box

3

The new Torino-Lyon railway

The Torino-Lyon project assumes great importance for the development in Europe linked to the promotion of exchanges and relations of the Continent on the east-west artery Lisbon-Kiev, and north and south linking the London-Lyon main road (already served by high speed railroad) with the Torino-Napoli high velocity railroad under construction). In particular, the realization of the link will allow the reduction in the growing congestion of the transalpine communication infrastructure.

Even if the final plan is still to be defined, the new Torino-Lyon line will be about 260 km long, i.e. thirty km less than the present railroad, and the tunnel between Val di Susa and Saint Jean de Maurienne will be about 52 km long.

The time taken to cover the international tracks will be significantly reduced: the Milano-Paris route will be covered in about 4 hours against the present 7, the Barcelona-Milano in 7 hours instead of the present 12, and the Torino-Lyon in 1 hour 45 minutes instead of over 4 hours.

With the approval in 2009 of new technical specification the final project will be, presumably, ready in 2012, whilst the opening of the construction site is foreseen on 2013; to complete the construction should take about 10 years. The goal is to assure railroad transport of over 40 million tons of freight by 2030, compared to just over 6 million tons transported at present, and to allow the transfer on trains of nearly one million trucks per year.

The growth in the flow of transalpine freight transport is very rapid, much more than in that of general transport: between 1970 and 2005 transalpine traffic increased six fold compared to that of general freight traffic¹, with the significant prevalence of road transport over rail. Between 1994 and 2004 traffic road in the Ventimiglia-Tauri alpine area increased by 56%² while that on rails increased notably less (about 20%)³, because of the lack of infrastructure and poor development in service quality in terms of regularity and time table communications.

The limited number of mountain passes through the Alps and the constant growth in traffic, estimated at out 2% per year⁴, results in an elevated concentration of heavy traffic, with high environmental costs as well as traffic congestion in periods of greatest influx.

In 2007, on the A32 Fréjus highway alone (Avigliana tollgate) 12,000 vehicles (cars and articulated trucks) passed per day⁵, for a total of 4,710,435 vehicles per year.

In terms of yearly tons of freight, by 2030 the doubling of the quantity which crosses the alpine area is expected, going from 28.5 million tons in 2004 to nearly 57 million tons in 2030 according to the project; rail freight traffic at the Modane border gate is expected to reach 16 million tons in 2030.

On the other hand, road freight is expected to increase from 22 to 41 million tons per year. Val di Susa would see a transit flow equivalent to about 57 million tons which is equal to double that of today⁶.

Estimated atmospheric emissions on the Val di Susa stretch show the environmental impact generated by an unbalanced road traffic logistic system. On the base of present growth trends and in absence of modal transfer measures, emissions would rise from 4,087 t/km in 2004 to 9,679 t/km in 2030.

1 Ministry of Infrastructure and Transport: Financial Preliminary Demand Prospect TEN Torino-Lyon — 2 *ibidem* — 3 *ibidem* — 4 The Cross Alpine Freight Transport (CAFT) Survey is an official database which collects data on road and rail freight flow over alpine passes with indication of origin and destination based on road and rail data collected and transmitted by relevant operators. CAFT data has been released on a five year basis since 1994 — 5 SITAF data: Autostrada A 32 and Fréjus Tunnel concessionaire — 6 Ferrovie Alpine rational and efficiency report FARE

Table

**Estimated road transport atmospheric emissions on the Val di Susa stretch
(in absence of modal transfer measures)**

Pollutant	Emissions (t/km)	
	2004	2030
CO ₂ (carbon dioxide)	4,000.00	9,515.00
CO (carbon oxide)	12.30	23.00
NO _x (ozone oxide)	68.00	129.00
COV (volatile organic compounds)	5.50	10.30
PM (particulate matter)	0.96	1.80
Total	4,086.76	9,679.10

Source: "Trasporti e Territorio Srl" consulting company

The environmental impact assessment of the Torino-Lyon railway is, together with necessary effect of the actual works, one of the aspects which characterized the planning and the construction of the infrastructure since the beginning. Problems such as the risk of damaging asbestos or uranium rocks in the basic tunnel, possible hydro-geologic disruption, positioning of electric power lines, management of material produced by the construction site and the limitation of noise pollution were well debated and were subject of various studies. Regarding a possible uranium risk, the Torino-Lyon Observatory⁷ affirms that mining research conducted in Val di Susa between the '50s and the '80s allowed the singling out of small concentrations ("mineralization") of uranium in areas far from the new high speed railway track and more recent geological studies have excluded that the basic tunnel can intersect quartzite that contain uranium mineralization. Field data collected by the Regional Environment Protection Agency (ARPA) of Piemonte between 1998 and 2001 during excavations carried out in the same area show uranium-238 concentration variable between 17 and 37 Bq/kg, measures that do not generate any significant risk for residents health. The total cost of the Torino-Lyon on the Italian side⁸ is about 5.4 billion euros with a funding from the European Union of about 670 million euros included in the budget of the TEN networks. On 12th March 2009 the strategic Plan for the development of the area interested by the Torino-Lyon artery was presented which foresaw actions to be taken in five sectors (sustainable mobility, sustainable economic development, environmental and territorial requalification, safety of the territory, integrated development of mountain areas) with a foreseeable investment of 1.4 billion euros of which 46% co-funded by the State administration.

Box

4

The Mestre Bypass

The Mestre bypass opened to traffic in February 2009 goes through 16 municipalities in the Venezia and Treviso provinces spreading for 32.3 km over flat land close to the Venezia Lagoon, between the interconnection of the Milano-Venezia and Venezia-Trieste highways.

The work, included among those of the National Integrated Transport System within the General Transport Plan, and among those provided by the law 443/01 (known as "Target law")¹, covers a fundamental role in East European connections as represents a key interchange segment of the Adriatic multi-corridor and, in particular, of the Lisbon-Kiev Corridor V, over which travel more than 36% of all freight carried in the European Union. The new artery, which carries the traffic flow from the Padova-Treviso-Venezia metropolitan area to the highway system, relieves traffic congestion on the Mestre ring road, reduces travelling time and restores a normal viability system to the area with significant advantages in terms of reduced atmospheric emissions and noise. It has been estimated that in 2009 between 40,000 and 48,000 vehicles will travel both ways over the bypass and about 90,000 in 2020, 30% of which will be heavy traffic.

— 7 <http://www.regione.piemonte.it/torinolione/dwd/uranio.pdf> — 8 Ministry of Infrastructure and Transport, Strategic Infrastructure - Annex: 6th Economic & Financial Program Document 2009-2013, June 2008 — 1 The law 443/01 provides the delegation to the Government in infrastructure matter and strategic productive installations and other interventions to relaunch productive activities

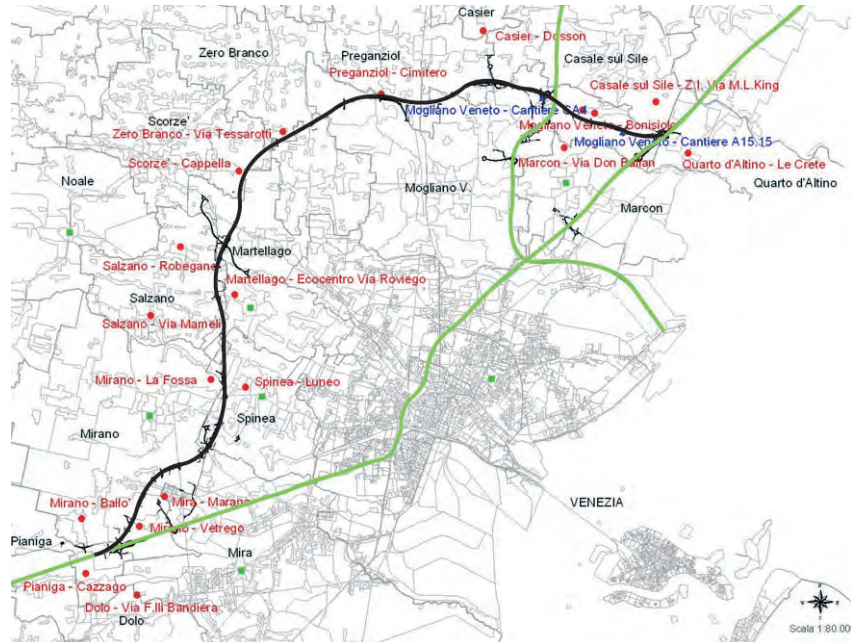
Figure

Outline of the Mestre Bypass

Source: ARPA Veneto (Regional Environment Protection Agency), 2002

Mestre bypass

Highways



Improved traffic movement reduces environmental damage and economic and social costs for an estimated benefit of about 4.3 billion euros per year. The cost for the realization of the bypass was about 968 million euros with an increase of about 29% in respect of the 750 million euros estimated when the project first began. The road, in most areas, goes over land used for agricultural cultivation and in only one place touches a Site of Community Importance². The measures to reduce the environmental impact generated by the by pass, mainly intervene on the environmental components:

- for the safeguard of the surface hydraulic system, improvement to the existing network is foreseen the realization of systems for the separation of black and white waters, the realization of collection and treatment system for liquid overflow in the case of accident, the building of phytodepuration basins for the collection of treated and white waters before being send to receiving bodies;
 - to minimize the impact on soil, the same material excavated has been used for the building of the roads;
 - to reduce risks relating to the loss of biodiversity, due above all to the subtraction of habitat, to the fragmentation of the territory and to consequent movement of wildlife, the most suitable conditions for the reconstruction of lost natural areas and removed vegetation have been restored;
 - to minimize acoustic environmental impact, noise absorbing barriers have been installed as well as the planting of trees and hedges that also have the function of integrating the infrastructure into the landscape.
- Air quality estimates have been made concerning the concentration of carbon monoxide (CO) and of particulate matter with a diameter between 2.5 and 10 $\mu\text{g}/\text{m}^3$ (PM₁₀) in the execution phase. CO estimates indicate quite low average values, comprised between 0.012 and 0.133 mg/m³ notably inferior to limits provided by the law (10 mg/m³ – maximum daily average over 8 hours); also maximum registered values, which during a year vary from 1.3 to 3.4 mg/m³, are always lower than normal limits. Estimated concentration of PM₁₀ shows acceptable levels; the estimated maximum value is 54.8 $\mu\text{g}/\text{m}^3$, 15 meters from the highway, considering that regulations impose – on the average over 24 hours – a value limited to 50 $\mu\text{g}/\text{m}^3$.

In 2002 on occasion of the preparation of the bypass project an assessment of environmental costs was made based on the estimate of external costs caused by road transport. The comparison on environmental costs between the solution without the bypass and with the bypass project showed that the latter would generate environmental benefits equal to 6.1 million euros in 2008 and 7.3 million euros in 2020.

— 2 Former quarry of Villetta di Alzano

Box

5

Biofuels

Liquid biofuels for transport represent about 1.5% of fuel for road transport. Future growth rate and potential are quite significant. Biofuels at present in use are bio-ethanol and biodiesel. Bio-ethanol is today produced by the transformation of sugar and starch. A variety of cultivations, such as sugar from sugar cane, sugar beet and sweet sorghum containing a high percentage of simple sugars are used as raw material for the production of bio-ethanol. Maize, wheat and cassava on the other hand have high starch content. Bio-ethanol can be mixed with petrol or entirely burnt but is slightly modified in fuel injection engines. One litre of bio-ethanol contains about 66% more energy than one litre of petrol. Furthermore it contains a higher number of octane and consequently when mixed with petrol improves performance. Bio-ethanol is called "oxygenating" because its oxygen content improves fuel combustion, thus contributing to reduction of carbon monoxide emissions, non combustible hydrocarbon residues and carcinogenic substances.

In 2006 total world production of bio-ethanol reached 51.3 billion litres. The United States, world leader in the production of bio-ethanol, which uses maize as raw material produced 20 billion litres in 2006 and expected 26 billion litres to be produced by the end of 2007. Brazil, the second largest producer of bio-ethanol in the world, in 2006 produced about 17.8 billion litres from sugar cane and foresaw the production of 20 billion litres in 2007.

Biodiesel is obtained by combing vegetable oil with alcohol, and with a catalyst to form a reaction known as trans-esterification. Oil for the production of biodiesel can be extracted from nearly all oil seed cultivations. The most used in Europe are rapeseeds and in the United States soya. In tropical and sub tropical countries palm, coconut and jatropha oil are used. As various oils can be used in production, fuels can have a wide range of physical properties, such as oiliness and combustibility. Biodiesel can be mixed with traditional diesel or burnt in its pure form. Biodiesel contains between 88 to 95% more energy than traditional diesel oil. The higher tone of oxygen in biodiesel helps the completion of fuel combustion, reducing polluting particles, carbon monoxide and hydrocarbons. World production of biodiesel was more than 6 billion litres in 2006. European production of biodiesel in 2006 reached 4.0 million tons of fuel, using rapeseeds, sunflower seeds and other oily seeds.

As leader in biodiesel production, Germany produced 3.8 million tons (2.5 million litres) of biodiesel in 2006. The United States are at present the second highest producer of biodiesel with an estimated production of 1.3 million tons in 2006.

Pure vegetable oil is also a potential fuel for diesel engines that can be produced from a wide variety of sources such as rapeseeds, sunflower seeds, soya and palm seeds. Also cooking oil used in restaurants and animal fat coming from transformation industries can be used as fuel for diesel vehicles.

Due to its high viscosity, in temperate climates pure vegetable oil is not always suitable for normal diesel engines while there is also an incompatibility with electronic systems.

Second generation biofuels (including ethanol and biodiesel derived from cellulosic feedstock) are in full development and it is estimated they will be accessible within the next 5 to 10 years.

Cellulosic biomass such as wood, grass and collection residues is the most abundant biological material on Earth and is able to notably enlarge the quality and variety of prime materials available for the production of biofuels. In comparison with conventional starches and oil seeds, which can only contribute with a fraction of vegetable material for the production of biofuels, the cultivation of energy cellulosic is able to produce more biomass per hectare of surface ground as the entire harvest is available as raw material for conversion into fuel.

Second generation biofuels have striking characteristics of sustainability. In fact, the use of cellulosic biomass (including waste) is not in direct competition with agricultural food production.

Furthermore wood crops coming from perennial plants of rapid growth and brief rotation can grow on a wide variety of lands, also the poorest and degraded where the production of food crops is not the best.

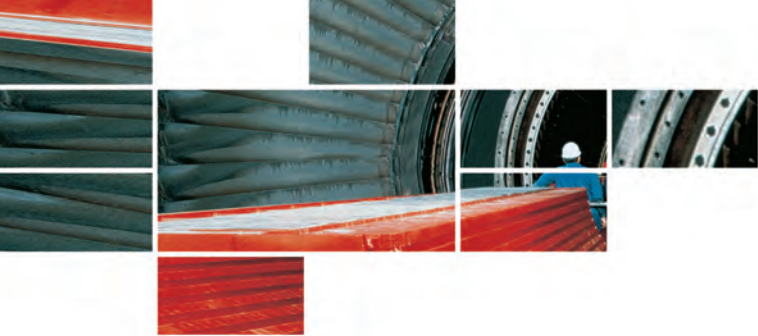
The Global Bioenergy Partnership - GBEP

Italy chairs the Global Bioenergy Partnership (GBEP) officially launched at the United Nations on 11 May 2006, during the 14th session of the Commission for Sustainable Development. The goal of the partnership is to provide its partners a mechanism to organize, coordinate and increase international research, development, activities, application and commercial diffusion activities relating to the production, conversion and use of biomass into energy, with special attention towards developing countries. Furthermore, the GBEP provides a forum for the activation of efficient policies by means of the identification of ways and instruments to support investments through the removal of barriers against cooperative development projects. Key aims of the Partnership are:

- create a high level political dialogue on bioenergy, sustain national and regional policies on bioenergy, as well as its diffusion on the market, and ease international cooperation;
- favour an efficient and sustainable use of biomass and develop concrete projects in the field of bioenergy;
- encourage the exchange of information and technical and technological knowledge through the identification and promotion of potential areas of bilateral and multilateral cooperation;
- facilitate the integration of bioenergy in the energy markets, analysing and overcoming existing barriers to its development;
- act as a transversal initiative, in synergy with other activities of the sector, avoiding duplications.

The Partnership unites political decision makers, representatives of the private sector and civil society, as well as international agencies and experts in the bioenergy sector. Present partners are: Brazil, Canada, China, France, Germany, Italy, Japan, Mexico, Netherlands, United Kingdom, Russia, United States of America, Sudan, Tanzania, United Nations Food and Agricultural Organization (FAO), United Nations Conference on Trade and Development (UNCTAD) United Nations Department for Economic and Social Affairs (UN-DESA), United Nations Development Programme (UNDP), United Nations Environmental Programme (UNEP), United Nations Industrial Development Organization (UNIDO), International Energy Agency (IEA), United Nations Foundation, World Council for Renewable Energy (WCRE) and the European Biomass Industrial Association (EUBIA).

Austria, Colombia, India, Indonesia, Kenya, Morocco, Mozambique, South Africa, Sweden, Switzerland, European Commission, European Environment Agency, International Fund for Agricultural Development (IFAD) and the World Bank participate as observers. Italy and Brazil are respectively President and Co-President for the present biennial.



Industrial Production and Innovation

Industry has a strong impact on the environment, directly in the production and indirectly in the distribution of goods for consumption and in their transformation into waste after use.

The challenge is to link sustainability with economic growth and welfare, decoupling the environmental impact from economic growth and thus “doing more with less”. Consequently, it is necessary to improve the total environmental performance in the entire life cycle, stimulating the demand for better goods and to improve production techniques (figure 1).

The first two phases in the life cycle concern the extraction of raw material, biomass and energy and their use in production or manufacturing activities. The comparison between economic activities (e.g. GDP and gross added value) and the quantity of resources and energy used or pollution emitted, allows areas of inefficiency, overuse, and excess to be highlighted together with their harmful environmental impacts.

Since 1990, most European countries have experienced a structural change towards service oriented economies, resulting in an increased contribution of services to GDP (figure 2). The economic changing process has been characterised by strong differences at regional level. The economy of the EU15 Member

States is dominated by services (services¹ 70%, industry² 28% and agriculture 2%). In the economy of the EU10, the share of services decreases to 65%, while industry rises to 32%. After a sharp decline during the last ten years, agriculture currently represents the 3% of the gross added value.

To single out which use of resources cause the greatest environmental impact the mass flow (‘how many tons are used?’) and the impact per unit (‘how harmful is each ton?’) are usually calculated.

The ten categories of material which characterise the greatest environmental impact are:

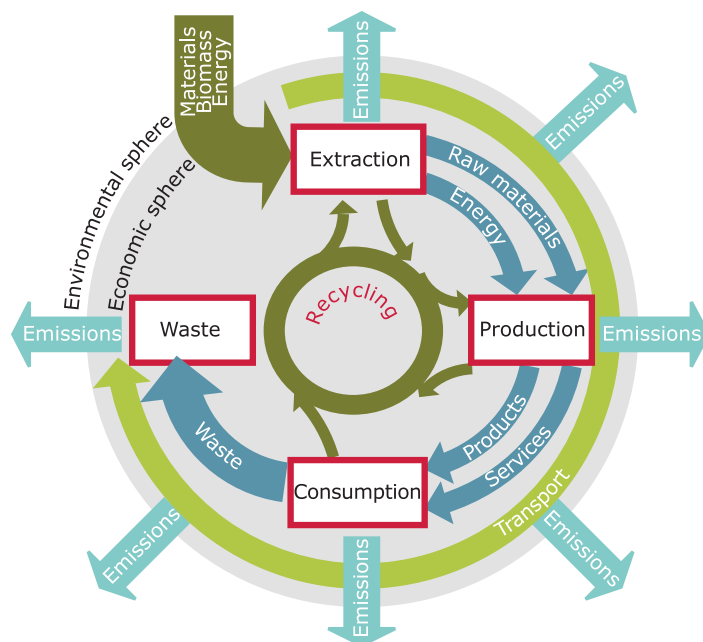
- animal products
- crops
- plastics
- oil for heating and transport
- concrete
- hard coal for electricity
- brown coal for electricity
- iron and steel
- gas for heating
- paper and board.

Figure

1

Life cycle phases of extraction, production, usage and waste disposal

Source:
European Environment Agency -
European Topic Centre on Resource
and Waste Management
(ETC/RWM), 2007



— 1 The term 'services' covers, among others, wholesale and retail trade, repairs, hotels and restaurants, transport, communication, financial services and real estate, public administration, defence, education, health care and various other services — 2 The term 'industry' covers mining, energy supply and manufacturing.

The production of metals and industrial minerals has a strong impact on the environment, due to the damage it causes and is usually associated with high consumption of resources. The ratio between unused and used minerals extracted can be as much as 10:1 (iron and aluminium), 100:1 (copper), 6,000:1 (zinc) and can reach 1,000,000:1 for gold and diamonds. Apart from the large amount of waste generated by extraction from quarries and mines, some waste can be highly toxic and be a risk to the surrounding environment (figure 3).

To oppose the pressure of production on the environment, in a “command and control” centred policy defining objectives and verification of achievements by industry, a policy based on voluntary participation and achievement of environmental targets has been added. A sign of an active participation of the private sector to environment policy is shown by the number of firms that have adopted an Environmental Management System (EMS).

The most adopted EMS is ISO 14001, with nearly 13,000 certified companies in Italy (table 1) at the end of 2008.

Table

1

Certified ISO 14001:2004 firms by sector, December 2008

Source: SINCERT, 2009

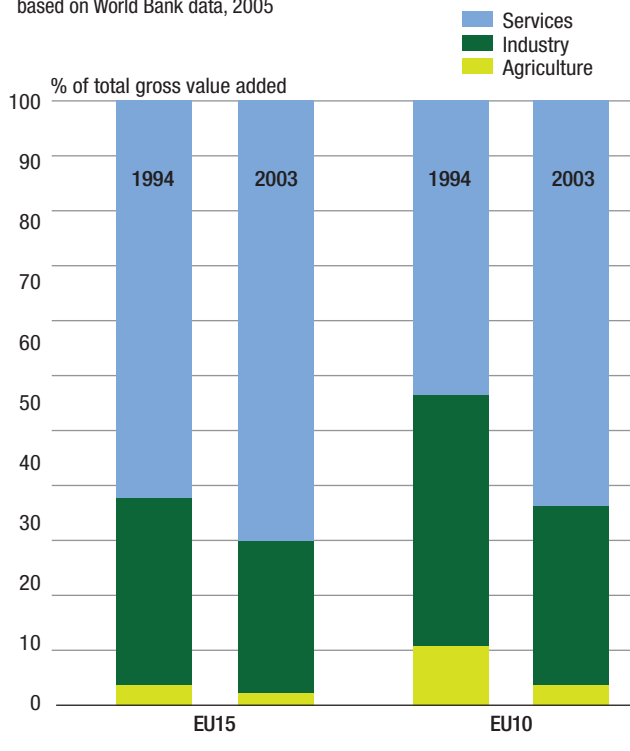
Section EA1	Certified productive sites
Agriculture, fishing	68
Mineral extraction	307
Food industry	774
Textile industry	115
Manufacture of leather goods	99
Wood products	105
Paper products	94
Publishers	-
Printers	67
Oil products	34
Nuclear fuel	-
Basic chemistry	367
Pharmaceutical products	73
Products in rubber and plastic material	428
Manufacture of non metal products	197
Lime, chalk, concrete, cement	222
Manufacture of metal products	1,030
mechanical plants	407
Electrical and optical apparatus	510
Ship building and repairs	46
Aeroplanes and spaceships	18
Cycles, cars and train material	131
Other non classified productions	175
Recovery recycling	277
Electricity production and distribution	1,119
Gas production and distribution	97
Water production and distribution	85
Building companies, plant installers	719
Wholesale commerce and repairs	820
Hotels, restaurants and bars	596
Transport, storage and communications	1,024
Financial, home and renting advising	126
Information technology	98
Technical and engineering consulting offices	126
Professional business services	745
Public administration	483
Education	-
Health and other social services	6
Public services	1,334
Total	12,951

Figure

2

Structural changes in the economy for geographical areas and sections, 1994 - 2003

Source: Elaboration European Environment Agency based on World Bank data, 2005



The EU Eco-Management and Audit Scheme (EMAS) is also progressively gaining support in Italy (figure 4). The scheme is defined by regulation 761/2001/EC, and is open to any organization of public and private sector which wishes to improve its environmental efficiency. Corporate social responsibility (CSR) is another important instrument of voluntary participation. CSR is “a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis”³. The concept of CSR is not new: to be permanently competitive firms have to adapt themselves to new markets and society requirements in the fields they operate in. The flexible nature of many small and medium enterprises allows them to react quickly to such changes, singling out and making use of market opportunities more easily than large firms. To quantitatively valuate the presence of CSR two different indicators can be used. The first is that relating to the number of firms which issue a social assessment or a sustainability assessment.

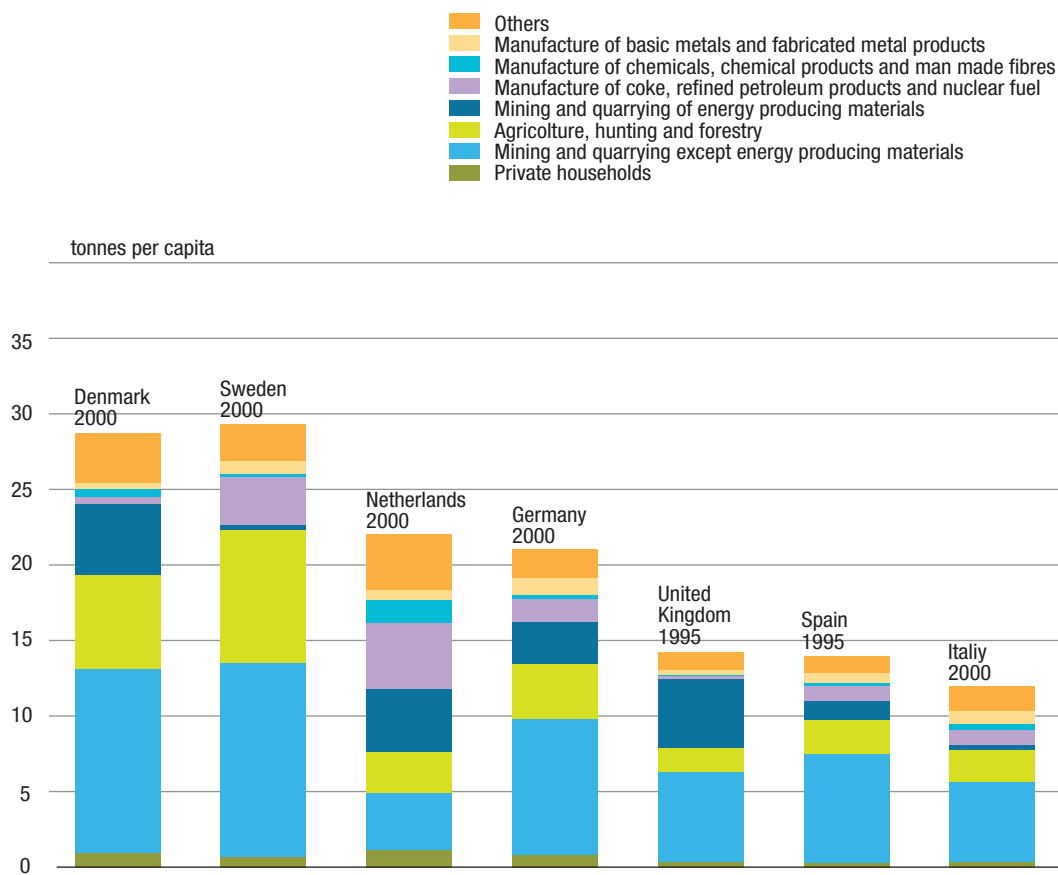
Italian companies which publish on a permanent basis a social or a sustainability assessment are approximately 270⁴. This data however is an underestimate of the interest for CSR by companies, as the use of the English language to draw up an internationally recognised reporting represents a limit for its diffusion at local level and in public sectors. The second indicator refers to the number of SA8000⁵ certificates: in this case data up until 2008 gives Italy 795 certified firms out of a world total of 1,693. Another element linking industry and environment is innovation: research and development of new technologies have been taken up by some firms as an opportunity for economic growth, especially with regard to areas such as the reduction of GHG emissions. As atmospheric pollution has proven to be the environmental area featured by the greatest richness in systematic data, this information is mainly used to depict the situation both in Europe and Italy. The most important sector in terms of emissions is energy (including transport), which in 2006 represented 80% of total EU15

Figure

3

Direct material input (DMI) by industries and households

Source: European Environment Agency, 2006



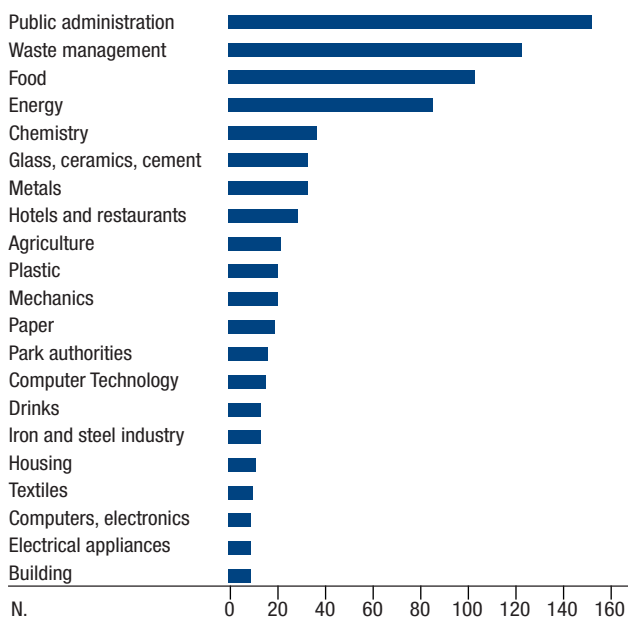
— 3 Commission Report of 27 November 2007: Progress towards achieving the Kyoto objectives [COM(2007) 757 final - not published in the Official Journal] — 4 Source <http://www.corporateregister.com> — 5 This is an international standard which lists the requirements for an ethically correct behaviour of companies and production lines towards workers

Figure

4

EMAS registered organizations by sector, December 2008

Source: ISPRA, 2009

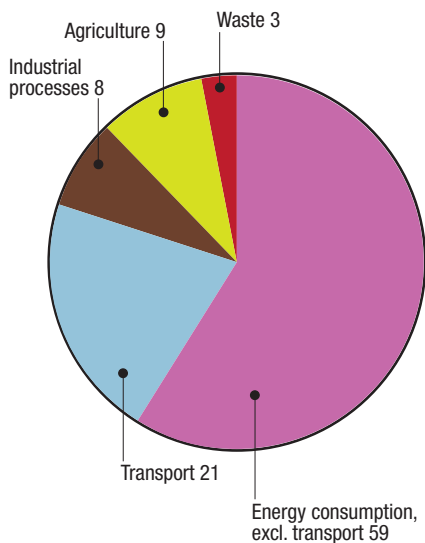


Figure

5

GHG emissions for sectors of the EU-15 values %, 2006

Source: European Environment Agency, 2008



emissions. GHG emissions in transport sector represented 21% of the total, agriculture 9%, industrial processes 8% and waste 3%⁶ (figure 5).

Compared to 1990 UE15 emissions:

- have decreased by 4% in the energy sector (excluding transport);
- have increased by 26% in transport;
- have diminished by 12% in industry, substantially due to the reduction of emissions caused by the production of adipic acid, halocarbide, sulphur hexafluoride and nitric acid and from the iron and steel sector;
- have dropped by 11% in agriculture due to less animal breeding and less use of chemical fertilizers and effluents;
- have diminished by 39% in the waste sector, due to the reduced emission of methane (CH₄) produced by controlled landfills (figure 6).

Regarding the emission of acidifying substances (sulphur dioxide, nitrogen and ammoniac acid) figure 7 represents the sharing per sector⁷ for the EU25 in 2004.

The environmental profile of productive sectors in Italy

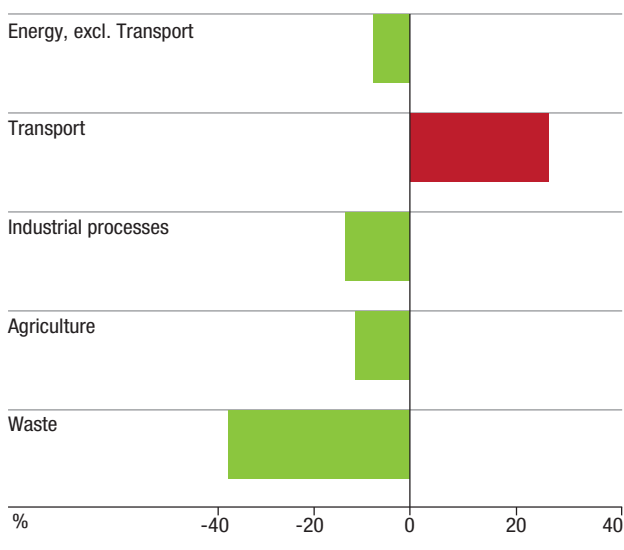
To analyse the Italian situation, the National Account Matrix including Environmental Accounts (NAMEA) elaborated by ISTAT is

Figure

6

Changes in greenhouse gas emissions in the UE15 per sector values %, 1990-2006

Source: European Environment Agency, 2008



— 6 Progress towards the meeting of Kyoto objectives European Commission, 2008 — 7 Eurostat Yearbook, 2008 — 8 Greenhouse gas effect emissions, SO_x, NO_x and NH₃ acidification emissions and the formation of tropospheric ozone COVNM, NO_x, CH₄ and CO emissions have all been counted. In all three cases the union of emissions in relation to the various pollutants involved is based on the use of measures defined in the ambit of international organizations — 9 In the environmental profiles, production and value added to basic costs (current price values) and the total full time work units (Ula) are represented — 10 To give a correct interpretation to the environmental profiles one must take into consideration that to each sector is at-

used, which allows to compare, following the EUROSTAT methodology, the aggregated data of production, added value, occupation and final households consumption with those that represent the pressures of production and consumer activities on the environment.

In 2006 over 80% of greenhouse gas emissions and more than 90% of acidifying gas emissions were generated by production activities⁸.

The major contributors in production activities are:

- manufacturing activities – which cause emissions for 27.1% of GHG, 18.6% of acidification gases and 23.8% of tropospheric ozone precursors;
- the agriculture, forestry and fisheries sector which contributes to more than 41% of emissions of acidifying substances;
- the electricity, gas and water sector that generates 26% of GHG emissions and 9.8% of acidifying substances emissions;
- third parties transport activities that contribute to 7.5% of emissions of GHG, 13% of acidifying emissions and of tropospheric ozone precursors.

The remaining percentage of emissions are caused by households consumption. GHG accounts for 19%, precursors of tropospheric ozone for 37% while acidification is a slightly less than 9% (figures 8,9 and 10).

Household emissions are caused mainly from the use of fuel for private transport, heating and cooking.

During the period 1990-2006, the weight of production activity

in the generation of atmospheric emissions diminished, although higher than emissions generated by households (table 2). Reduction is particularly strong for precursors of tropospheric ozone (production activities make a contribution of about 63% in 2006, 71% in 1990), lower for GHG emissions (from 84% in 1990 to 81% in 2006), least of all in the case of acidification (from 92 to 91%)

Referring only to emissions generated by production activities in 2006, figure 11 shows that agriculture, forestry and fisheries as well as electricity, gas and water contributed much more to pressure on the environment than to create economic wealth, measured in terms of production, added values and employment⁹. In the case of “transport” the weight of this sector in emission terms is more than the weight in the national economy but is reduced compared to earlier cases. On the other hand, for “manufacturing activities” as a whole, as for waste disposal and other services, the pressure on the environment in 2006 is comparable to the contribution given by economic variables¹⁰.

The refining industry, chemical industry, cement production and steel production show an environmental profile in which the percentage contribution given to the creation of economic values is much lower than that in relation to atmospheric emissions (figure 12).

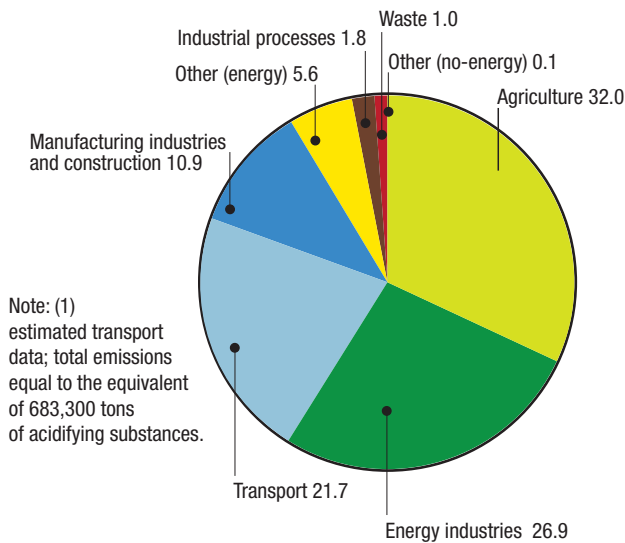
The comparison between the economic performance and the atmospheric emissions of production activities in Italy shows a higher decoupling¹¹ for gases (which contribute to the phenom-

Figure

7

Percentage of acidifying substances emissions per sector (1) in the EU-25 values %, 2004

Source: Eurostat, 2008

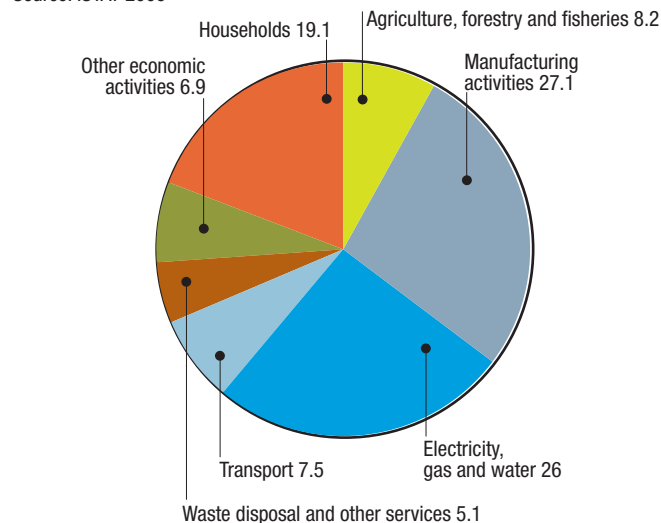


Figure

8

Atmospheric greenhouse gases emissions – CO₂, N₂O and CH₄ due to economic and household activities per sector values %, 2006

Source: ISTAT 2009



tributed all the emissions directly caused by the production processes characterised by the activity in question and by the heating processes and transport of each one. In this way each activity is associated with the emissions generated to satisfy the total demand of its products, independent of the use (final or intermediate) of the products. Vice versa, in the analysis in which environmental pressures are brought back to the final demand, each economic activity is attributed all the emissions generated to satisfy the final demand of its products, both those which are generated within the production process and those which are indirectly generated in the same process, that is in the realization its products of intermediate consumption — 11 Decoupling or disassociation between economic growth and environmental pressures happens when the productive growth activity is higher than pressures on the natural environment

enon of acidification and the formation of tropospheric ozone) than for greenhouse gases in all the economic sectors analysed (figure 13)¹².

Research support actions: the Programme “Industry 2015”

The necessity to clearly single out strategic lines for the future development and competitiveness of the Italian production system has led to the birth of “Industry 2015”, born as a new industrial policy framework in September 2006, and included in

the 2007 financial law.

The strategy is based on:

- an industrial concept extended to new production lines that combine manufacture, advanced services and new technology;
- an analysis of the future economic production scenario which awaits Italy in the mid-long-term perspective (2015).

To allow the strategic repositioning of the Italian industrial system in a globalized and highly competitive world economy, industrial innovation, flanked by the creation of company networks¹³ and innovating finance¹⁴, is seen as the main tool.

The aim is therefore to orientate the production system towards assets compatible with changing scenarios of competition, both

Table

2

Atmospheric emissions caused by economic activities and households, 1990 and 2006

Source: ISTAT, 2009

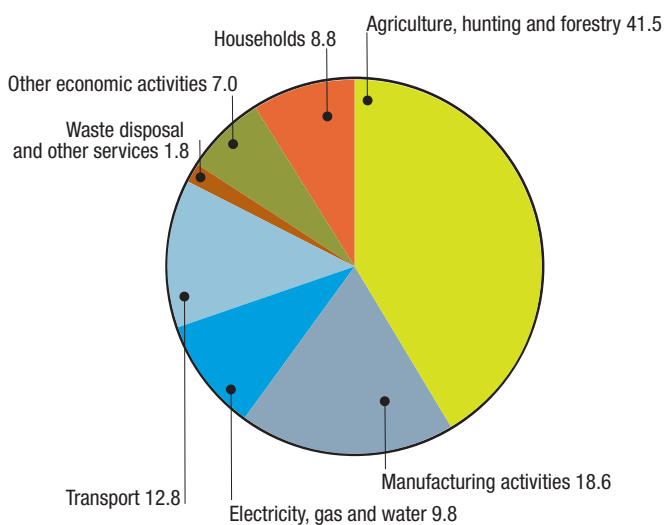
	Greenhouse gases (tCO ₂ eq)			Acidification (t acid potential eq)			Tropospheric ozone (t potential)		
	1990	2006	2006/1990 %	1990	2006	2006/1990 %	1990	2006	2006/1990 %
Economic activities	435,006,003	454,771,116	5	116,693	54,389	-53	3,668,222	1,828,287	-50
Households	81,534,243	107,613,317	32	9,826	5,220	-47	1,490,592	1,063,406	-29
Total	516,540,246	562,386,439	9	128,509	61,615	-52	5,158,814	2,891,693	-44

Figure

9

Atmospheric emissions of acidifying substances SO_x, NO_x and NH₃ due to economic and household activities per sector values %, 2006

Source: ISTAT, 2009

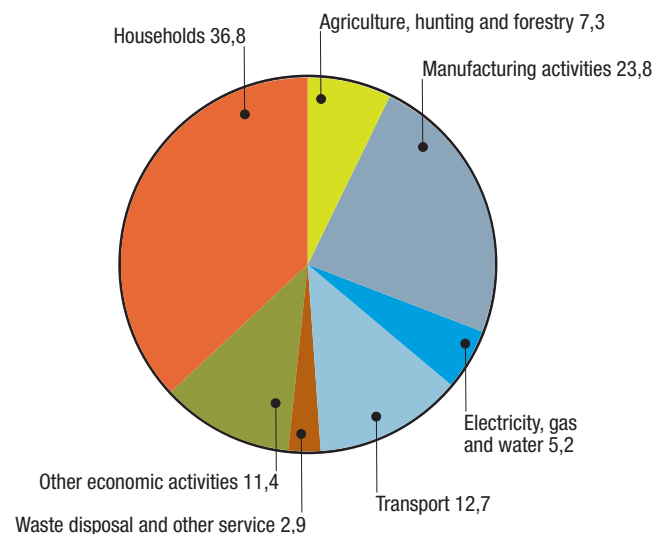


Figure

10

Tropospheric ozone precursors – COVNM, NO_x, CH₄ and CO emissions due to economic and household activities per sector values %, 2006

Source: ISTAT, 2009



— 12 Among the groups of economic activities taken in consideration figures the “transport” sector (inclusive of ground transport and sea, air and auxiliary transport activities). Seeing that economic data relating to this group can not be reconstructed before 1990 (the year from which Namea data is available) the analysis begins in this same year — 13 The company network is of a coordinating contractual nature between companies aimed in particular at small and medium sized companies who want to increase their critical mass and have a greater force on the market without having to become part of, or join, a larger company — 14 The fund for the financing of companies has the objective of offering easy credit access and risk capital to companies, in particular to those of a small and medium size

by singling out productive technological areas and specific objects of industrial innovation. This is to be accomplished by the mobilization of local and central administrations, the business sector, universities, research institutes and the financial system. An aspect of great importance is furthermore represented by incentives to companies for the implementation of the Industrial Innovation Projects (PII) of the "Industry 2015" plan. The new system of incentives will allow companies to choose both the type and kind of financial support most convenient to their needs in activities, ranging from industrial research to experimental development, and to the definition of prototypes and demonstrative plants for new products and the provision of serv-

ices ready to compete on international markets.

The Industrial Innovation Project, coordinated by the Ministry for Economic Development represents the main and most innovative instrument of intervention for the launching of the industrial policy as defined in the detailed document "Industry 2015". These are coherent intervention projects which, beginning with the productive technological objectives singled out by the government, aim at favouring the development in Italian strategic areas of specific products and services with high innovation content:

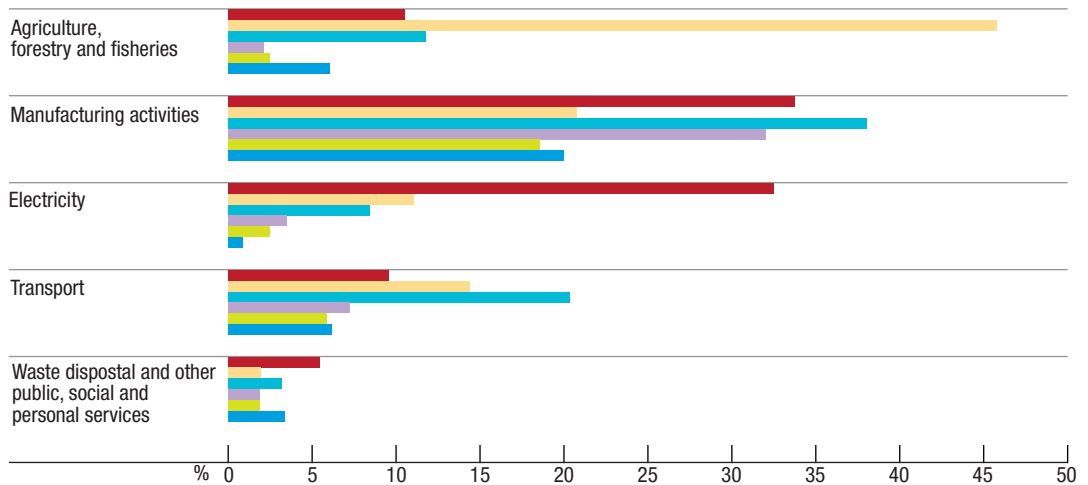
- energy efficiency
- sustainable mobility
- new medical technologies

Figure

11
Environmental profile of some economic activity sectors, 2006

Source: ISTAT, 2009

- Greenhouse effect
- Acidification
- Tropospheric ozone
- Production
- Added value
- Work unit

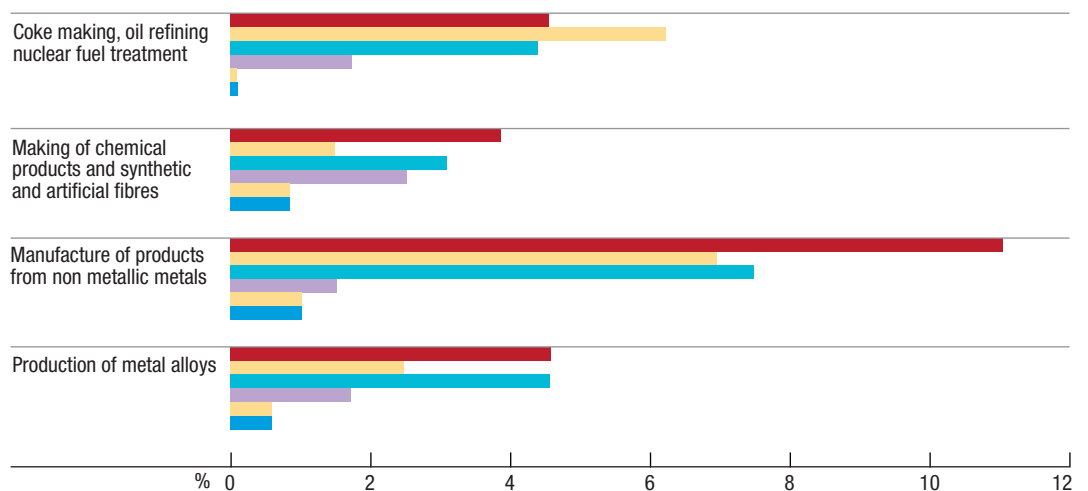


Figure

12
Environmental profile of manufacturing activities, 2006

Source: ISTAT, 2009

- Greenhouse effect
- Acidification
- Tropospheric ozone
- Production
- Added value
- Work unit





- new technologies to support “made in Italy”;
- new technologies for cultural assets.

The first two listed are those of immediate interest regarding environmental themes.

The PII Energy Efficiency’s objective is to make the industrial system competitive by improving energy efficiency in Italy by means of energy saving in the production process and in its final use, and by exploiting the most of renewable energy sources thus improving energy safety, also in view of environmental sustainability. In 2009, 30 research and innovation projects out of a total of 86 submitted, have been financed. The projects accepted concern 234 companies, 160 research institutes and will make use of about 500 million euros in development and research activities.

The PII Sustainable Mobility aims at favouring the development

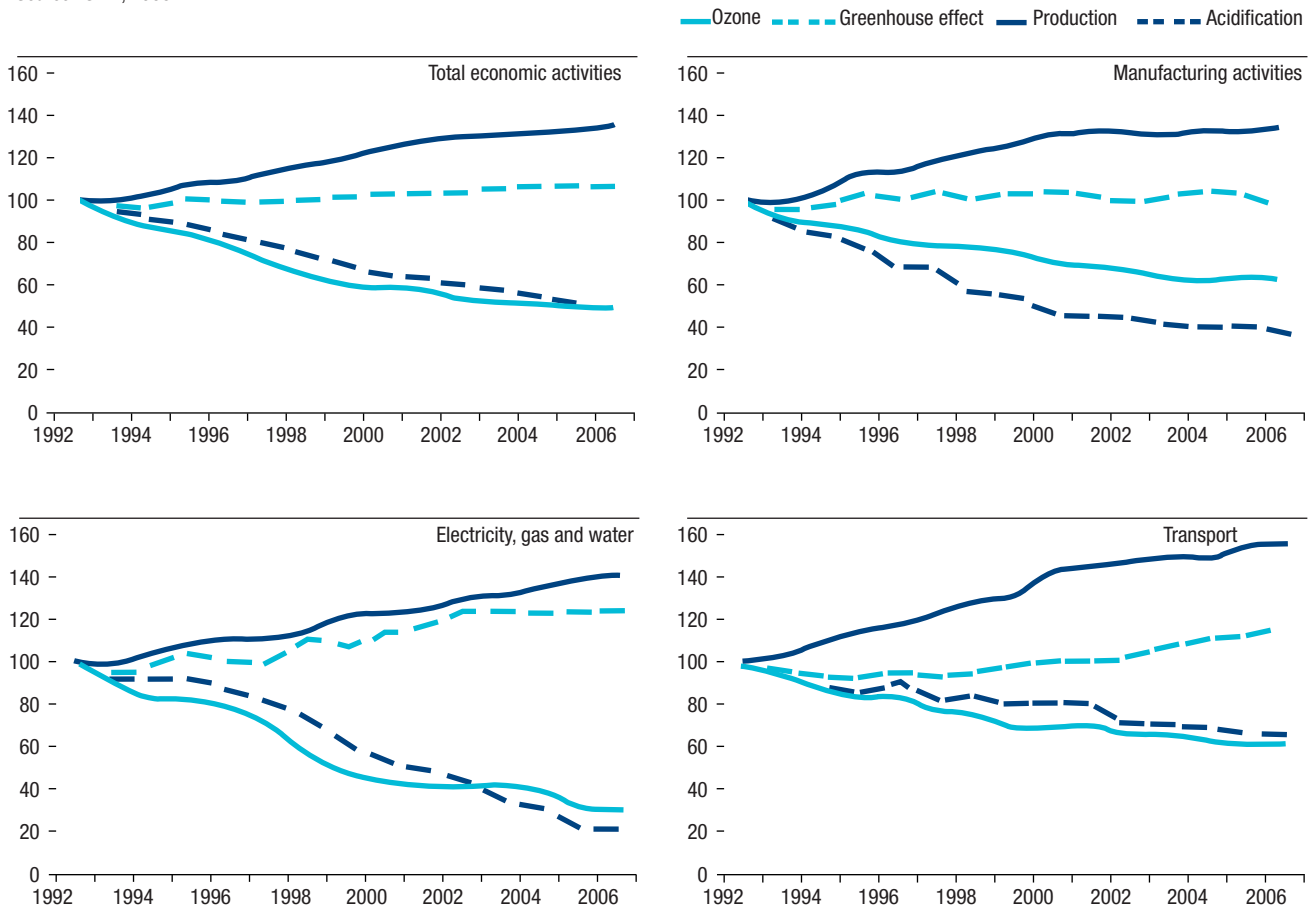
of new products and innovative technical solutions able to respond to needs concerning mobility, transport of people and freight, more efficient and at the same time paying more attention to social and environmental ties, thus increasing the competitive capacity of the industrial sectors involved. In 2009, 25 projects have been financed for a total investment of about 450 million euros, corresponding to 180 million euros of contribution. The total number of companies involved is about 250 and 100 research bodies .

Figure

13

Basic cost production (index 1992=100): linked values and atmospheric emissions for environmental topics and economic activities, 1992 - 2006

Source: ISTAT, 2009



Box

1

Technological innovation: Carbon Capture and Storage

Within the European Commission's "Energy – Climate" package a framework for the geological storage of carbon dioxide (Carbon Capture and Geological Storage – CCS) is foreseen, in order to guarantee that the sequestration on this substance is permanent and that possible risks for the environment and health are reduced to a minimum.

The geological capture and storage of carbon dioxide is a technological bridge which will contribute to mitigate climate change. Carbon dioxide (CO₂) captured by industrial plants, is transported to a storing site and later injected into a geological underground formation suitable to indefinite storage.

According to preliminary estimates of impact assessment cited by the European Commission, it should be possible to store 7 million tons of CO₂ by 2020 and up to 160 million tons by 2030, on the condition that the CCS obtains private, national and community support and demonstrates an environmentally sustainable technology. CO₂ emissions stated for 2030 could correspond to about 15% of reduction requested by the European Union.

CCS technology is not yet available and requires therefore a significant development in research in the next ten years. All the various CCS phases, that is to say capture, transport and storage of CO₂, have been object of pilot plans on a scale lower than required for their industrial application. It is still necessary to integrate them into a full process, reduce technological costs and gather better and greater scientific knowledge. It is therefore important that the European Union puts into action, as soon as possible, demonstrations of CCS activity in an integral political picture, foreseeing a legal frame for the application of an environmental sustainable storage of CO₂, incentives for further research and development, demonstration projects and public sensibility measures.

According to a recent study¹, in Italy 13% of reduction in greenhouse gas emissions is possible by 2020 and 34% by 2030 keeping in line with "business as usual": 35% of reduction opportunities are linked to a come back in the use of nuclear power and use of CCS systems in carbon and gas power stations used by industry. The large scale introduction of CCS technology will count for 51 Mt of CO₂ emissions by 2030, allowing the capture of about 85% of emissions, against a loss in efficiency of 35% of the plants due to the alimentation of the same capturing process. It is assumed that the first pilot sites will be in operation between 2010 and 2015, whilst the first two industrial plants equipped with CCS will be in activity by 2025. Then there will then be a gradual enlargement to cover by 2030 all plants where a CCS retrofit is technically feasible (that is by 2030 56% of carbon powered plants and 66% of combined cycle turbine gas plants).

CCS is a measure that has a positive cost (the abatement of CO₂ is a cost for operators) for about 65 €/t CO₂ in the case of gas (of which 8 €/t CO₂ is due to the transport and storing of CO₂, and the remaining 57 due to the higher cost of investment and fuel per MWh for the plant) and 45 €/t CO₂ in the case of carbon (of which 8 €/t CO₂ transport and storage, 37 due to a higher investment and fuel cost per MWh of the plant).

ENEL and ENI are together developing an integrated pilot project based along the following lines:

- capture: post combustion capture pilot plant (10,000 Nm³/h fumes) working in Brindisi from December 2009 and able to separate 20,000 t/y of CO₂;
- liquefaction: liquefaction of CO₂ and cryogenic storage system will be installed in Brindisi for the treatment of the CO₂ produced by the pilot plant;
- transport: pilot line to test transport in a pipeline to be installed at Brindisi: transport to Cortemaggiore by 230 trucks / year;
- CO₂ injection: ENI deposit – Stogit di Cortemaggiore (Piacenza) starting in October 2010 for a total of 24,000 t CO₂ injected.

— 1 The reduction of greenhouse gas emissions in Italy: opportunities and costs" ENEL, 2009

Box

2

The answer of large enterprises to climate change: the “Carbon Disclosure Project”

Investors are more and more interested in information of company strategies regarding climate change. Greenhouse gas emissions are considered in many parts of the world as a company liability, that can be counted and put on the balance sheet: on the contrary reduction of CO₂ emissions can be a source of economic activity.

An instrument which answers this need is the “Carbon Disclosure Project” (CDP). The idea was launched in 2000 by the Rockefeller Philanthropy Advisors¹ of New York and it works on behalf of 385 among the main international investors (banks and financial brokers) who control more than 57 trillion dollars.

CDP, on behalf of its investors, every year asks companies information on GHG emissions and measures taken to combat climate change.

The aim of CDP is to encourage organizations to measure, make public and control their greenhouse emissions and to give, in such a way, information to investors useful for the better understanding of the capacity of companies to face risks and gather opportunities offered by climate change.

The project, furthermore, allows to understand in what terms and to what measure climate change and relating strategic proposals influence the choice of investors in their budget management to obtain maximum value for their beneficiaries.

The first step of the CDP was to implement and permanently up to date the database: the challenge is to have by 1st February 2010 a worldwide register of greenhouse gas emissions with details down to each individual factory. This would increase the quality of the data and help auditors when verifying this information for third parties.

Last year in New York, CDP launched with Wal-Mart² a project regarding a supply chain: leader companies such as Boeing, Procter and Gamble, HP and PepsiCo, through CDP asked their suppliers to give specific information linked to climate change.

This helps to identify opportunities to reduce emissions and costs along the entire supply chain as well as identifying potential risks (closure of activity due to extreme climate occurrences or previsions on the volatility of energy prices and its impact on business). More than 35 enterprises complied with this project, with thousands of new companies who have come together on the CDP data bank.

It has recently been proposed a huge new initiative regarding public spending: in UK, the Minister of the Environment and the Minister of Foreign Office send suppliers the Carbon Disclosure Project's questionnaire.

Regarding the United States, 29 large cities of the United States, among which Las Vegas and New York, are already giving emissions information to CDP.

Data contained in the 2008 global report has been elaborated by three groups of global companies: FTSE 350³, S&P 500⁴ and Global 500⁵. The results, in a progressive in depth theme study depend on how many companies:

- answered the questionnaire;
- gave their consent to publish answers to the questionnaire;
- prepared an annual emissions report (both direct and indirect);
- made public information regarding their emissions;
- adopted a specific protocol regarding emissions measurement;
- made public reduction objectives;
- made public emissions forecast.

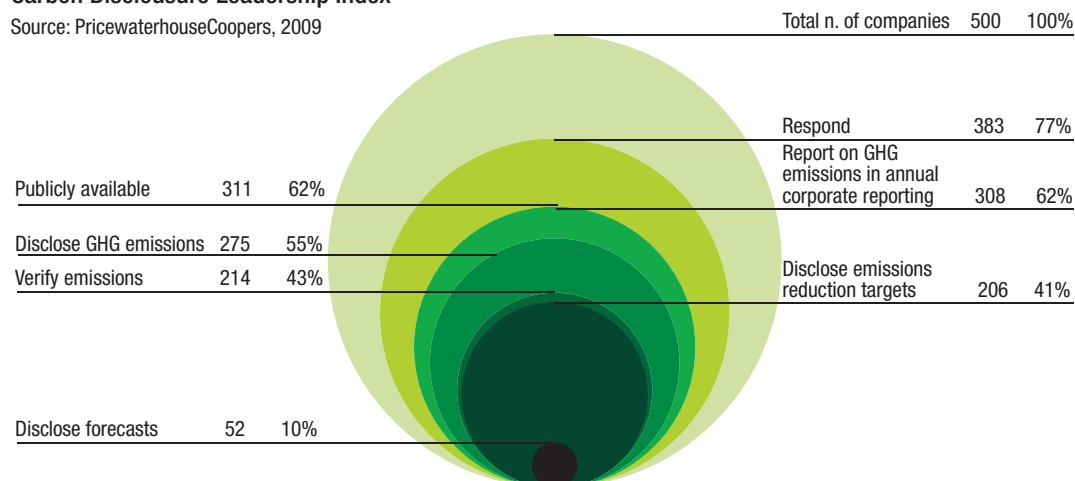
Considering the companies included in the Global 500, the results are shown in the following figure:

— 1 The Rockefeller Philanthropy Advisors is a non profit organization which assists its donors in their worldwide philanthropist efforts — 2 Wal-Mart Stores Inc. is a multi national American company, owners of the Wal-Mart chain stores founded in 1962. It is the greatest retailer in the world and among the first in the world for its annual turnover and number of employees. Today it is the greatest chain store operating in the line of organized distribution —

Figure

Carbon Disclosure Leadership Index

Source: PricewaterhouseCoopers, 2009



Table

Companies included in the Global 500 and in the Carbon Disclosure Leadership Index⁽¹⁾ per activity

Source: PricewaterhouseCoopers, 2009

Note (1): The Carbon Disclosure Leadership Index (CDLI) is an index which classifies the companies analysed in relation to greenhouse gas emissions both direct and indirect. The analysis is made by dividing the companies into two groups 'energy intensive' and 'non-energy intensive'.

Activity	Companies in		
	Global 500	Carbon Disclosure Leadership Index (CDLI)	CDLI / G500 %
Energy intensive			
Chemical & pharmaceutical	44	9	20
Construction & manufacturing products	11	1	9
Manufacturing	43	1	7
Petroleum & gas	54	4	7
Raw materials, mining industry, paper & packaging industry	25	6	24
Transport & Logistics	11	1	9
Services	30	9	30
Total	218	33	15
Non-energy intensive			
Financial services	121	18	15
Hospitals, free time & commercial activities	30	4	13
Retail sales and consumption	58	7	12
Technology, media & telecommunications	73	5	7
Total	282	34	12

³ FTSE (Financial times Stock Exchange) 350 is a share index of the 350 companies with the highest share capital quoted on the London Stock exchange — ⁴ S&P 500 index was started by Standard & Poor's in 1957 and follows the share tendency of 500 of the largest share capital American companies — ⁵ The 500 biggest corporations in the world

In 2008 CDP prepared its second report on Italy (the first was made in 2007) taking into consideration the 40 companies with the highest capital in the Italian stock market (S&P/MIB). Among these, 8 also belong to Global 500.

The sample used for the analysis is rather limited, so results can not be considered completely representative of the Italian situation as a whole. However, from the data available some interesting considerations can be made, also bearing in mind that top Italian companies are questioned.

Out of the 40 companies in the group only 18 answered the questionnaire and 14 of them agreed to make public information given.

Nearly all the companies involved can sense opportunities in climate change. The financial sector in particular is aware of the opportunity to develop new financing and insurance services to support low-carbon investments and adaptation and mitigation activities.

Regarding the measuring of greenhouse gas emissions, 14 companies were able to give direct information about their emissions. The number relating to indirect emissions deriving from buying electricity, heat and steam were given by 12 companies. Only 9 firms publish other indirect emissions, measured or estimated, which in many cases are those generated by business trips. Emission data is checked in 13 firms by an independent company.

Nine companies have introduced a programme to reduce their GHG emissions while only 7 have established a quantitative target.



Waste Management

Overall commitments

Recent decades have seen an unprecedented growth in population, economy, and well-being. This growth has caused an overwhelming consumption of resources and materials, and consequently, the production of huge quantities of waste. According to OECD¹ estimates, from 1980 to 2002, global resource extraction increased by 36%, and it is expected to grow 48% more by 2020, for an overall amount of around 80 billion tonnes. In order to appropriately discuss the issue of waste, the topic must be assessed in a context that analyzes and manages the problem as a component of the total material flow that impacts society, as part of an integrated policy of sustainable development that has, among its priorities, a reduced resource exploitation, lower energy consumption, and emissions reduction. The European Union currently produces approximately 1.3 billion tonnes of waste every year, of which 40 million are considered hazardous and more than 700 million tonnes of which is agricultural waste.

The total amount of waste produced has constantly increased since the 1990's, and municipal waste represents a little less than 15% of the total produced in the European Union, compared to around 29% attributable to the mining sector and approximately 26% to manufacturing. Generally, waste production is directly correlated to socio-economic factors such as the GDP and consumption trends, and this ratio varies as a function of the geographic and social components and the production sectors considered.

Some countries (especially Germany and Denmark²) report waste production, expressed per GDP unit, as being substantially lower than average figures, due to the introduction of clean technology and efforts towards waste prevention, and also in relation to modifications in industrial operations and reallocation of production activities. The connection between development and waste production is not, therefore, indissoluble as long as the changes occurring in society, changes in consumer habits, and the dangers associated with the diffusion of those lifestyles which are indifferent to environmental respect are taken into account when carrying out sustainable development policies.

Measures aimed at reducing pressure on the environment coming from waste production and management are reflected in many community documents. In particular, the "Strategy on the prevention and recycling of waste"³ identifies key elements

for action in improved legislation, in prevention of waste production, and in promotion of effective recycling. The Strategy aims to reduce the negative environmental impact generated by waste over the course of its existence, from its production to its disposal, providing an incentive for an approach that considers waste not only as a source of pollution to be reduced, but also as a potential resource to be used.

This approach is complementary to that of the directive on integrated pollution prevention and control - IPPC⁴ and to the strategy for the use of natural resources⁵. A guiding principle of this kind implies that improvement should be made in creating awareness about the impact caused by the use of the resources that reduce environmental pressure (exhaustion and pollution) in each phase of the resources' life cycle, from production to collection, from use to disposal.

Currently in the European Union a large part of the waste produced is delivered to landfill or is incinerated (these two disposal types account for around 65% of the total managed waste), resulting in serious consequences for the environment. Particularly detrimental are inadequately controlled dumping grounds, which are responsible for atmospheric pollution, soil degradation, dispersion of hazardous chemical substances in surface and ground watersheds, and human health risks (figures 1 and 2). Each European citizen produces, every year, an average of 522 kg of municipal waste, of which a 41% average ends up in landfill (figure 3).

For this reason, the European Union has been committed to obtaining a significant reduction in waste production through initiatives aimed at preventing production, limiting utilization of natural resources, and creating incentives for changes leading to more sustainable models of production and consumption. In line with these principles, in April 2006 the waste framework directive 2006/12/EC was issued to define a coordinated management framework aimed at limiting waste production and at organizing waste treatment and disposal in the best way possible.

The community legislative framework was further renovated and integrated through directive 2008/98/EC⁶. The directive identifies criteria to be used in order to consider or not a product as waste⁷ and underlines that, for a stronger environmental protection, EU member states, besides seeing to the dumping and recovery of waste in a responsible way, must adopt measures intended at limiting the production of the waste itself, thus promoting clean technologies and recyclable and reusable products, while keeping in mind the current and potential possibilities of the market for recoverable waste.

— 1 OECD Environment Outlook, 2008 — 2 European Environment Agency, 2007 — 3 COM/2005/0666 of December 21, 2005: "Taking sustainable use of resources forward: a thematic strategy on the prevention and recycling of waste" — 4 Directive 2008/1/EC of the European Parliament and of the Council of 15 January, 2008 concerning integrated pollution prevention and control — 5 Communication from the Commission of 21 December, 2005 - Thematic Strategy on the sustainable use of natural resources [COM(2005) 670] — 6 Directive 2008/98/EC of the European Parliament and Council of November 19, 2008 on waste and which abrogates some directives — 7 Waste is defined "any substance or object whose holder discards or has the intention or obligation to discard" (art.3)



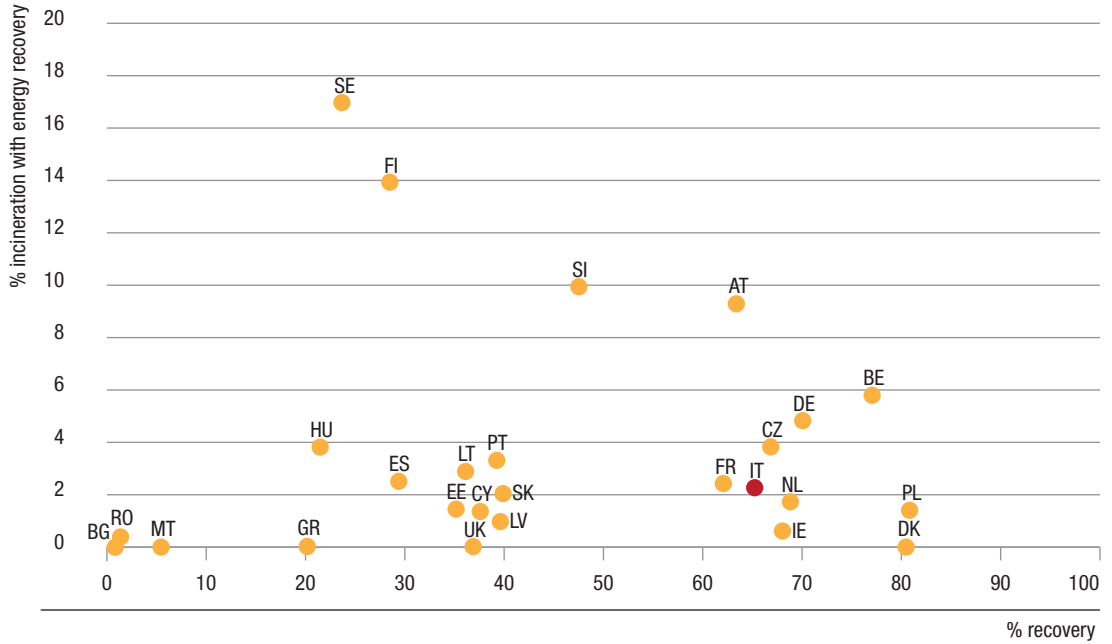
Figure

1

Recovery and incineration with energy recovery from waste in EU27⁽¹⁾ values %, 2006

Note: (1) data not available for Luxembourg

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by Eurostat, 2009



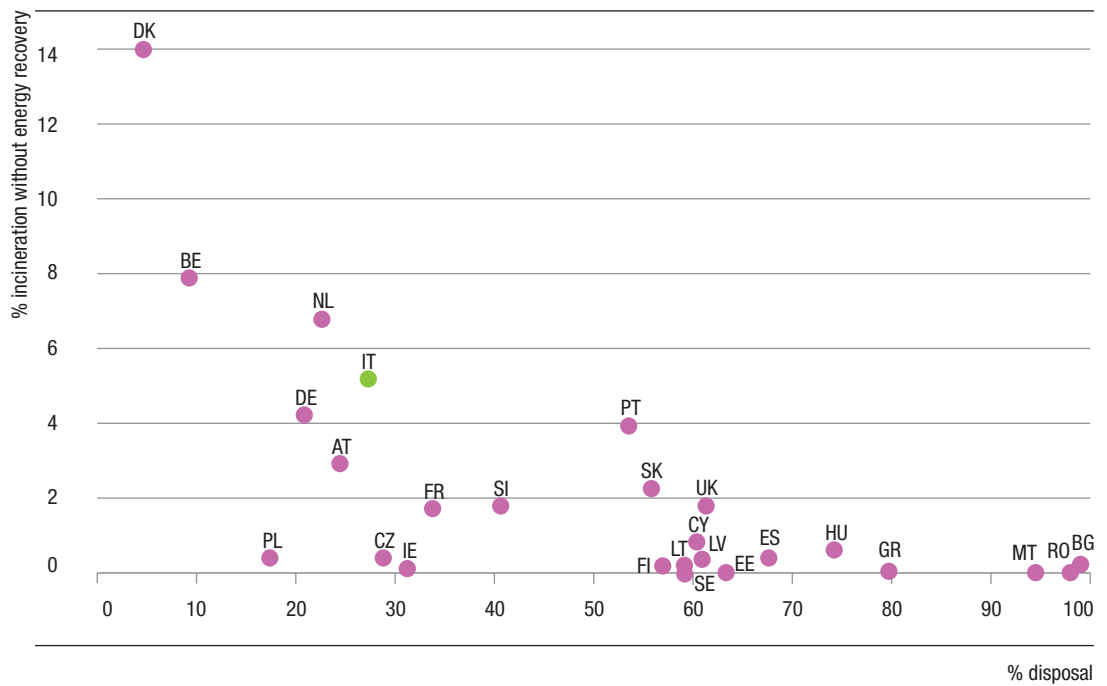
Figure

2

Incineration without energy recovery and waste disposal in EU27⁽¹⁾ values %, 2006

Note: (1) data not available for Luxembourg

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by Eurostat, 2009



Legend: Sweden SE, Germany DE, France FR, Italy IT, Spain ES, Austria AT, Finland FI, Romania RO, United Kingdom UK, Denmark DK, Netherlands NL, Portugal PT, Greece GR, Slovakia SK, Bulgaria BG, Poland PL, Slovenia SL, Latvia LV, Czech Republic CZ, Belgium BE, Hungary HU, Ireland IE, Lithuania LT, Luxembourg LU, Estonia EE, Cyprus CY, Malta MT

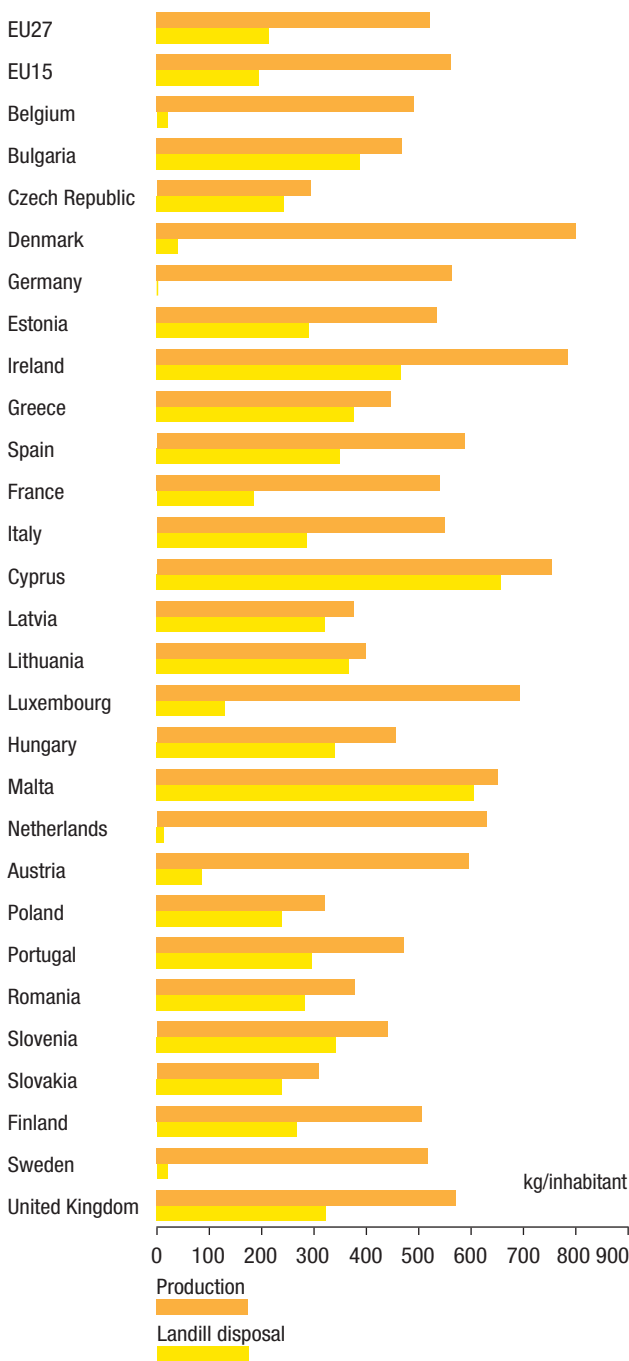


Figure

3

Per capita production and landfill disposal of municipal waste in EU27, 2007

Source: Eurostat, 2009



The directive emphasizes that each environmental policy on waste must promote the reduction of use of resources and a concrete application of the hierarchy of waste materials, which generally sets a priority order of what constitutes the best environmental choice in the regulation and policy of waste.

According to the hierarchy, proper waste management first goes through prevention policies, then on to the recovery of material before that of energy recovery, and lastly, disposal.

The directive proposes to help the European Union become a “recycling society,” attempting to limit waste production and to use waste as a resource. The directive originates from the need to specify some basic essential concepts for the correct implementation of waste legislation. In using the terms “recovery” and “disposal,” a distinction must be made between these two concepts, given their clear differences in regard to environmental impact (substitution of natural resources in the economy) and in effectively recognizing potential benefits for the environment and human health by using waste as a resource.

Member states must take it upon themselves to ensure that recyclable materials do not end up either in the landfill or in energy recovery. The European Union sets specific objectives to be reached before 2020 for recycling municipal waste (but only for certain types of waste such as metal, paper, glass and plastic) which is expected to increase by at least 50% in weight, and for recovering waste from demolition, expected to increase at least by 70%.

In applying the principle of the extensive responsibility of the waste’s producer, member states must account for the technical feasibility and economic practicality of recycling measures as well as of the overall social, health and environmental impact, while abiding by the need to assure the proper functioning of the internal market.

The national reference framework

National legislation on waste management was reformed following the legislative decree 152/06 “Regulations on environment matters”. The decree, later subjected to an entire revision⁸, places among the general provisions priority criteria for waste management in part IV. The regulation (art. 184) subdivides waste as municipal and special (table 1). The regulation makes specific reference to the “integrated management of waste”, identifying activities as complementary and non-alternative, through a framework subdivided into four different levels that, in conformity with community directions, calls for a reduction of production (through promotion and economic instruments), recovery of material from waste (separating hazardous fractions and utilizing separate waste collection), treatment of residual waste (reuse, recycling, recovery of material or energy), and as a final option, stockpiling in a landfill (only the fraction that is no longer recoverable, in an inert form and not hazardous to the environment).

— 8 Legislative decree n. 4 of 16 January, 2008, “Further corrective and integrative provisions of legislative decree 152 of April 3, 2006, norms on environment matters”



Table

1

Types of municipal and special waste according to legislative decree 152/06

Municipal waste

- a) household waste, including bulky items, coming from premises and places intended for use as civil dwellings;
- b) non-hazardous waste coming from premises and places intended for other uses than those cited in letter a), assimilated with municipal waste by quality and quantity;
- c) waste coming from street sweeping;
- d) waste of any nature or origin, lying on public streets;
- e) organic waste from green areas, such as gardens, parks and cemetery areas;
- f) waste from exhumation and disinterment as well as other waste from cemeteries other than that described in letters b), c) and e).

Special waste

- a) waste from agricultural and agro-industrial activity;
- b) waste from demolition and construction activities, as well as waste from excavation activity;
- c) waste from industrial manufacturing;
- d) waste from artisan workings;
- e) waste from commercial activities;
- f) waste from service activities;
- g) waste from waste recovery and disposal, sludge produced from wastewater treatment and other water treatment and from water conditioning of sewage and from smoke blasting;
- h) waste from sanitary-health related activities;
- i) deteriorated and obsolete machinery and equipment;
- l) motor vehicles, trailers, and similar which are considered beyond repair, and their parts;
- m) waste derived fuel.

Source: Ministry for the Environment, Land and Sea, 2009

The definition and implementation of an integrated waste management system implies the involvement of numerous institutional parties (state, regions, provinces, municipalities) and private citizens involved, for whatever reason, in waste management and disposal.

The central state is responsible primarily for implementation and coordination, definition of general criteria and methodologies for integrated waste management, and the adoption of general criteria for developing plans for the sector. Regions have

the priority task of preparing, adopting, and updating regional plans for waste management, while provinces have administrative functions regarding the programming and organization of waste recovery and disposal in the provincial areas.

Integrated waste management is achieved through the constitution of Optimal Territorial Areas (OTA) which, unlike legislative decree 22/97, cannot coincide with provincial administrative limits. The OTAs are legal entities in which local administrations participate mandatorily; the competencies of local administrations on integrated waste management are transferred to OTAs. Municipalities share in carrying out managerial activities called for by OTAs in regard to municipal and assimilated waste.

The national legislation identifies specific targets for separate waste collection, with an objective set at 45% for 2008 and 65% for 2012. If such results are not obtained at the OTA level, a 20% surtax will be added to the charge for allocation of the landfill at the expense of the OTA, which will distribute the burden among those municipalities that have not reached the expected targets.

Even taking into account the variations occurring over the years in reference to the measurement methods⁹, since the mid-1990's, total waste production in Italy has almost doubled, recording a percentage increase of almost 91% between 1997 and 2006. In addition, the increase of special waste (especially from manufacturing and waste treatment activities) has been particularly significant, while the increase in municipal waste is less dramatic (table 2).

Table

2

Total production of waste in Italy (million tonnes), 1997-2006

	Municipal	Non hazardous special	Hazardous special	C&D (1)	Total
1997	26.6	37.1	3.4	20.4	87.5
1998	26.8	43.9	4.1	21.3	96.1
1999	28.4	44.8	3.8	23.9	100.9
2000	29.0	51.9	3.9	27.3	112.1
2001	29.4	55.1	4.3	31.0	119.7
2002	29.9	49.4	5.0	37.3	121.6
2003	30.0	52.4	5.4	42.5	130.4
2004	31.2	57.1	5.4	46.5	140.1
2005	31.7	55.6	7.9	45.9	141.1
2006	32.5	73.4	9.2	52.1	167.2

Note: (1) Construction and Demolition

Source: ISPRA, 2008

— 9 Consider, for example, the variations occurring with the obligation to make MUD declaration



The amount of municipal waste produced in Italy in 2007 remained practically unchanged at around 32.5 million tonnes, with a per capita production of around 546 kg/inhabitant per year, in comparison to 550 kg/inhabitant per year in 2006. After many years of increasing waste production growth, a more or less constant trend was then seen in 2007.

This trend could be attributed to the latest regulatory provisions limiting the possibility of assimilating special and municipal waste.

Positive signals, even if incomparable within the national outlook, emerge from separate waste collection.

The overall national figure of 2007 was 27.5%, an increase of almost two percentage points over the previous year.

This figure, which can be read in a positive light, as an indication of progressive improvement over the years, is still far from the provisions ordered by legal norms.

Furthermore, the figure, if divided into macro-geographical areas, shows an incongruous picture in Northern, Central, and Southern Italy (figure 4).

As for the different market fractions, the cellulose and organic

fractions together represent more than 62.5% of the total separate waste collected. These together with the textile and wood fractions include the so-called biodegradable waste, for which legislative decree 36/03 introduced specific objectives aimed at the reduction of disposal in landfills.

Among other waste management forms, incineration (with 47 operating plants) accounts for 10.3% of waste processed in 2007. The ratio between the amount incinerated and the relative production of municipal waste, equivalent in 2007 to 12.2%, is stable compared to 2006 (12.1%). The 44 operating plants equipped for energy recovery have produced around 3 TWh of electrical energy and 1.1 TWh of heat energy.

A growing trend has been noted for composting from selected fractions and for the mechanical/biological treatment of non-differentiated waste: for the latter, in particular, the overall capacity of the national plants is estimated to be 14 million tonnes (compared to 8.8 tonnes processed in 2007).

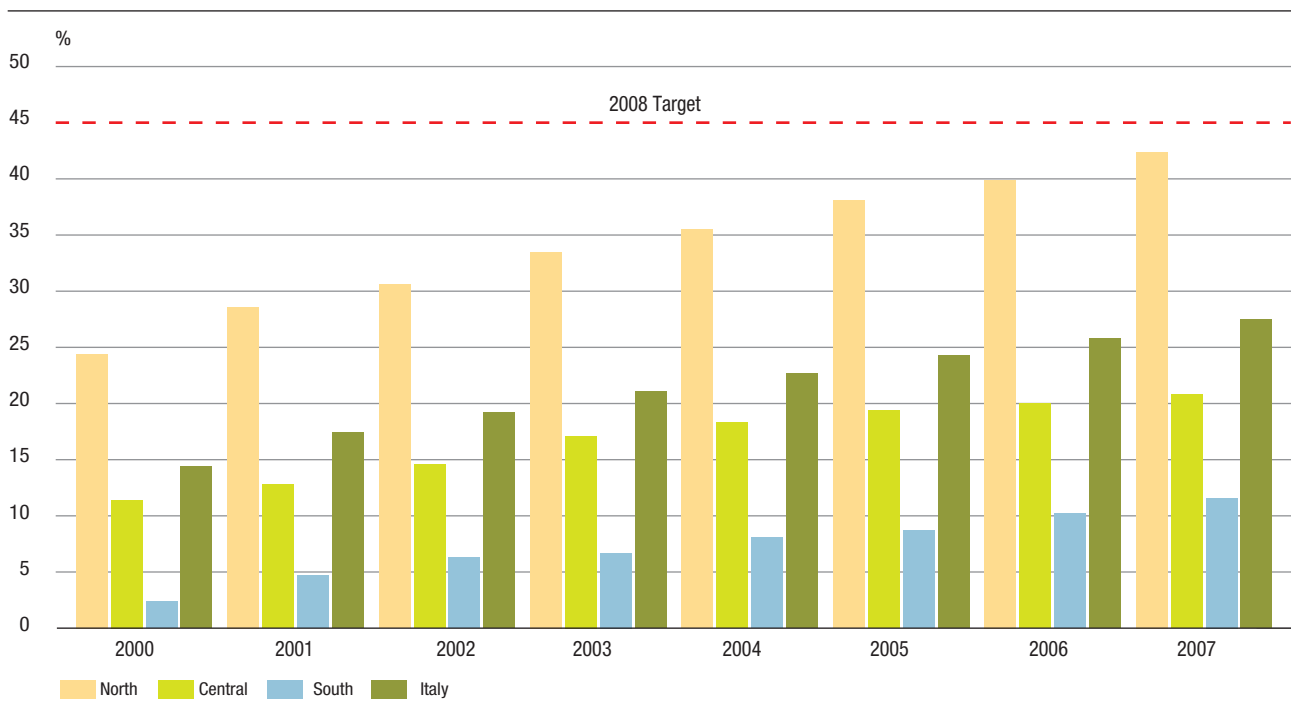
Lastly, landfill for municipal waste accounts for around 47% of the total waste managed, with a 2.4% reduction from 2006 (figure 5).

Figure

4

Separate waste collection in Italy by macro-geographic area values %, 2000-2007

Source: ISPRA, 2008





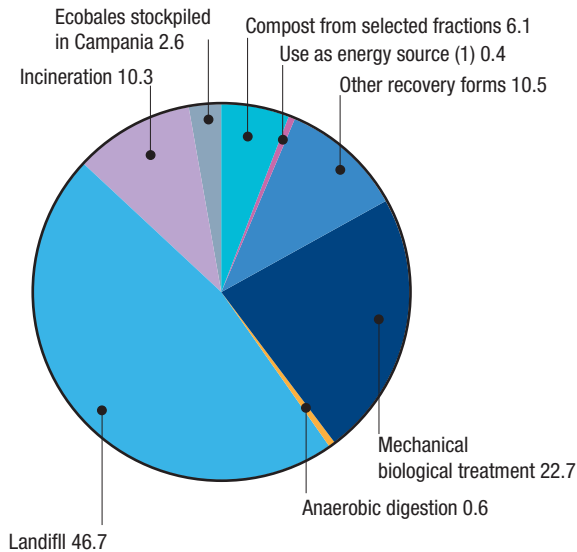
Figure

5

Management of municipal waste in Italy values %, 2007

Source: ISPRA, 2008

Note: (1) estimated value

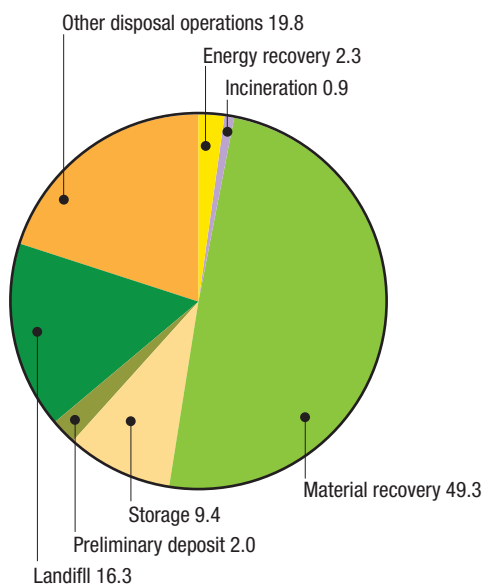


Figure

6

Management of special waste in Italy values %, 2006

Source: ISPRA, 2008



Special waste, which represents more than 80% of waste produced annually in Italy, is prevalently processed through the recovery of material (49.3% in 2007), while among the other disposal operations, an important fraction is attributable to chemical and biological treatment, which has seen in recent years a positive trend due to the increase of waste treated by chemical industries (figure 6).

Assessment and perspectives

Waste management produces effects of great impact on the environment and on human health, and as a consequence, constitutes an activity at the centre of attention of public opinion. New models of integrated waste management take into consideration the growing concerns of sustainability of the socio-economic system in terms of consumption and impact on the environment; and environmental protection is not the only objective; there are also targets aimed at the overall improvement of the “human-environment” system, especially through prevention.

The concrete implementation of sustainable consumption and production patterns means the fulfilment of important steps to get to the decoupling of the “productive growth-waste generation” binomial, by radically modifying the perspective from which waste is viewed, and especially by seizing opportunities to recover material and energy resources contained in them. The 3R approach (Reduction, Reuse, Recycle), already launched in 2004, was endorsed again in 2008 by G8 representatives in Japan¹⁰, to promote, at an international level, a more efficient use of materials. The G8 governments committed themselves to setting specific objectives in view of the development of innovative technologies and the creation of ever-increasing ecological products. Waste prevention or, more importantly, the reduction of the production of waste and its relative dangers, is identified by the European Union as a priority in the hierarchy of interventions aimed at sustainable management of the waste cycle and underscored by national legislation decisions¹¹. Current patterns of production and consumption must be modified, and a policy of ecological planning (eco-design) of products must be adopted to reduce waste production and the presence in it of hazardous substances, favouring technologies focused on sustainable, reusable, and recyclable products. In addition, it is necessary to assure the application of both the principle of extended producer responsibility, due to the fundamental role producers play in carrying out efficient prevention policies, and the responsibility shared among the various parties involved in the production and consumption cycle.

Although from the viewpoint of an integrated waste cycle, priority is always given to reduction and prevention, proper treatment of waste produced is just as important. Among the duties assigned by the existing legislation to the CONAI – Consortium network of packaging materials (paper, glass, wood, plastic,

aluminium and iron), important objectives are set for recovery and recycling.

Accordingly to existing rules, four mandatory Consortium networks operate in the country to prevent the dispersion into the environment of special categories of waste. The Consortium network for spent oil guarantees the collection and proper reuse of used lubricant oil and informs public opinion on risks incurred by its dispersion into the environment. The Consortium network¹² for the recycling of waste of polyethylene goods has as its primary objective the promotion of collection of polyethylene-based goods considered at the end of their life cycle to later distribute for recycling and recovery activities. The Consortium network for used lead batteries and lead-containing waste assures the collection, transport and recycling of used lead batteries in specific consortium plants which guarantee the recovery of the lead metal, rendering it inert or eventually recovering sulphuric acid from the batteries. The Consortium network for the collection and treatment of used vegetable and animal oil and fat controls and monitors spent oil and fat.

Reinforcement of the recovery system occurs by intervening in the management of particular types of waste. Legislative decree 209/03 (amended by legislative decree 149/06 "Implementation of provision 2000/53/EC relative to end-of-life vehicles") introduced some important changes in the management system of end-of-life vehicles, regulating the impact generated by removed vehicles, correct functioning of the internal market, and the development of activities related to the recovery and recycling of the materials taken from the vehicles. The Consortium network for the recovery of end-of-life vehicles (plastic, steel, aluminium, rubber, batteries) provides a fundamental and growing contribution to the national economic system both in terms of raw materials and in energy saved. In July 2008, the Italian Ministry for the Environment, Land and Sea, the Ministry of Economic Development and associations from the automobile sector signed the "Framework agreement for the management of end-of-life vehicles". The objective of the agreement is mainly to promote the use of environmentally non-hazardous materials, to create incentives for recovery at the end-of-life, and to promote cooperation and coordination among all parties involved in the processing of end-of-life vehicles.

In recent years, correct management of waste coming from equipment whose proper functioning depends on electricity or electromagnetic fields, "Waste Electrical and Electronic Equipment (WEEE)", has become especially important. Since January 2008, according to legislative decree 151/05 on the management and disposal of technology-related waste, the task of dealing with WEEE has been transferred from municipalities to manufacturers themselves, which become responsible for their own products before and after their commercial life on the market and in the consumers' houses.

The recycling industry represents a fast-growing sector in the national economy and is closely linked to production sectors that

process secondary materials. The importance of the recycling sector is confirmed by its growth; while industrial production underwent a fall of 1.6% from 2000 to 2006, recycling activities grew by 8.2% during the same period. The use of secondary materials accounts for more than 60% of production input in iron metals as well as in some non-ferrous metals. In the paper-making industry, the incidence is higher than 50% and is significant even in the glass, wood, textile, plastic, and rubber operations. Today, the availability of secondary raw materials is fundamental for many industrial sectors, and the introduction of Asian countries into the global economy requires, much more than in the past, large quantities of raw and secondary materials. Still, the present economic crisis has provoked a fall in commodity prices, as a consequence also causing a reduction in the price of recyclable materials.

The chance for success with a waste management strategy at local, regional and national levels thus depends on the degree of maturity of this sector in the general economic context, in the same way that strategies of proper disposal of waste produced in a specific area depend on the level of plant-engineering equipment available.

The recycling industry contributes positively to the general eco-efficiency of the system through concrete results in energy savings, development of renewable sources, and reduced greenhouse gas emissions.

In the future, recycling sectors will have to compare and study new products, so as to utilize, to the best extent possible, the opportunities to use recovered material and return to being competitive when the demand for raw materials and their prices increase.

Waste disposal, a residual activity of the integrated cycle, must be carried out under conditions of safety, upon prior confirmation by the competent authorities of the technical and economical impossibility of attempting any operations for recovery. Waste disposal is conducted with recourse to an integrated and adequate network of disposal plants, using the best available technologies and considering the overall cost-benefit ratio. Legislative decree 133/05 "Implementation of provision 2000/76/EC, on waste incineration", creates incentives for new management models based more and more on energy and waste material recovery.

The subject of incinerators is closely linked to that of Refuse-Derived Fuel (RDF): the use of RDF in well-defined industrial plants can offer great potential, evidenced by the fact that in order to promote energy recovery from waste, the RDF itself has been classified as special waste.

To encourage the use of RDF, the Ministry of Productive Activities, through the decree of May 2nd 2006 (Modality of use for the production of electrical energy of high quality RDF, "RDF-Q"), established the right to a "Green Certificate" even for electrical energy produced in industrial plants utilizing RDF-Q. The existing legislation does not classify RDF-Q as a special waste

— 12 National Consortium Network for the management, collection and treatment of spent mineral oils (COOU); National Consortium Network for recycling of waste from polyethylene goods (PolieCo); National Consortium Network for the collection and treatment of worn lead batteries and lead waste (COBAT); National Consortium Network for the collection and treatment of spent vegetable and animal oil and fat.



if it comes from a production system that adopts a quality management system based on the standard UNI-EN-ISO 9001 and that is intended for use as co-combustion in production plants for electrical energy and cement works.

In this context, there is also the prohibition – called for by legislative decree 36/03 – to dispose, in dumping sites, waste with a Low Heat Value higher than 13,000 kJ/kg, which requires significant waste volumes to be managed differently in landfill. This prohibition has been postponed to December 31, 2009 in consideration of the present lack of suitable disposal plants. The Ministry for the Environment, Land and Sea intends to promote an alternative solution to the deferral of terms, which will permit getting through the present difficulties with respect to national and EU regulations.

An important role for reaching behavioral patterns consistent with the objectives set by the norm and for improving environmental performances is played by economic measures. In conjunction with the community polluter-pay principle and in view of promoting environmental sustainability (less waste produced and its greater recovery), economic sustainability (expenditures = income), and contributive equity (distribute expenditures more equitably) of waste management, an important role is given to transferring from a charge to a tariff system. Shifting from a charge to a normalized tariff rate for the management of municipal waste (initially introduced through legislative decree 22/97) allows costs of municipal waste management to be covered entirely without requiring the municipalities to look after specific budget items. The system allows greater transparency in the management of the service, since the expenditures are shown within the budgets through the financial plan and must progressively be completely covered by the tariff.

Over the years, the number of municipalities that have shifted from the application of a charge to the tariff rate has progressively increased. In 2008, the municipalities that applied the tariff rate were 1,193, while in the year 2000 they were 225 (figure 7). Currently, the only two areas entirely covered by the application of the tariff rate are the autonomous provinces of Trento and Bolzano.

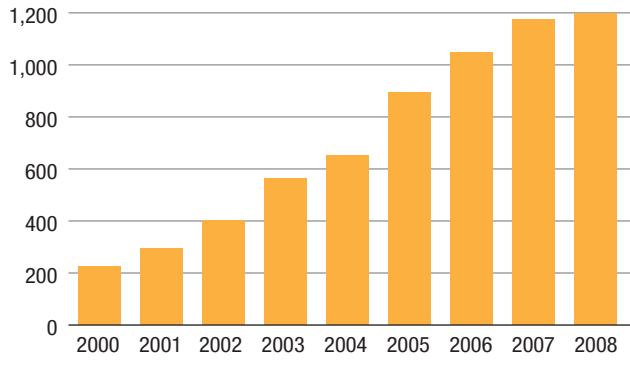
Article 238 of legislative decree 152/06 abolishes the tariff called for by legislative decree 22/97, establishing that the new tariff consists of a fixed rate and a charge proportionate to the quantity of waste given in function of the average quantity and quality of waste produced per house's surface unit, determined by parameters contained in a specific regulation which will be issued by the Italian Ministry for the Environment, Land and Sea. Legislative decree 208/08 "Special measures on water resources and environmental protection", converted into law 13/09, established that for 2009, the current system of collection relative to the service of collection and disposal of waste adopted by municipalities will remain unchanged, including the charge for municipal waste disposal.

Figure

7

Municipalities applying tariff for municipal waste management, 2000-2008

Source: ISPRA, 2009



The same decree also postpones, for urban residents, the application of the tariff rate on assimilated waste with regard to the amount of waste delivered into the municipal waste circuit.

Another measure that can be adopted by public administrations for the prevention and reuse of waste regards the sector of public procurement. The financial law 2002¹³ had already foreseen that state-controlled administrations would allocate a 20% share to the purchase of rebuilt tires and had also provided for the issuance of a decree that would stimulate the recycled products market.

This plan, which is already in place, will find a further stimulus and incentive through completion of the "Action Plan for environmental sustainability of public procurement", provided by the Italian Ministry for the Environment, Land and Sea, in collaboration with the Ministries of the Economy and Finance and Economic Development in accordance with law 296/06 (art. 1, paragraph 1126) of December 27, 2006.

The contribution of waste management to CO₂ reduction

The European Environment Agency estimates that, in 2005, greenhouse gas emissions originating from waste management accounted for 2% of total emissions in the European Union. In this framework, the application of EU directive 1999/31/EC on landfill sites can strongly contribute to fulfilling the objectives set by the EU on the reduction of the greenhouse gas emissions, both through recovery of methane, thus preventing biodegradable waste to end up in landfill, and through the collection, treatment, and use of waste.

— 13 Law n. 448 of December 28, 2001



Waste Management

According to the provisions made by the Agency, greenhouse gas emissions must be reduced from the maximum level of 55 million tonnes of CO₂ equivalent, calculated at the end of the 1980's, to approximately 10 million by 2020¹⁴. This result is determined by two main factors. On one hand, an overall increase in waste production in the near future as well as a further improvement in its collection must be considered¹⁵ (figure 8).

On the other hand, recycling and waste to energy plants will increase, which will give rise to a reduction in CO₂ emissions, counterbalancing direct emissions.

These expectations, as required by the 6th Environmental Action Programme, should give rise to decoupling between economic growth and environmental concerns emerging from waste production.

Recovery of material and energy represents an important sector for curtailing the environmental impact from industries. With reuse of materials in production processes, a considerable reduction of CO₂ and climate-modifying gases would be achieved compared to that when using virgin materials.

It is estimated that there would be lower CO₂ production, variable between 31 and 88 million tonnes, concentrated especially in steel and aluminium manufacturing sectors, with a lower average production of 40 million tonnes of CO₂ (74% of the total saved by the recovery sector), and a lower production of 5.4 million tonnes of CO₂ in the paper and cardboard sector¹⁶.

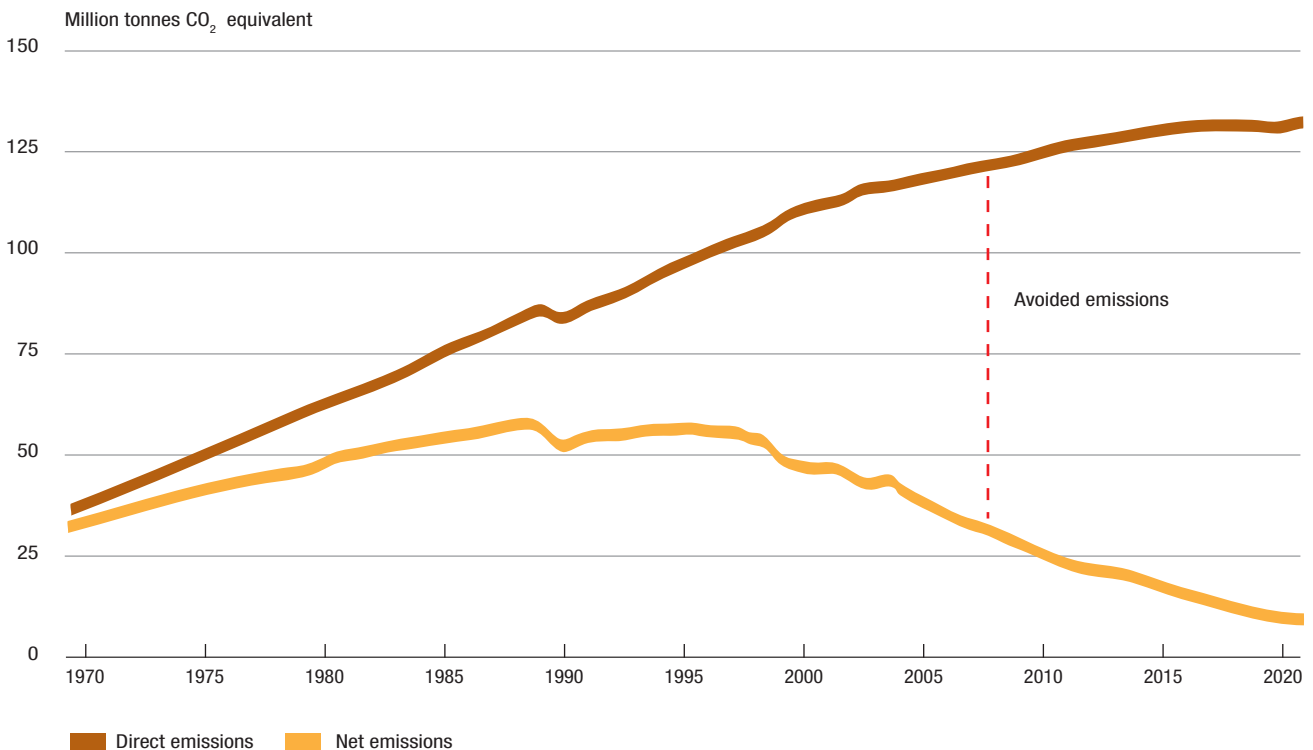
The evolution of the energy production system towards more efficient production patterns with a lower carbon dioxide content will always render more convenient the recourse to recycling for energy uses of all materials.

The only environmentally competitive energy use by recycling (and definitively advantageous from an environmental point of view) will be the substitutive use of the most polluting fuels, especially carbon, or fossil fuels with the use of lignocellulosic biomass. A 15% increase in internal industrial recycling from now to 2020 would have a significant impact on the targets set for CO₂ emissions reduction and energy efficiency.

Figure

8

Tendencies and projections of greenhouse gas emissions produced by municipal waste management in the European Union, 1970-2020 Source : EEA, 2008



— 14 EEA, Briefing 1/2008 — 15 The European Environment Agency has considered that while in 1995, each European citizen produced an average of 460 kg/year of waste, in 2020, this figure will reach 680 kg/year. This will be due to a continuous increase in waste production by EU 15 countries and to a more consistent increase by the EU 12 countries whose economies are in full development with consumption patterns in an evolutionary phase. The study reports that these countries are expected to reach levels shown by the EU 15 countries in the next few years (EEA Briefing, 01/2008) — 16 Source: FISE-UNIRE, 2008

Box

1

Municipal waste production in urban areas

Municipal waste production represents a major challenge in urban areas, both in economic and environmental terms; for this reason, responsible waste management can be to citizens' advantage and contribute toward combating climate change.

Urban areas concentrate 16% of the entire national population (about 9.5 million inhabitants); this figure evinces some important considerations related to the three geographical macro-areas. As to per capita production, in 2007 the highest values are reported in central Italy with about 630 kg/inhabitant, followed by the North with 539 kg and the South with 508 kg.

In the period 2002 to 2007, per capita municipal waste production increased in all surveyed cities with the exception of Milano (-3.5%), Palermo (-2.2%) and Genova (-1.9%), where several programmes and initiatives have been adopted in order to minimize waste production, thus sensibly improving urban environmental quality, also thanks to citizens' active participation.

In 2007 the value was higher than the national average in nearly all cities (546 kg/inhabitant), only Trieste, Genova and Messina showed figures lower than the average value¹⁷.

The city with the highest per capita waste production is Catania; in the considered five-year period it shows figures higher than 800 kg/inhabitant, probably due to working activities concentrated within the city and to tourist traffic¹⁸. This data takes into account legislative decree 152/06, which limits the possibility of including special waste not directly linked to resident population consumption to municipal waste.

Furthermore, per capita production values only consider current population in the surveyed city, thus not assessing the relevant contribution from tourist flows. Although it has mid-sized population¹⁹ (268,993 inhabitants), Venezia is the city showing the highest increase in the five-year period (+9.9) with values around 744 kg/inhabitant in 2007. This value can be explained through the specific regional reality attributing the region Veneto the major tourist flows in Italy and the highest household consumption within the national framework (figure 1).

Within the integrated process of waste management, separate waste collection plays a fundamental role since it ensures energy recovery in the final treatment stage, while at the same time directing remarkable amounts of waste toward more suitable treatment processes, thus enabling a reduction of environmental impact deriving from their disposal. In 2007, a considerable amount of municipal waste (about 10.2 million tonnes) was moved from the waste disposal circuit to landfills, thanks to separate waste collection of biodegradable waste fractions (organic, greenery, paper, wood and textile fractions), incineration, and biological/mechanical treatment.

Among urban areas, Torino recorded the best performance in 2007, reaching the target set by the law, with nearly 39% of separate waste collection; in the 2002-2007 five-year period, the increase in urban areas as a whole amounts to 4.6%. Torino, Roma, Venezia and Cagliari show a constant increase, while Messina, Bari and Palermo are the cities recording the major decrease. The situation of Messina is due to the decrease of contribution from some market goods producing organic, wood and metals²⁰. Among historic cities Roma accounts for 17% and Venezia 28%; figures related to the city of Cagliari should be highlighted: it passes from 1.6% in 2002 to nearly 11% in 2007, thus increasing little less than 10% and surpassing cities such as Palermo and Catania. Cagliari positive figures can be ascribed to the Sardegna region: following the implementation of efficient systems for separate waste collection, it recorded the above mentioned increase, with a regional collection rate equal to about 28%. Bari, showing opposite trend to the percentages of southern cities, has reached a remarkable level of separate waste collection (12.1%) thanks to sustainable development policies that have been implemented in the latest years (figure 2).

— 17 Messina shows also a lower value than the national average, although it records an increase of 8.3% — 18 ISPRA, 2009 — 19 APAT-ONR 2008 Report — 20 ARPA Sicily, Environmental Statistical Yearbook, 2007

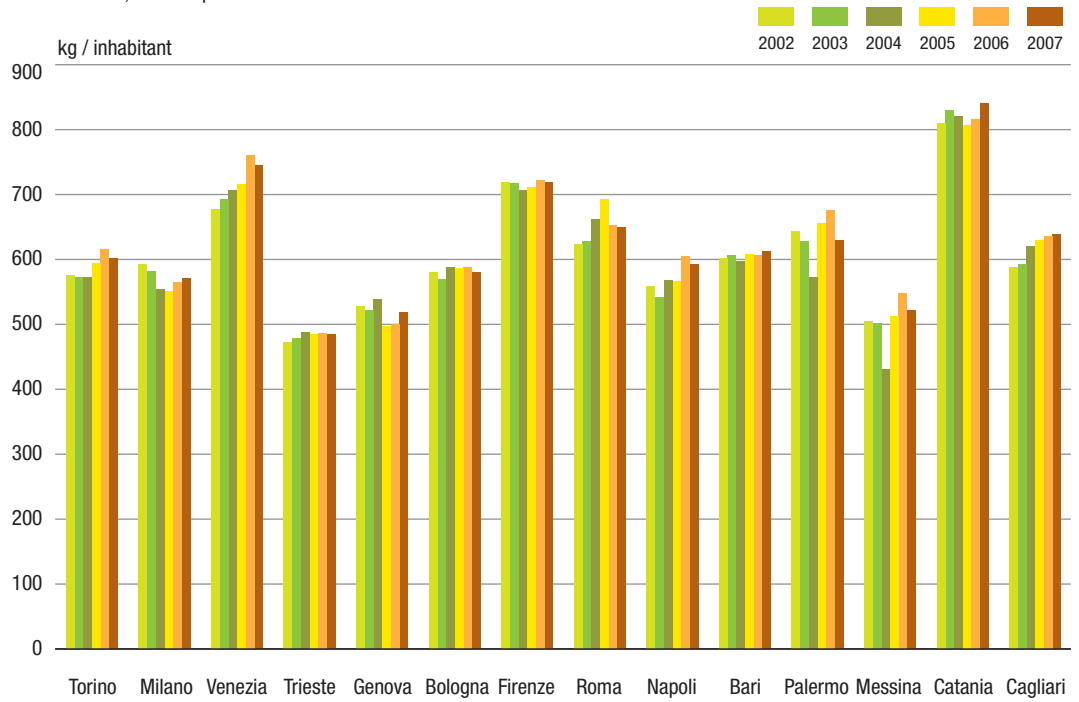


Figure

1

Per capita municipal waste production in urban areas, 2002-2007

Source: ISPRA, Waste report 2008

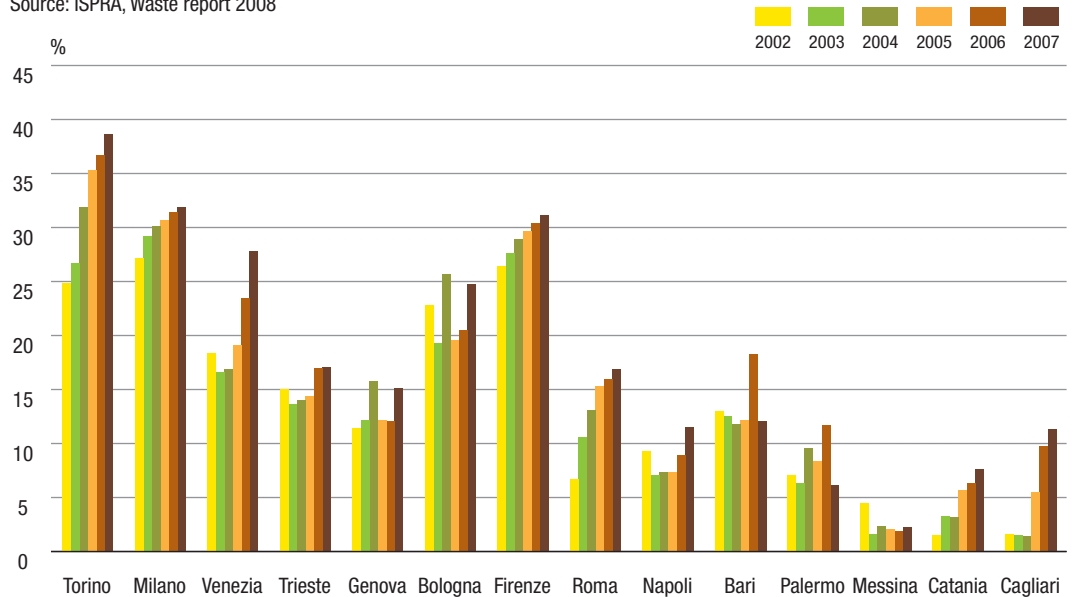


Figure

2

Separate waste collection in urban areas values %, 2002-2007

Source: ISPRA, Waste report 2008





Box

2

The management of the waste crisis in Naples and in some areas of Campania Region

In July 2008 law decree 90/08 was passed and converted into law 123/08 in order to overcome the most acute moment of a decade-long crisis. The Civil Protection Department of the Presidency of the Council of Ministers was entrusted with "...coordinating the overall waste management in the Campania region for the crisis period. ...Until December 31, 2009 an Undersecretary is appointed at the Presidency of the Council of Ministers to solve the waste crisis in the Campania Region". The Head of the Civil Protection Department has been appointed to that office with the following tasks: resuming waste collection; implementing and operating plants (landfill and incinerators) as identified by the law itself; implementing separate waste collection; taking actions to overcome the crisis situation; and returning to ordinary management.

This box is a summary of the Report to Parliament entitled "Extraordinary measures to face the waste crisis in the Campania region and other civil protection provisions" presented by the Undersecretary of State of the Presidency of the Council of Ministers on February 26, 2009.

Situation as of May 23, 2008

Backlogged waste deposits was estimated to amount to 35,000 tonnes in the entire region (waste discarded in the streets) 90,000 tonnes stored in municipal temporary disposal sites

Daily waste production amounted to 7,034 tonnes

Separate waste collection stable at 13% of waste - Serious problems in the disposal of organic waste due to the lack of suitable landfills on the territory of the region. Overall quantity to be disposed of estimated as amounting to about 2,000 tonnes/week

Report to Parliament of February 26, 2009

Disposal facilities used:

- Landfill at Macchia Soprana with capacity of 2,500 t/d (1,500 t domestic waste and 1,000 t organic waste)
- Temporary stockpiling site at Ferrandelle with capacity of 1,700 t/d
- Railway shipment out of region (Germany) of approximately 700 t/d
- Shipment to the plant of 2,200 t/d of shredding, separating and packaging waste (STIR ex RDF)
- Ecobales stockpiling in small land areas at Taverna del Re, San Tammara, Eboli, Battipaglia
- Disposal of 150 t/d ecobales in Massafra incinerator (TA).

1,806,219 tonnes waste were disposed of from June 11, 2008 to March 3, 2009, corresponding to 6,790 t/d and 5,800 t/d in the week from February 2008 to March 1, 2009 5.800 t/g.

A minimum target for separate waste collection amounting to **25% of municipal waste by December 31, 2009**, 35% by December 31, 2010 and 50% by December 31, 2011 was set by the Regional Waste Disposal Plan (Commissioner Ordinance n.500 of December 30, 2007). In order to check the target attainment, a monitoring system was set up to analyse data on waste production and separate waste collection transmitted by the mayors of the region on a monthly basis. Separate waste collection by enterprises, wholesale retailers, greengrocers, and state administrative offices became mandatory (672,000 kg of paper was collected and recycled in the period July/December 2008).



Situation as of May 23, 2008 (*cont.d*)

Report to Parliament of February 26, 2009

Provinces were entrusted with the task of discouraging the use of “disposables” (to date completely disregarded), while CONAI was assigned the task of developing a communications campaign.

Specific measures were proposed to provide incentives to separate waste collection of packaging by involving national and regional voluntary associations (over 3,000 voluntary workers).

Separate waste collection in the second half of 2008 is estimated to **have increased in the region by an average 9%** (+26% packaging, +93% plastic packaging). In order to face the problem of organic waste, it was no longer prohibited to move and dispose waste in other regions (12 disposal plants scattered on the national territory declared available to receive about 25,000 t/y organic waste).

Following art.11 of law 123/08, the municipality of Naples and ASIA SpA (company for municipal waste collection and transportation) presented on June 23, 2008 the “Separate Waste Collection Plan”. The Plan promotes the application of an integrated door-to-door system (applicable to all communities and eliminating the use of garbage bins) to 100,000 inhabitants by 2008 and 200,000 by 2009, thus reaching a separate waste collection target of 56% in the areas served by this system. To date, ASIA coverage by the system amounts to total 85,000 inhabitants.

Landfills

In order to allow a fully safe waste disposal of municipal waste produced in the Campania region and to ensure the disposal of backlogged waste located at municipal waste selection and treatment plants and at temporary disposal sites, and in compliance with EU legislation, art. 9 of law 123/08 authorizes the setting up of following landfills:

Savignano Irpino (Avellino) and S. Arcangelo Trimonte (Benevento) are undergoing implementation procedures

Savignano Irpino, locality of Postarza: overall project capacity 700,000 cubic metres. Waste dumping started on June 12, 2008. By January 2009 about 350,000 tonnes of waste have been dumped. In April 2009 reclamation activities started in the adjacent old landfill. Thanks to the planned opening of other treatment/disposal sites, waste dumping will be reduced from the present 1,500 t/d to 400 t/d.



Situation as of May 23, 2008 (*cont.d*)

Report to Parliament of February 26, 2009

Serre (Salerno)
out of capacity

Chiaiano and Terzigno (Napoli)
currently under study

Sant’Arcangelo Trimonte, locality of Noceccchie: overall capacity about 750,000 cubic metres. Dumping activities started on June 25, 2008. By January 2009 about 250,000 tonnes of waste had been dumped. In April 2009 reclamation activities will start in the adjacent old landfill. Thanks to the planned opening of other treatment/disposal sites, starting in June waste dumping will be reduced from the current 1,500 t/d to 400 t/d.

Serre, locality of Macchia Soprana: overall capacity 700,000 cubic metres. Since August 25, waste dumping has been suspended due to extremely limited capacity. Some work to meet safety requirements in small areas and environmental recovery activities are left to be done.

Napoli locality of Chiaiano (Cava del Poligono - Cupa del cane): capacity about 700,000 cubic metres. The final project was approved in August 2008; executive planning and implementation works were assigned in October 2008.

Terzigno, locality of Pozzelle and locality of Cava Vitiello: two landfills are planned. The quarry of Pozzelle has a capacity of about 650,000 cubic metres; the project received favourable review in October 2008 by the Conference of Services. Since the intervention area is located within the perimeter of the Vesuvius National Park ¹, the environmental impact assessment was requested, which yielded a favourable review by the Ministry for the Environment, Land and Sea. Bids for the assignment of executive planning and implementation works of the plant took place in November 2008. Geognostic and environmental investigations as well as preliminary planning have already started for the locality of Vitiello.

San Tammaro (Caserta), locality of Maruzzella: capacity of about 1,600,000 cubic metres for the landfill and 150,000 cubic metres for temporary stockpiling land spaces. The executive plan, approved in December 2008, promotes a technologic-environmental platform consisting of a landfill for municipal waste, a land space for temporary stockpiling, a percolation treatment plant in the Caserta province, a selection plant, and a composting plant. Ongoing activities foresee procedures to select a company to complete the work. Waste currently stockpiled at Ferandelle will be moved to landfill.

— 1 Special Protected Area and Site of Community Importance



Situation as of May 23, 2008 (*cont.d*)

Report to Parliament of February 26, 2009

Serre, locality of Valle della Masseria: before sizing the plant, information on negotiation procedures for the Salerno incinerator and detailed data on separate waste collection in the province are needed.

Caserta, locality of Torrione (Cava Mastroianni): the site is located in an area involved in tuff extraction activities.

Andretta (Avellino), locality of Pero Spaccone (Formicoso): geognostic and environmental investigations as well as seismic analysis have been carried out.

Temporary ecobales stockpiling sites

- 4 stockpiling sites (Taverna del Re, Ferrandelle, Pianodardine, Eboli) are close to saturation levels
- Additional small land areas are being developed at Ferrandelle and Maruzzella
- Surveying and analysis activities are being carried out to find other potential sites
- 5.8 million tonnes ecobales stockpiled in the sites

Hypotheses related to planning, technology, and territorial placement are currently being tested to develop a plant for recycling of stockpiled waste for energy production (ecobales).

If the Acerra and other 3 planned incinerators were constructed and became operative, all backlogged ecobales could be disposed of in less than 10 years. Some surveying activities with enterprises in the sector have been started (also at an international level) to test the application of suitable ecobale treatment/disposal technologies; studies have been carried out that highlighted some difficulties in ecobale combustion. The low moisture calorific value (PCiU) amounts for ecobales to over 6,000 Kcal/kg, while the admissible thermal load in Acerra incinerator does not exceed 4,300 Kcal/kg.

Incinerators

Acerra completed by 90%, however works are not proceeding due to economic, financial and management problems

Art. 5 of law 123/08 permits the operation of Acerra incinerator and the development of Santa Maria La Fossa (CE) and Salerno, while art. 8 permits the construction of a further incinerator in the Municipality of Naples.

Acerra: Work started in June 2008. By May 2009 the plant will dispose of 200/300 t/d waste for each of the 3 lines, and it will work at full capacity by June 2009.

Salerno: construction work planning has been entrusted to the Mayor of Salerno. The construction site was identified, the necessary permits have been obtained, planning has been concluded, and bids to assign construction work are currently being received. Thirty months after assignment of the work is required to build the plant that will have capacity equal to 450,000 t/y treated waste with electric power production amounting to maximum 70 MWe (electric MW).



Situation as of May 23, 2008 (*cont.d*)

Report to Parliament of February 26, 2009

Santa Maria La Fossa

preliminary work and building yard preparation, area fencing and military land improvement have been assigned

Santa Maria la Fossa: the construction site is now available; the VIA Commission expressed positive opinion indicating some provisions for the executive project; preliminary work of the building yard and area fencing has been assigned.

Napoli: the area dedicated to the incinerator has been already identified.

Composting plants

On December 18, 2008, the first composting plant in the Municipality of Molinara (BN) was tested. The plant has been operating thanks to the ROP of Campania region 2000/2006 financing and has a capacity of 10,000 t/y. Another plant will be located in the technological area of San Tammaro (CE) and will have a capacity of 30,000 t/y.

Criticalities and programmes

From an operational point of view, overcoming the critical situation goes through the further development of separate waste collection, the construction of treatment and disposal plants (development and completion), the ability of local authorities to implement separate waste collection plans, and the setting up of provincial bodies to manage the waste cycle.

The criticalities to overcome in the short term are related to the opening of Chiaiano and Terzino disposal sites and the upgrading to meet plants safety requirements by converting the structures of Pianodardine and Casalduni into mechanical/biological composting plants.

In order to create the premises to return to ordinary management by assigning local authorities their competence by January 2010, it is therefore necessary: to intensify the collection of backlogged waste (emptying of stockpiling sites set up by municipalities); to collect special and hazardous waste that is still present along main thoroughfares in localities close to municipalities north of Naples and in the lower Casertano area; to let monitoring systems work at full capacity; and to carry out data certification on waste production and on separate waste collection as set forth by decree 90/08; to meet plants safety requirements.

The conversion of the law decree 172/08 into law 210 of December 30, 2008 also represents a step toward the end of the crisis. The law includes:

- Measures to encourage citizens to dispose of bulky waste and packaging;
- Administration by an external commissioner for local authorities that are negligent in the recovery and disposal of waste and separate waste collection;
- Severe administrative sanctions (including arrest) for whoever discards, disposes of or deposits hazardous, bulky, or special waste;
- Information campaigns addressed to citizens with special focus on creating awareness among young people about the importance of environmental conservation and land respect by including environment education into school programmes.

Box

3

The Italian National Packaging Consortium (CONAI), a winning model for environmental protection

CONAI is a private consortium requested and conceived by enterprises representing a reference model in Europe. With over 1,400,000 registered enterprises, it is one of the largest European consortia and establishes Italy's already widespread model, according to which private enterprises efficiently manage public interest related to environmental protection.

CONAI developed one of Europe's most efficient and effective systems for recovering, recycling, and packaging reclamation. The model is based on the principle of "shared responsibility" that assumes the involvement of all waste disposal actors: from enterprises producing and using packaging, to public administrations providing measures on waste management, to citizens who start a virtuous process for the environment through a daily commitment to separate waste collection.

The CONAI system is based on the activity of six consortia representing the materials used to produce packaging: steel (National Steel Consortium), aluminium (CiaI), paper (Comieco), wood (Rilegno), plastic (Corepla), glass (Coreve). Each consortium has to coordinate, organize and support the collection of each of these materials from separate waste collection, promote the collection of packaging waste from industrial and commercial enterprises, start recovery, and recycle.

CONAI has attained the targets set by the law as to packaging recovery and recycling: in 2008 total 8.5 million tons packaging waste were recovered, an amount close to the 70% threshold of the total placed on the market. This result attains and even exceeds the 2008 60% target set by European and national legislation. Since its institution in 1997, the CONAI consortium has increased packaging recovery by 140% and nearly halved the amount of packaging waste disposed of in landfill.

Out of total recovered material, over 7 million tons used packaging have been recycled, thus reaching 59% of the total placed on the market in 2008, while the remaining share has been recycled for energy recovery. Since the system started operating, recycling has grown by 120%.

CONAI activities have been the driving engine of Italy's increase in separate waste collection. Since 2000, CONAI-Consortia disposed amount of packaging waste from separate waste collection has shown more than four-fold increase and is now stable at 2.8 million tons: only last year waste volumes increased by 8.5% thanks to public awareness campaigns addressed to the process main actors, citizens, and to cooperation and synergy between CONAI and the territory, which proved fundamental for successful integrated waste management. The main cooperation tool is a framework agreement signed together with the Italian Association of Municipalities (ANCI). Thanks to this recently renewed agreement, it is possible to conduct certain and permanent separate waste collection. The agreement aims at ensuring homogeneous increase of separate waste collection on the entire territory: there are over 7,000 municipalities serving 56 million citizens. For many years municipalities subscribing conventions have received economic support proportionate to the amount and quality of the collected packaging waste. The important novelty in the new agreement is that packaging waste collected according to specific economic conditions are disposed of even when targets set by the Packaging and Packaging Waste Management and Prevention Plan are exceeded at national level.

CONAI's mission is to promote packaging environmental sustainability: environmental impact from packaging does not only depend on its end-of-life management as waste, but also on the way packaging is conceived and produced. For this reason, in recent years CONAI has worked out a specific project to broaden awareness and reward enterprises that adopt prevention measures.

The project called "Thinking future" includes initiatives such as the "Prevention Dossier" describing and promoting new virtuous packaging examples proposed by enterprises producing and using packaging; the "Oscar of Packaging" competition, in collaboration with the "Italian Institute of Packaging" dedicated to the "eco-packaging".

Enterprises' responses were quite significant, and prevention measures have been integrated within business strategies. This is proven by the following data: over 500 prevention actions collected in the three editions of the Prevention Dossier; increase by 50% of enterprises that have started certificated environmental management in the last few years; 420 million euros of socio-environmental expenditures avoided by the community according to Prevention Dossier studies; reduction of CO₂ emissions thanks to prevention, corresponding to those from 460,000 trucks travelling 100 km.

Box

4

The OECD Recommendation on Resource Productivity and the G8-3R Action Plan (Reduce, Reuse, Recycle waste and resources)

Two important documents aimed at improving waste and resource policies also at national and local level, were recently adopted at international level. They are the OECD Recommendation on Resource Productivity and the G8-3R Action Plan (Reduce, Reuse, Recycle waste and resources).

Both documents stem from the experience of environmentally effective and economically efficient waste cycle management; they widen their scope to include raw materials and natural resources management; and they converge with broader concepts such as: sustainable consumption and production models and the UN Millennium Development Goals of the UN world; material flows analysis, resource productivity and sustainable materials management of the OECD tradition; the waste strategy hierarchy and the principle of extended producer responsibility of the European *acquis*; the Circular Economy of the Chinese approach; the Sound Material-Cycle Society of the Japanese experience.

The OECD Recommendation on Resource Productivity¹ (adopted by the OECD Council in March 2008) aims at supporting member countries efforts to improve resource productivity, taking into consideration the entire life-cycle of resources in order to reduce negative effects on environment and to avoid deterioration of natural resources.

The Recommendation outlines a wide vision to:

- Improve knowledge (i.e. scientific knowledge, information) and analytical capacity concerning material flows and resource productivity at national, international and global levels - including their economic and environmental implications - and disseminate knowledge by means of information;
- Reduce, in a cost-efficient way, the negative environmental impacts associated with the use of natural resources and materials, and avoid the waste of resources at all stages of their life-cycle (extraction, processing, use and eventual elimination, including the management of reuse, recovery, recycling, re-manufacturing and final disposal), taking into account the diversity of countries as regards their geographic and socio-economic context and their endowment in natural resources;
- Effectively and efficiently integrate measures concerning natural resources and materials management, such as the 3Rs, sustainable materials management, circular economy programmes.

The adoption of the Recommendation by OECD as an organisation is also a contribution by OECD countries as a group to ongoing international debates and initiatives on sustainable materials management, resource productivity and circular economy (among them the 3R Initiative by the G8; and the Panel for Sustainable Resource Management by UNEP, supported also by Italy). It gives an evidence of the political will for leadership by OECD countries in these areas.

The Recommendation requires OECD member countries to commit themselves on these issues, *inter alia* by:

- Improving scientific knowledge, statistical data collection and economic assessment of material flows, their environmental impacts and resource productivity;
- Producing indicators to assess material use efficiency, including indicators able to measure a) resource productivity and decoupling of resource use from economic growth; b) availability, quality and deterioration of natural resource stocks, in particular renewable resource stocks; c) material flows at international level, and their environmental impact by life-cycle-oriented approach;
- Using and processing information collected for policy planning aims, to determine improvement quantitative goals; share best practices among member countries;
- Further developing and promoting the use of new technologies and innovations aimed at improving resource productivity;
- Co-operating with non-member economies to strengthen their capacity for developing and implementing policies concerning the improvement of resource productivity;
- Reporting to OECD on progress achieved in implementing the Recommendation by 2013.

The 3R Kobe Action Plan (adopted by the G8 Environment Ministers Meeting in May 2008), recognises and analyses the existing situation, commits G8 countries to undertake the following actions, grouped in three goals and a follow-up (to be achieved by specific sub-actions, see the original text):

— 1 OECD Council Recommendation (2008) <http://www.oecd.org/dataoecd/1/56/40564462.pdf>

I. Goal 1: Prioritize 3Rs policies and improve resource productivity

- Action 1: Prioritize implementation of 3Rs policy
- Action 2: Improve resource productivity and set targets
- Action 3: Pursue co-benefits between the 3Rs and greenhouse gas emissions reduction
- Action 4: Promote science and technology and create a market for 3Rs-related products

II. Goal 2: Establishment of an international sound material-cycle society

- Action 1: Collaborate to promote sound international resource circulation
- Action 2: Promote international trade of 3Rs-related materials, goods and products

III. Goal 3: Collaborate for 3Rs capacity development in developing countries

- Action 1: Promote collaboration with developing countries
- Action 2: Promote technology transfer, information sharing and environmental education
- Action 3: Promote partnership between stakeholders

Follow-up on G8 activities based on the Action Plan

- Report on the progress of activities, policies and measures implemented based on the Action Plan at the G8 Environment ministers meeting in 2011 or whenever appropriate
- OECD is requested to follow up on the progress of work related to resource productivity.

As far as Goal 1 Action 2 is concerned, possible targets are, for example, resource productivity, abiotic raw materials used, total waste, hazardous waste generation, municipal waste generation, per capita rates of waste recycling, final disposal, energy intensity.



Management of Natural Resources and Soil

Air
Water
Biodiversity
Soil use



Air

Overall commitments

Improving air quality is one of the most important targets for environmental protection; air pollution is both a local and a trans-boundary problem, endangers human health and provokes damages to the environment, such as acidification and eutrophication¹.

In relation to health, tropospheric ozone (O₃)² and particulate matter³ (both PM₁₀ and fine dust PM_{2,5}), are the pollutants of most concern.

From a legislative point of view, the European Union sets targets to reduce some pollutants and strengthen the legislative framework, tackling the problem of air pollution through two main tools: improving European environmental Legislation and integrating the problem “air quality” in sector-based policies.

In 2005 the European Commission called for the development of a “Thematic Strategy on Air Pollution⁴” with the objective to attain “levels of air quality that do not give rise to significant negative impacts on, and risks to human health and the environment”.

The air pollution strategy is one of the seven thematic strategies in the framework of the Sixth Environmental Action Programme in 2002 and was adopted by the Commission as first. The thematic strategy recommends that current legislation be updated, be better focused on the most serious pollutants and that more has to be done to integrate environmental concerns into other policies and programmes.

To attain these targets, emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds⁵ (VOCs), ammonia (NH₃), particulate matter (PM₁₀) primary particles (emitted directly to the air) will need to decrease versus 2000 levels.

The implementation of the European strategy necessarily involves progressive additional costs, besides expenses related to current measures, that can be quantified in 7.1 billion euros yearly, starting from 2020. In relation to health, the savings obtained through this strategy can be estimated to be yearly about 42 billion euros. Moreover, “...although there is no agreed way to monetize ecosystem damage, the environmental benefits of reduced air pollution will also be significant in terms of reduced risks and reduced areas of ecosystems that may be damaged by acidification, eutrophication and ozone”⁶.

The level of air emissions

The national emission ceilings to be reached by 2010 are set by legislative decree 171/2004, complying with directive 2001/81/EC National Emission Ceiling (NEC).

Ceilings refer to total emissions of acidifying substances, precursors of tropospheric ozone and particulate secondary particles (SO₂, NO_x, NH₃ and VOCs).

ISTAT data on National accounting matrix including environmental accounts (NAMEA)⁷ are used to analyse emissions. NAMEA satellite account allows to compare productive economic aggregates, added value, households final consumption and employment with data on environmental damage caused by productive activities and consumption.

The following five figures show the trend of total emissions related to the above mentioned pollutants for the period 1995-2006. In the case of VOCs, total emissions in 2006 were almost equal to the emission ceilings to be reached in 2010. Given the speedy reduction of emissions, the target will be probably attained already in 2007-2008 (figure 1).

As shown in figure 2 and 3, the three sectors Transport, stocking and communications, Manufacturing and Households are the main responsible for emissions with over 64% in 2006. Moreover, it should be considered that in sector Households fuels (with weight equal to 72.2%) and heating (with weight 27.8%) are included. Percentage variation of the single items is shown in figure 3.

The figure also shows that a performance improvement is needed in the sectors Transport, stocking and communications and Manufacturing, while the largest contribution to emissions reduction is in the sector Production and distribution of electric power, gas and water, as well as in Households (especially fuels).

Among other pollutants, directive 2001/80/EC for PM₁₀ indicates emissions ceilings for solid, liquid and gas fuels in large combustion plants, while recommendation 2003/47/EC supplies guidelines for Member States to work out a national plan for emissions reduction in large plants, as indicated in the directive. In opposition to other cases, no ceilings for total emissions are set. Figure 4 shows PM₁₀ emissions.

Manufacturing, Agriculture, hunting and forestry, Households,

— 1 Excessive nutrient nitrogen (ammonia and nitrogen oxides) disturbing vegetables and infiltrating fresh water, thus giving rise to a loss of biodiversity.— 2 Ozone arising from a reaction between volatile organic compounds and nitrogen oxides under solar light and accumulating at low altitude.— 3 Fine dust emitted to the air following some human activities (primary particles) or originated in the atmosphere (secondary particles) from gases such as sulphur dioxides, nitrogen oxides and ammonia. Particles main difference is their size: particulate particles diameter is between 2,5 e 10 µm while fine dust particles diameter is lower than 2,5 µm.— 4 COM (2005) 446 “Thematic Strategy on Air Pollution”— 5 Carbon-based chemicals emitted to the air from natural sources or following human activities (use of solvents, paint and varnish, fuel stocking and their use in service stations and vehicle exhaust gas) — 6 COM (2005) 446 “Thematic Strategy on Air Pollution”.— 7 NAMEA is a matrix of National economic accounts integrated with environmental accounts.

Air

Transport, stocking and communications are the main responsible for emissions.

However, a closer analysis of the emissions percentage variation shows that in the Manufacturing sector emissions have been reduced since 1995 by over 30% and in the Transport, stocking and communications sector by over 26%, while emissions from Households increased by nearly 4%, especially from

heating (+23.7%) (see figure 4).

It should be underlined that in sector Households both transport and heating consumption is included, while Transport, stocking and communications includes land, sea and air transport.

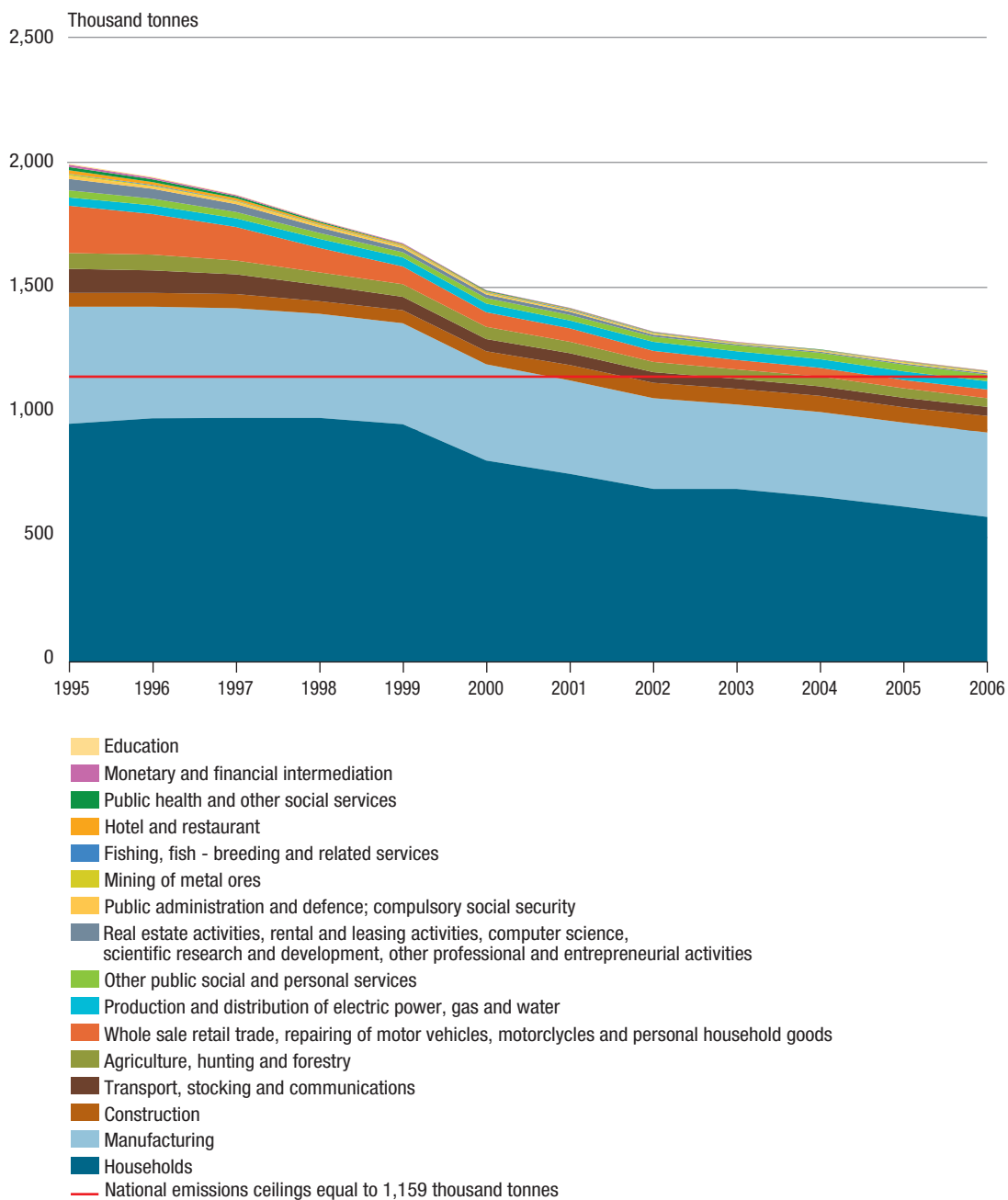
In general, NAMEA data indicate that both directives on pollutant emissions by vehicles and technological innovations

Figure

1

Volatile Organic Compounds (VOCs) - total emissions by sectors, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT-NAMEA, 2009



Air

adopted by car companies played a fundamental role. Even taking into account differences related to the fuel used (diesel or petrol) and to the vehicle type (passenger cars, light- and heavy duty vehicles), PM₁₀ and NO_x emissions in land transportation have considerably reduced in the period 1995-2006, although the vehicle fleet has increased on average by 25% from 1995 to 2007 and driven km per vehicle have in-

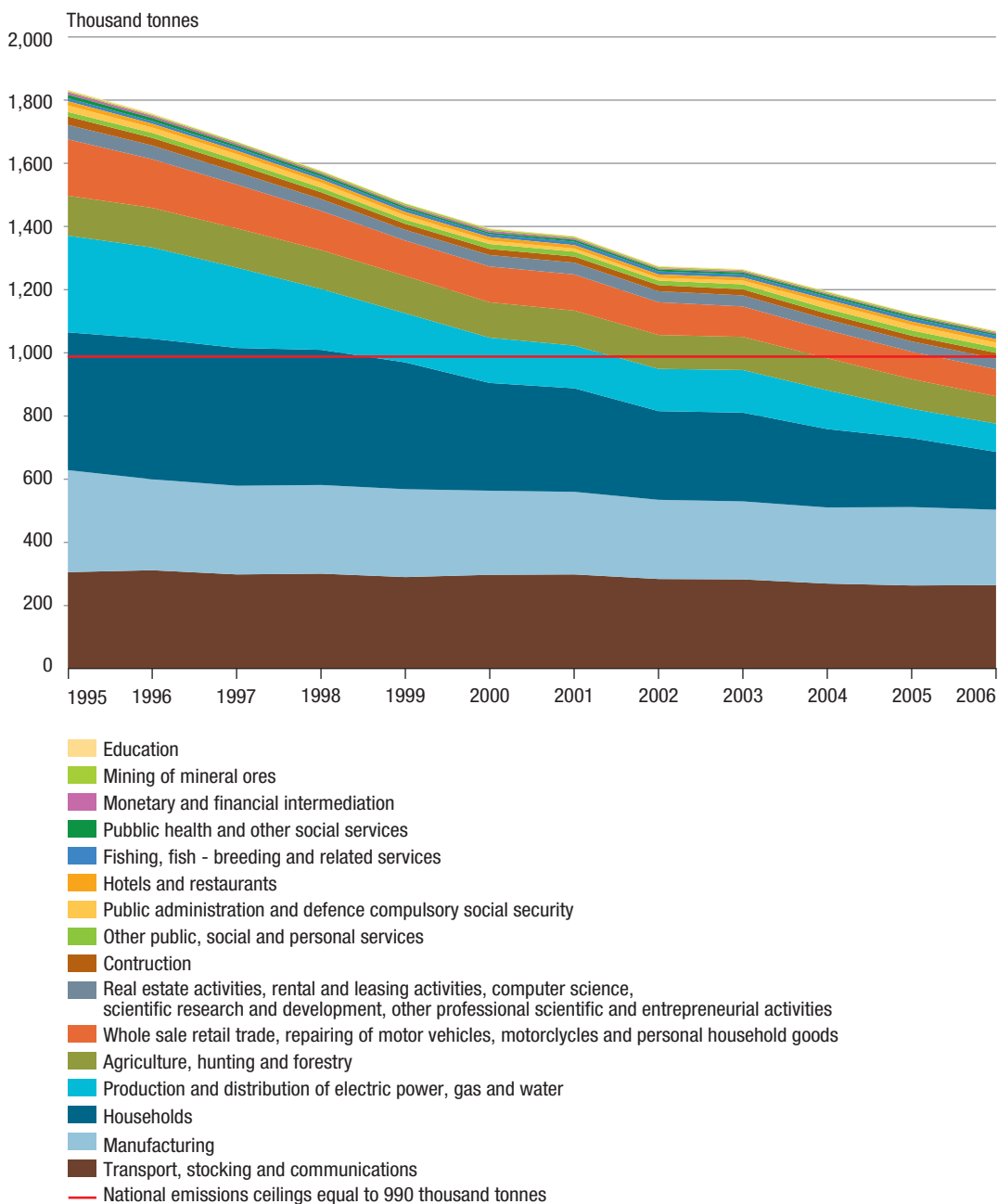
creased on average by 58% in the period 1990-2006. Structural and infrastructural actions aiming at reducing private transport in favour of public transport and to achieve a modal change in commercial traffic will be fundamental to attain further emissions decrease (see figure 5). If analyse pollutant concentration in urban areas, we find that the related problems are often similar at European level.

Figure

2

Nitrogen oxides (NOx) - total emissions by sectors, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT-NAMEA, 2009



Air

This issue is obviously particularly complex for tropospheric ozone and particulate secondary particles, that are linked to non-linear chemical processes, whereby unbalanced reduction of the various precursors could even worsen the situation. Finally, the natural contribution to concentration from particulate should be further studied (both for the marine component and the desert dust).

Territorial and local policies

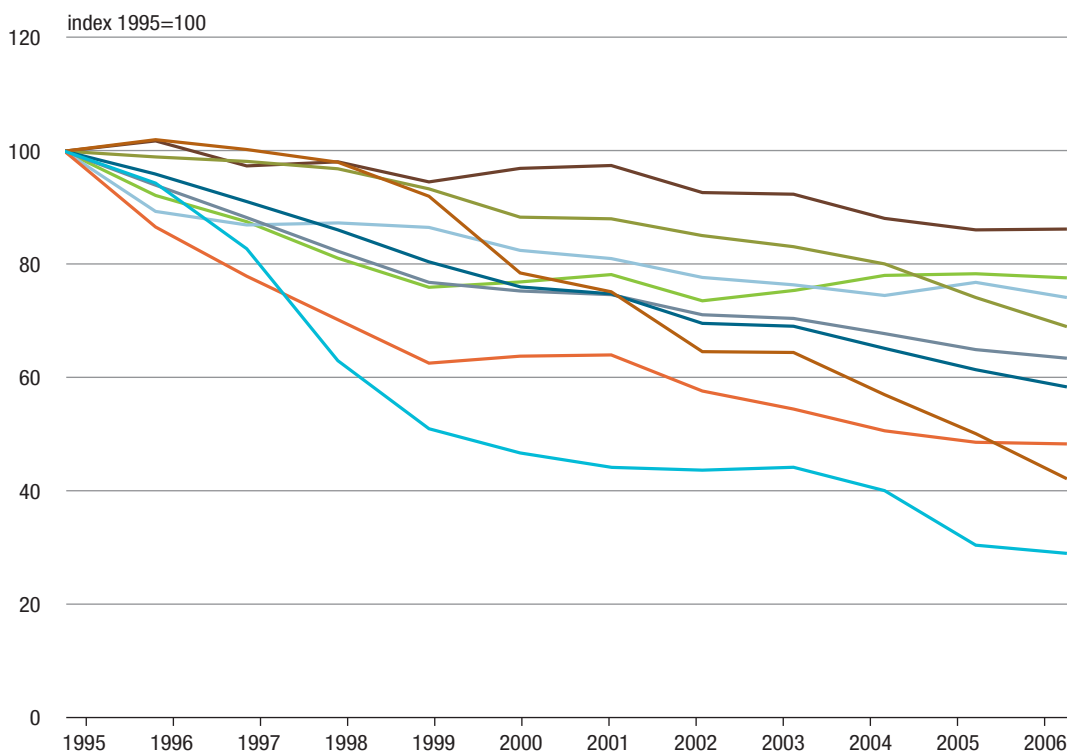
Legislative decree 351/99 “Implementation of directive 96/62/EC on assessment of environmental air quality” assigns regions the task of assessing air quality in order to identify regional areas with different critical levels. Emission ceilings are mainly exceeded in urban areas with

Figure

3

Percentage variation of nitrogen oxides (NOx) by sector, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT-NAMEA, 2009



- Transport, stocking and communications
- Other (1)
- Manufacturing
- Agriculture, hunting and forestry
- Total-economic activities
- Total-household and Economic Activities
- Wholesale and retail trade; repairing of motor vehicles, motorcycles and personal household goods
- Households
- Production and distribution of electric power, gas and water

Note (1) Includes following sectors: Real estate activities, rental and leasing activities, computer science, scientific research and development, other professional and entrepreneurial activities; construction; Other public, social and personal services; Public Administration and defence; compulsory social security; Hotel, restaurant and catering; Fishing, fish-breeding and related services; Public Health and other social services; Monetary and financial intermediation; Mining of metal ores; Education. .

Air

high number and density of inhabitants and a large number of infrastructures, enterprises, commercial and recreational activities.

This is associated to thoroughfares for the large communications that induce high traffic levels, i.e. roads or street intersections with low fluidity.

Regional plans envisage measures applicable to all pollutants

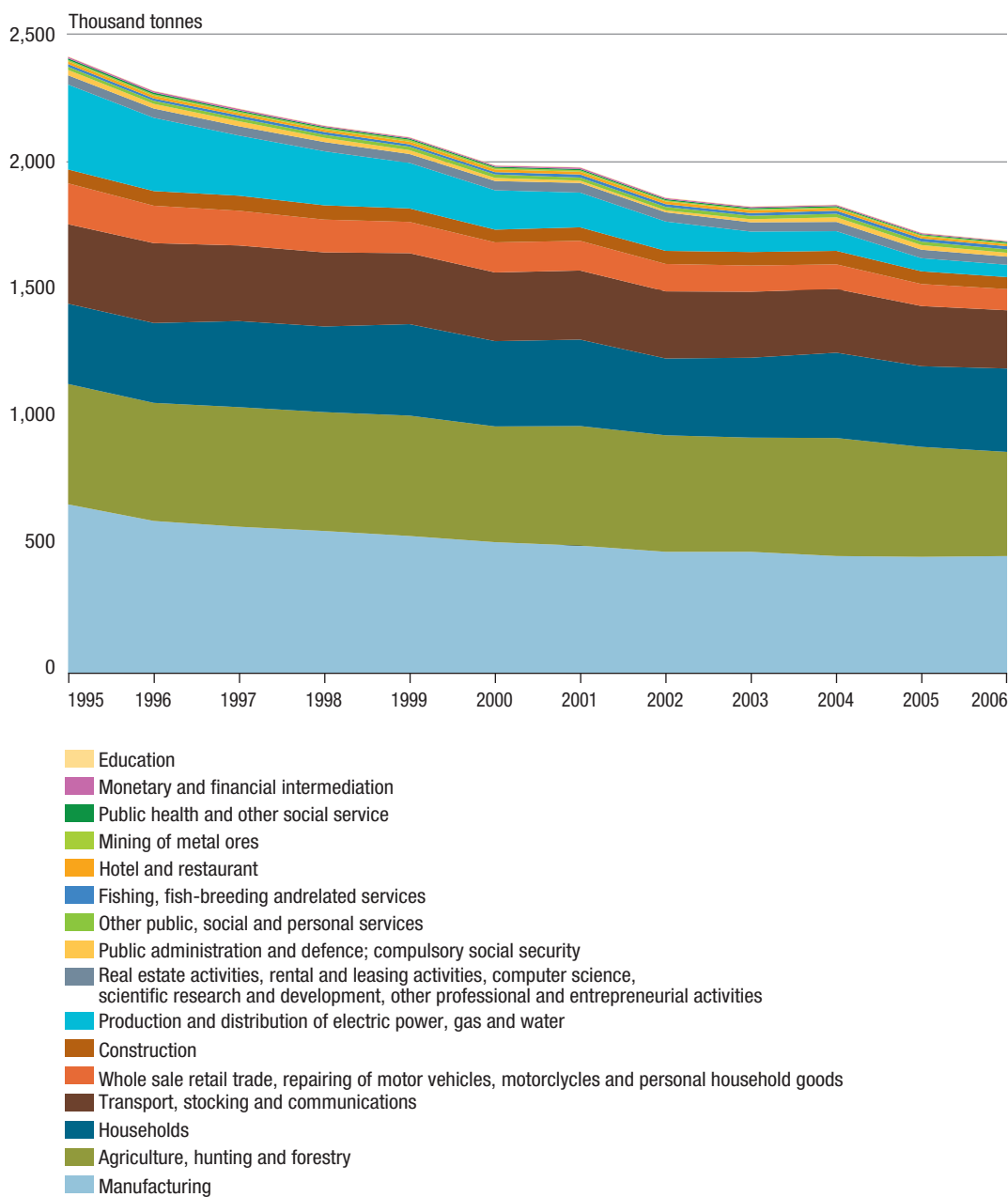
all over the regional territory in a differentiated mode according to the various problems encountered. Interventions are mainly of technological-structural nature and are aimed at reducing private transport.

Figure

4

Particulate matter total emissions (PM₁₀) by sector, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT-NAMEA, 2009

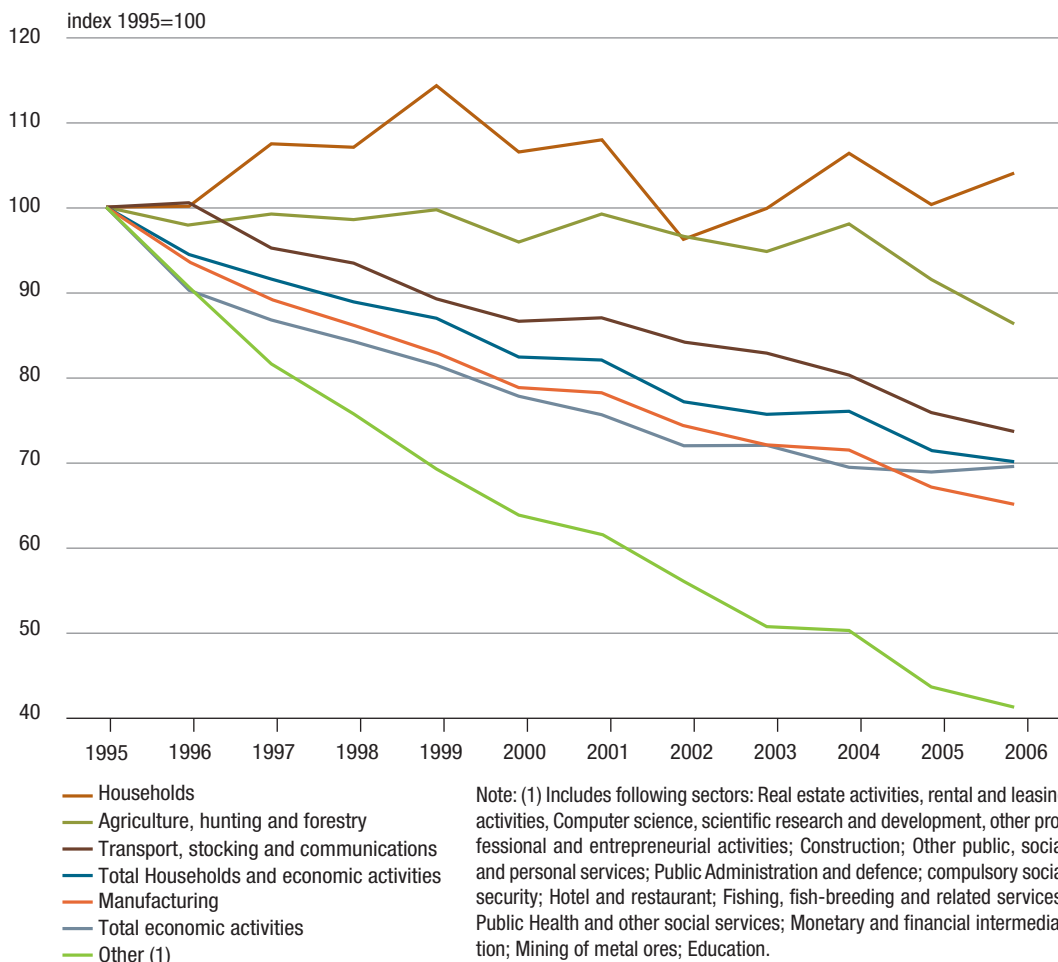


Figure

5

PM₁₀ percentage variation, 1995-2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT-NAMEA, 2009



Box

1

Air quality in urban areas

The problem of air pollution concerns mainly urban areas, where vehicle traffic, building heating systems, industrial and energy-producing plants substantially contribute to the worsening of air quality. Although emissions of some pollutants have decreased in the last years, a significant share of European urban population still lives in cities where EU air quality ceilings to protect human health are exceeded.¹

If we compare data collected twenty years ago with today's data, we see that more than twice as many persons suffer from asthmatic diseases; the European target of attaining air quality levels that would not damage human health or the environment has therefore not been achieved yet. According to a study of the European Environment Agency (EEA), 15 out of 27 EU Member States will not attain one or more legally binding pollutant reduction objectives by 2010².

In relation to health problems, Europe's attention is focused on the following pollutants: nitrogen dioxides (NO₂), ozone (O₃), sulphur dioxide (SO₂), particulate matter (PM₁₀) and benzene (C₆H₆). Especially in urban

— 1 45% out of total European population live in urban areas where PM₁₀ exceeds such ceilings and over 30% out of total population live in areas with high ozone concentration. — 2 EEA, Signals, 2009. — 3 In accordance with Ministerial decree 60/02 complying with Council directive 1999/30/EC of April 22, 1999, the daily ceiling to protect human health is 50 µg/m³ that cannot be exceeded more than 35 times per year and the average annual ceiling to protect human health is 40 µg/m³. — 4 EEA, Signals, 2009 — 5 At national level, Member States should respect the ceiling of 25 µg/m³ PM_{2.5} to be bindingly attained by 2015 and, if possible, already by 2010. To generally reduce exposure, Member States should also measure PM_{2.5} in urban road bed sites and work out action plans to obtain differentiated reductions of average levels on the basis of 2010 pollution values. The directive key elements are: simplification of legislation related to environmental air quality by merging framework directive 96/62/EC, first daughter directive 1999/30/EC, second daughter directive 2000/69/EC and

areas, particulate matter smaller than $10\ \mu\text{m}$ and $2,5\ \mu\text{m}$, tropospheric ozone and nitrogen dioxides are usually considered as the most harmful pollutants for human health.

According to EEA most recent data, since 1997 up to 50% of European urban population could have been exposed to particulate concentration higher than EU ceilings set to protect human health³ and 61% could have been exposed to ozone levels higher than the EU target. It was estimated that fine dust in the air has reduced life expectancy in the European Union by more than eight months.

EEA also observed that, while PM_{10} and ozone emissions have decreased since 1997, the concentration measured in the air has remained nearly the same. This could depend on the combination of several factors: temperature increase due to climate change, import of pollution from other continents or natural emission of substances favouring ozone production released by trees⁴.

The framework of environmental policy at European level is specified by the programme Clean Air For Europe (CAFE), that led in September 2005 to the definition of a thematic strategy to combat air pollution, setting objectives and measures for a new phase of European policy on the issue air pollution.

Directive 2008/50/EC of May 21, 2008 on environmental air quality confirms the previous ceilings for the main pollutants and introduces new ceilings for $\text{PM}_{2,5}$; it envisages that Member States should reduce exposure level to $\text{PM}_{2,5}$ in urban areas below $20\ \mu\text{g}/\text{m}^3$ by 2015 and exposure level versus 2010⁵ values by 20% by 2020.

Local administrations' environmental policies and related projects adopted by municipalities to comply with European legislation are placed within this strategic framework.

Urban air pollution and air quality related problems should be managed through a cross vision of the different environmental policies in the various sectors affected, thus privileging a wider and more integrated view of the issue.

Air directives are closely linked to traffic or mobility directives; in this case, an integrated approach could produce better results in terms of effectiveness of environmental local plans.

The type of air pollutants in urban areas is progressively changing: while pollution due to lead or sulphur dioxide is diminishing, a decreasing trend for benzene is being confirmed and pollution due to PM_{10} , NO_2 and ozone is growing. In many cities, fine dust pollution is mainly caused by road traffic and combustion plants.

Referring to 2007, for PM_{10} , in all 14 metropolitan areas considered, the number of days exceeding the air pollution ceiling to protect human health was higher than allowed by the law⁶. The cities with the highest number of days exceeding the air pollution ceiling are Milano and Venezia (150) and Torino (147), probably due to specific meteorological-climatic conditions; these values confirm what was documented in the recent past, in particular versus 2006. Also other cities show values in line with those recorded in the previous years (see figure 1).

As to nitrogen dioxides, the annual ceiling to be attained by January 1, 2010 amounts to $40\ \mu\text{g}/\text{m}^3$.

During 2007, traffic stations average annual values higher than $40\ \mu\text{g}/\text{m}^3$ have been recorded in nearly all cities with the exception of Trieste and Cagliari; in stations to monitoring background concentration in Torino, Milano, Bologna, Roma and Napoli values exceeding the ceiling of $40\ \mu\text{g}/\text{m}^3$ are reported; for all other cities the values remained below the ceilings envisaged for by the law (see figure 2).

Figure 3 shows the average number of days exceeding the ozone air pollution ceiling to protect human health in the long term ($120\ \mu\text{g}/\text{m}^3$) recorded in the period April to September 2008⁷.

The average amount of days exceeding the air pollution ceiling varies from a minimum amount of $1\ \mu\text{g}/\text{m}^3$ recorded in Bari to a maximum of 81 in Milano; the urban areas of Torino, Venezia, Genova, Bologna, Firenze and Roma are located in an intermediate position, however higher than the average calculated in all cities, thus confirming a generally more critical situation in Central-Northern Italy.

third daughter directive 2002/3/EC decision on information exchange 97/101/EC) into a single directive, with the exception of fourth daughter directive 2004/107/EC; introduction of new targets for $\text{PM}_{2,5}$, while ceilings for other pollutants have remained unvaried; permission to consider natural sources of pollution in assessing target attainment; possibility to extend time limits to attain PM_{10} , NO_2 and benzene ceilings in the presence of some specific conditions and a positive assessment by the Commission; need of constant information to citizens and importance of quality of data produced by monitoring networks— 6 The number of days exceeding the air pollution ceiling are taken from the monitoring station that recorded the highest number in the urban area considered. This parameter is more rigid than the annual ceiling and is the most critical to assess compliance with the law. — 7 In compliance with Law Decree 183/04, stations for ozone measurement are classified differently; data refer to the totality of stations of the urban area where ozone is measured.

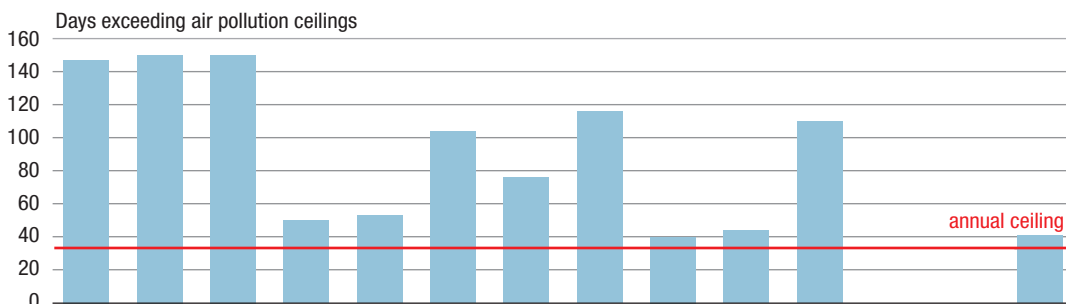
Air

Figure

1

Maximum amount of days exceeding the air pollution ceiling of 50 µg/m³ PM₁₀ in 14 urban areas, 2007

Source: ISPRA, 2009



Torino Milano Venezia Trieste Genova Bologna Firenze Roma Napoli Bari Palermo Messina Catania Cagliari

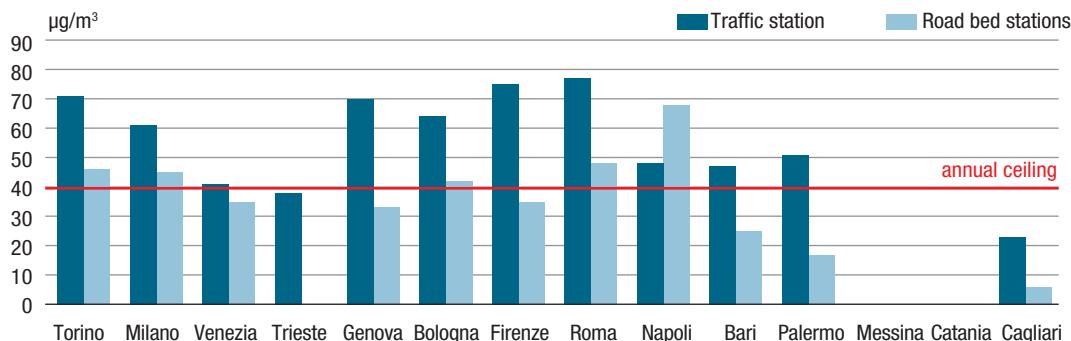
N.B.: Torino data refer to road bed stations, Trieste data to industrial stations, Firenze data related to traffic stations and road bed stations coincide, Messina and Catania data are not available.

Figure

2

Average annual value for nitrogen dioxides (NO₂) in 14 urban areas, 2007

Source: ISPRA, 2009

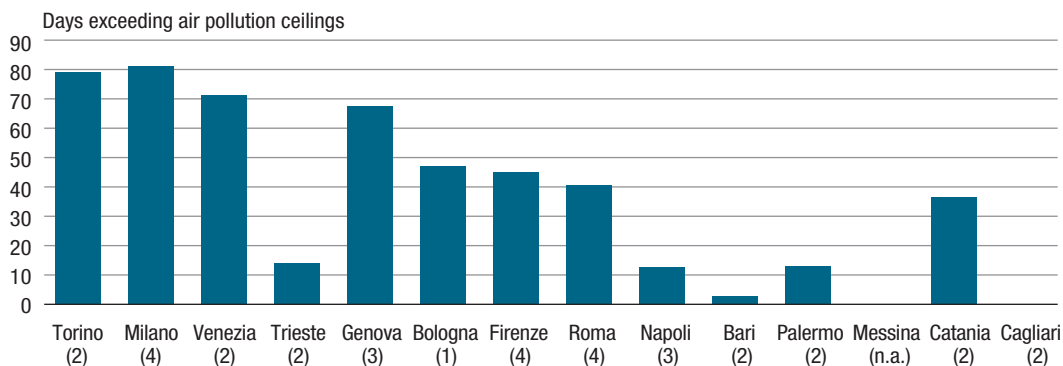


Figure

3

Average number of days exceeding the air pollution ceiling of 120 µg/m³ for summer ozone in 14 urban areas, April – September 2008

Source: ISPRA, 2009



N.B.: in brackets the number of considered stations. Data on Messina are not available.



Water

The reference framework

The EU reference legislation on water consists of the framework directive 2000/60EC – Water Framework Directive (WFD) which represents a complex and deep reform of the European legislation with respect to both action for the protection of water basins and of administration and management of water resources. The fundamental objective of the directive is to establish a general framework for water protection that will prevent further process of deterioration both qualitative and quantitative, and will allow reaching a “healthy state” for all water bodies by 2015. The key objectives of the directive are integrated into the more comprehensive European Union’s environmental policy, which must contribute to the safeguarding, protection and improvement of environmental quality, as well as to the rational use of natural resources, underpinning on precautionary and prevention principles, as well as on the principle of reducing pollution at its source and on the “polluter pays” principle.

The WFD is based on the idea of integrated management at the water basin level (IWRM – Integrated Water Resource Management), through an approach aimed at overcoming the bond of administrative boundaries, focusing on physical aspects of the territory, and considering environmental aspects (hydrological, hydro-geological and eco-systemic) through a holistic and multidisciplinary vision. The Water Framework Directive requires that each member State identifies, in its own territory, the hydrographic districts (an international district is created for cross-border basins) and that for each of those districts a management plan be drawn up by 2009 capable of reaching the target for an ecologically and chemically healthy state for surface waters and for a chemically and quantitatively healthy state for ground waters.

The WFD represents a fundamental step towards water reclamation and protection of the European territory, for it plays a pivotal role between Community policies of the past and future in the sector: on one hand, the measures set by preceding directives (such as the directive on urban waste-water and the directive on nitrates) prove to be valid and represent the minimum requirements for the program of measures in the management plans of hydrographic districts; on the other hand, WFD sets up a dynamic system for producing new European legislation (the so-called “daughter” directives) necessary for completing the framework for Community action on waters (such as the directive on ground waters, the directive

on flooding and the directive on hazardous substances).

Italy transposed the European WFD through the decree 152 of April 3, 2006 “Rules on environment protection” and subsequent amendments and integrations; the third part of the legislative decree comprises, therefore, the regulatory text of reference on land protection and fight against desertification, pollution water protection, and water resource management. The decree 152/06 resumes, to a large extent, the provisions already in force in the existing legal framework pivotal to three key provisions: law 183/89 on land protection, law 36/94 (also known as “Galli law”) on the regulation of water utilities, and the decree 152/99 on water pollution protection. As a whole, these legal rules already made up an institutional framework substantially consistent with the key principles expressed by directive 2000/60/EC. By the decree 152/06, the unification of the existing rules and the simultaneous integration of the Community provisions that had not yet been transposed to national regulations were carried out. The changes introduced by the new decree especially regard: the organization and management of hydrographic basin/districts, the entrustment and regulation of the Integrated Water System, the introduction of new principles (especially those on economic matters), and new technical-managerial aspects. The new regulatory setup designated by the decree 152/06 is, however, still in the implementation phase; the new hydrographic districts are not yet operational, some corrective decrees have intervened with further changes, some provisions to be carried out have not yet been issued and several sectors have recognized the need to intervene to simplify and rationalize some crucial aspects, such as planning, where there is some overlapping and lack of coordination between the different plans called for by the regulation.

Concerning the water services, the decree 152/06 confirms the structure outlined by law 36/94, focused on the identification of coordination levels that go beyond traditional administrative limits. Law 36/94 affirmed some fundamental principles, such as those regarding the public nature of all surface and ground water, the sustainability of uses of the resource, the sharp separation between policy and control duties, belonging specifically to government, and management duties, which are in charge to industrial subjects. This setup aims at overcoming the extreme fragmentation found in water services, a major cause of the diseconomies and malfunctions of the sector. The objective is to guarantee, through the tool of integrated management of the distribution, treatment, and sewerage cycles, optimal levels of man-



Water

agement and quality service to consumers. The existing legislation considers all management models subject to the establishment of Optimal Territorial Ambits (OTA) within which municipalities and provinces set up the integrated water service in a co-operative manner, so as to guarantee its management, according to economic efficiency and effectiveness criteria. The duties of general direction and control of the process are entrusted to central government authorities, while it is up to Regions and local administrations to define and adopt the organizational models and the most appropriate solutions to their specific territorial situation.

The basin/district Authority is responsible for the definition and periodic updating of the water balance, in order to assure a balance between the availability of resources that can be localized or that can be drawn in the reference area, and the demand for different uses, in line with the abovementioned criteria and objectives.

The basin/district Authorities, Regions and Ambit Authorities are assigned with a system of competencies and functions which should guarantee reaching the targets set by the EU directives and the decree 152/06.

In particular, the Ambit Authority must preliminarily carry out a survey of existing aqueducts, treatment and sewerage systems. This activity includes data collecting on the demographics of the territory, its infrastructures, and related functionality level, and is basic to drawing up of the Ambit Plan, which is the tool for planning interventions and to regulate the service.

After the assessment of the status of infrastructures and the definition of the service levels, a comparison between the existing

situation and the entirety of the objectives permits the Authority to identify the critical elements on which it must intervene with an investment plan. Table 1 summarizes as of 2007, the status of the implementation process of the Optimal Territorial Ambits and of the Integrated Water Service (IWS) in Italy, divided by geographic areas.

Water quality in Italy

Rivers

More than half of the Italian regions have adopted or approved the Water Protection Plan containing an overall assessment of the status of quality of river environments according to decree 152/99, which has defined standard parameters necessary for expressing the overall environmental quality of surface water resources by combining the chemical and biological approaches. In fact, river quality is expressed by the Ecological State of Watercourses (ESW), which combines results from chemical analysis (PLM – Pollution Level by Macro-descriptors) with results from biological testing (EBI – Extended Biotic Index).

In Italy, in 2007, 48% (1,014) of monitored sites falls into the quality classes 1 (very good) and 2 (good), 32% falls into class 3 (sufficient) and the remaining 20% of sites shows scarce and poor quality (figure 1). In general, it is precisely the biological parameter, which is the most sensitive to the different kinds of pollution that determines the scarce quality of a watercourse.

However, it should be pointed out that these data are not suffi-

Table

1

Implementation status of Optimal Territorial Ambits and Integrated Water Service, 2007

Geographic area	Planned and established	Ambit Plan drawn and approved	OTA where IWS is assigned and operational
North	45 ⁽¹⁾	38 ⁽²⁾	31 ⁽³⁾
Central	19	19	17
South	28	28	19 ⁽⁴⁾
Italy	92	85	67

Notes: (1) 1 OTA in the North not installed; (2) 4 Plans in the North not approved; (3) 2 in the North not operational; (4) 3 in the South not operational.

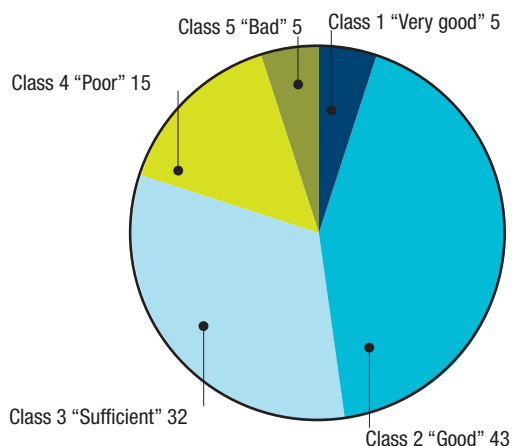
Source: ISTAT, 2008

Figure

1

Distribution of quality classes shown by the Ecological Status of Watercourses (ESW) index values %, 2007

Source: ISPRA, 2009



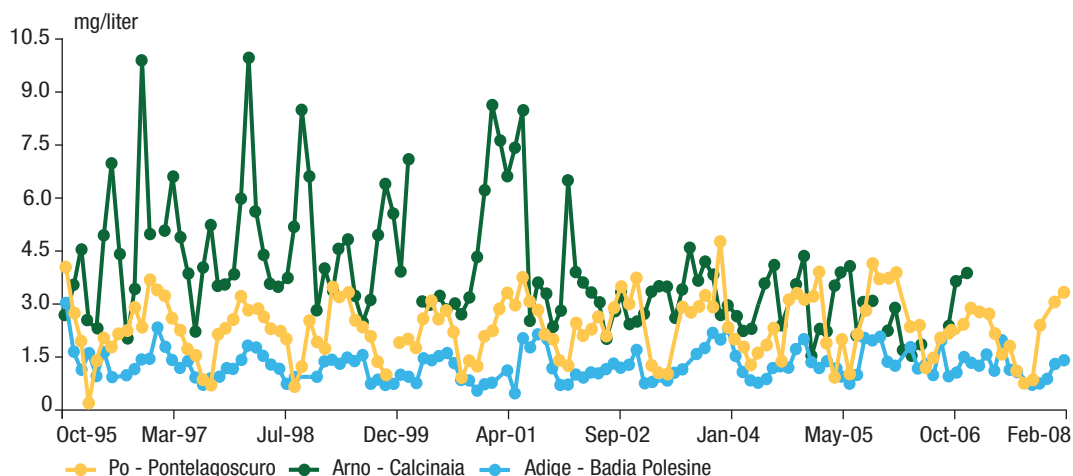


Figure

2

Trend in concentration levels of total nitrogen in monthly samplings taken from the Po, Adige and Arno Rivers, from 1997 to 2007

Source: Ministry for the Environment, Land and Sea, 2009

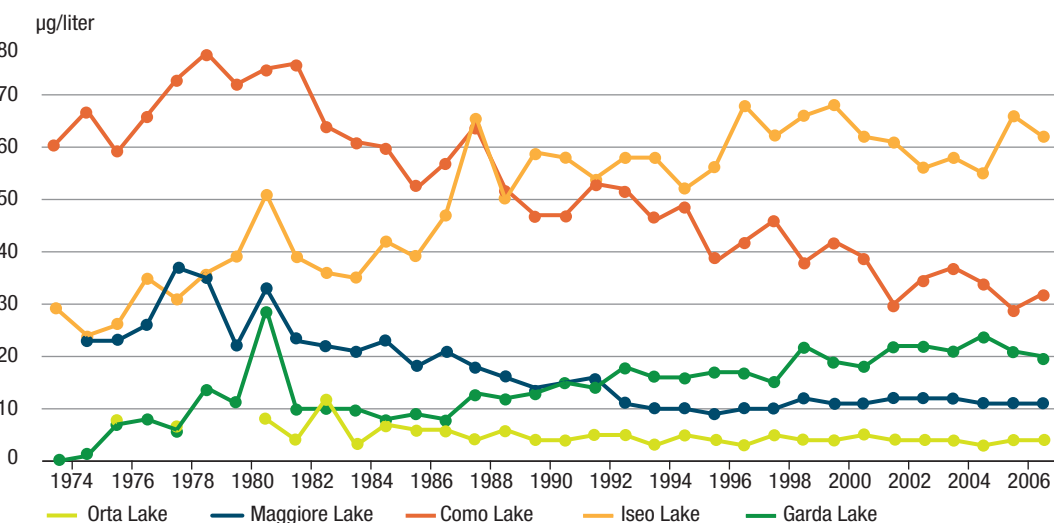


Figure

3

Trend in the concentration of total phosphorus in selected southern alpine lakes, 1973-2006

Source: CNR data processing by the Italian Ministry for the Environment, Land and Sea, 2008



cient for preparing an exhaustive classification of rivers, especially considering that the directive 2000/60/EC calls for a much more detailed definition of ecological status and, more generally, a more complex approach to the classification of surface waters. Italy is, anyhow, seeing to it to have monitoring and classification systems consistent with EU provisions.

Through Council decision 77/795/EC and following amendments, the European Union provided a procedure for the exchange of information on the quality of inland surface waters. Accordingly, each member State has identified watercourses, sample sites and parameters to examine. In fulfillment of this decision, the Ministry for the Environment, Land and Sea selected five watercourses: Adige, Po, Metauro, Arno, and Tevere Rivers.

Figure 2 refers to the trend in concentration levels of total nitro-

gen, as a total of ammonium nitrate and ammonium nitrite, which is a basic indicator necessary for determining the degree of pollution of a river, in the period of 1997-2007; the data considered are from the sample stations closest to the mouth of rivers Po, Adige and Arno.

Lakes

The available data for the assessment of the water quality of lakes (expressed as Ecological State of Lakes – ESL) are not homogeneous on the national territory. In 2007, 73% of the stations representative of the 134 lakes (most of which are in Northern Italy, where 85% of Italian lakes are located) falls into the classes “sufficient” to “optimal”.

From analyses carried out by the Institute for Ecosystems



Water

Study of the CNR (National Research Council) in five southern alpine lakes (Orta, Maggiore, Como, Iseo and Garda Lakes) to check the concentration level of algal nutrients for the total phosphorous indicator, which is fundamental for evaluating the quality variation in trophic terms, differentiated trends can be found for the period from 1973-2006. In regular decrease the concentration level measured at the Como Lake that went from 61µg/l to 32µg/l, with a peak level of 78µg/l in 1978, while the concentration level of the Iseo Lake showed a constant increase from 29 µg/l to 56 µg/l.

The concentration levels of the Maggiore Lake and the Orta Lake showed a constant decrease starting in the second half of the 1980's, which in the 1990's stabilized, respectively, at approximately 11 and 4µg/l. The Garda Lake has been, in recent years, at a level of around 20µg/l (figure 3).

The same considerations made for rivers apply to the demanding task undertaken by Italy in adapting technical approaches for the assessment of the ecological status of surface water to the provisions of directive 2000/60/EC.

Groundwater

The environmental quality of groundwater consists of the “quantitative” state and the “chemical” state. While data on quantity are not available, data on “chemical” state can be described by the Chemical State of Ground Waters (CSGW) index. Analytical testing carried out in 2007 in 11 regions and 2 autonomous provinces involving 2,890 sampling stations shows a qualitative state of water bodies that ranges from 49% included in classes 1 and 3 (quality from good to sufficient), 24% in class 4 (poor quality due to anthropic causes), and the remaining 27% in class 0 with no or negligible anthropic impact. Among the pollutants of anthropic origin there are the nitrates, which beyond the limit of 50mg/l (limit of potability) are responsible for falling off into class 4 for many of the regions analyzed (figure 4).

Italy is about to transpose the European directive 2006/118/EC on ground water protection within the national legislation. The directive requires member States to set threshold values for pollutants, pollutant groups and pollution indicators, which have been identified as factors contributing to placing groundwater

Figure

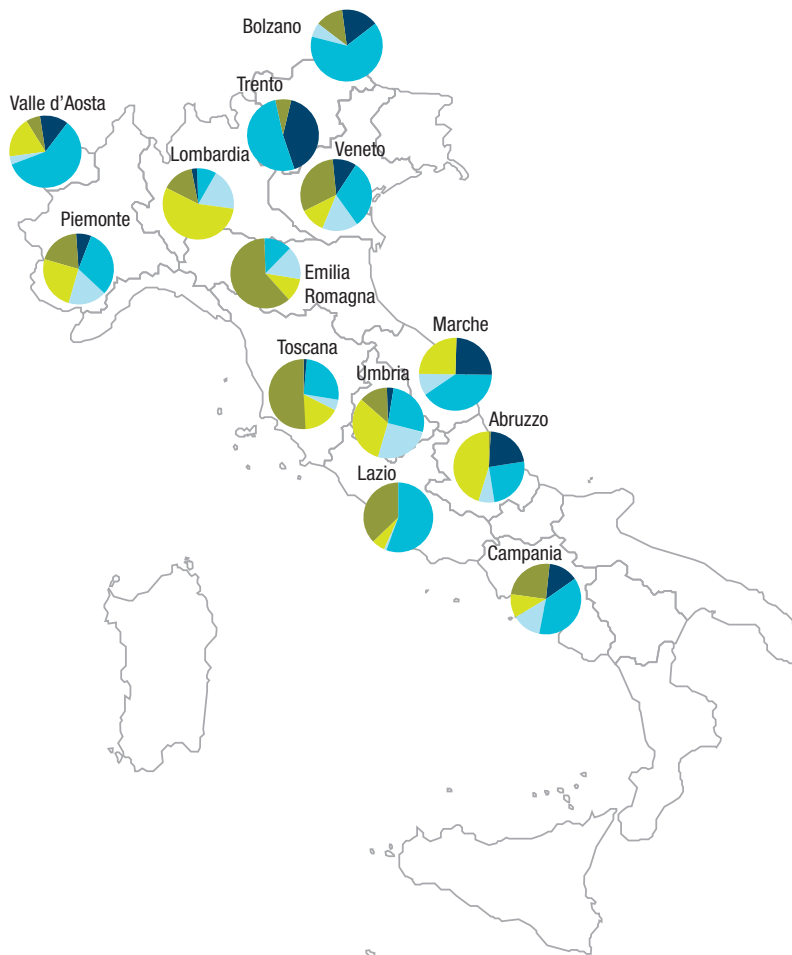
4

Qualitative state of groundwater bodies in 11 regions and 2 autonomous provinces, 2007

Source: ISPRA, 2009

Point of drawing	
Piemonte	605
Valle d'Aosta	45
Lombardia	179
Trento aut. prov.	29
Bolzano aut. prov.	34
Veneto	285
Emilia-Romagna	418
Toscana	380
Umbria	207
Marche	221
Lazio	70
Abruzzo	264
Campania	153

Class index SCAS	
	Class 1
	Class 2
	Class 3
	Class 4
	Class 5





Water

bodies at a risk of not reaching the “healthy state” level. The directive indicates a minimum list of 10 parameters and requires that the member States, on the basis of existing monitoring data, set further limits for pollutants whose presence has been confirmed on the national territory.

Sea

Control tests performed on 7,372 km of seacoast in 2007 show that more than 67% of coastal waters are suitable for bathing, 15% are not controlled due to inaccessibility to monitoring, 12% are permanently off-limits to bathers due to pollution, 3% are off-limits to bathers for reasons other than pollution, and the remaining 3% are temporarily unsuitable for bathing due to pollution (figure 5).

Use of water resources

In Italy, agriculture is the production sector with the highest consumption of water, intended for irrigation. More than 503,000 farms use water for irrigation purposes and represent more than 29% of

utilized agricultural surface (UAS). The irrigated surface (covering more than 2,600,000 hectares) represents 20.4% of the cultivated surface (table 2). The surface irrigated by the use of irrigation systems, indicated by geographical area, is reported in table 3.

Urban areas are large cities characterized by a high concentration of business activities mostly associated with public, artisan, and industrial uses and services. Worldwide around 50% of the global population lives concentrated in metropolitan urban areas and Europe is one of the most urbanized continents in the world: around 75% of its population lives in cities, a figure which, according to estimates by the United Nations, is destined to increase to at least 83.8% by 2050. This represents an exceptional challenge in terms of a greater demand for services related to the satisfaction of primary goods for human life, among which some of the most important are the availability and accessibility to water resource. Its diversified use, quality and management are of growing importance in all geographical areas and large cities. In Italy, the drawing of water for distribution for human consumption, both at the national and metropolitan area level represents one of the leading key points in the sustainable management of water resources.

At the national level, the loss from aqueducts, estimated at an average of around 40%, indicates the need for an infrastructure improvement in the system of distribution network¹.

During 2007, the per capita consumption of water for household use in the all of the 14 metropolitan areas was around 70m³/year per inhabitant and shows an average decreasing trend in the last six years. The five cities showing an above-average consumption level are: Torino, Milano, Genova, Roma, Messina and Catania. Compared to 2006, there was a 1.1% overall decrease (figure 6)².

In metropolitan areas, the percentage trend of population served by wastewater treatment plants in the last six years shows a sharp improvement, going from 72.2% in 2002, to 82.4% in 2007, with an increase of approximately 10%. In 2007, only four cities showed below average levels compared to metropolitan areas as a whole, and of these, Palermo and Catania showed extremely low levels compared to the other cities of equal size (35% and 23%, respectively) (figure 7). In the 2002-2007 period, local governments adopted water rationing measures in five of the cities under consideration, all situated in Southern Italy, except for Genova, which had rationing only in 2003.

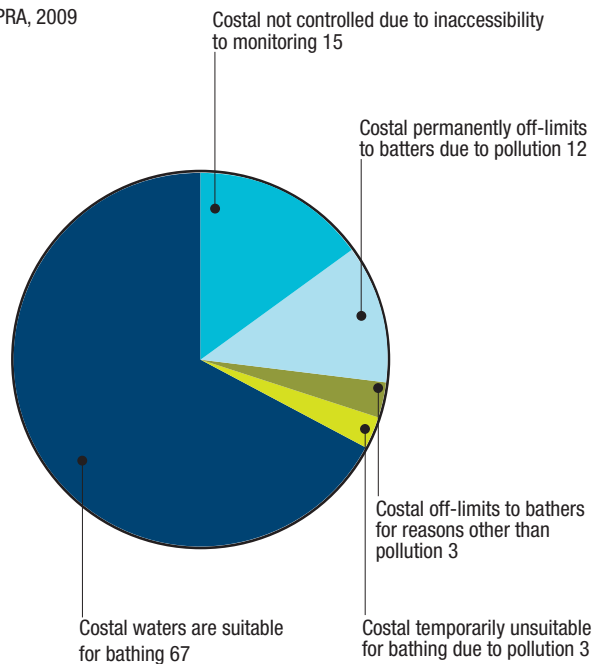
As for the quality of water utility service subjectively perceived, around 35% of Italian households shows perplexity about drinking tap water, and this figure is quite variable when analyzed by community type: the greatest percentage of households is located in the suburban areas of large cities and in mid-sized communities, while the lower percentages reflect families living in communities with a population of up to 2,000 inhabitants. The indicator showing an irregularity of water supply reveals that the situation is quite the same for communities of different demographic sizes with the exception of community centers in the metropolitan area (figure 8).

Figure

5

Quality of coastal waters values %, 2007

Source:
ISPRA, 2009



— 1 APAT, Annual yearbook 2007 — 2 ISTAT, Urban environmental indicators, 2008

Water

Table

2

Agricultural farms and the relative surfaces irrigated, by geographical area, 2005 Source: ISTAT, 2008

Geographical area	Farms		Irrigated surface	
	n.	value % on farms with UAS (1)	ha	value % on cultivated surface (2)
North	177,715	39.2	1,659,984	35.9
Central	50,663	18.0	193,231	8.2
South	275,083	27.8	760,204	13.0
Italy	503,461	29.2	2,613,419	20.4

Notes: (1) Utilized Agricultural Surface (2) Data obtained from total of UAS and arboriculture for timber

Table

3

Surface irrigated, by irrigation systems and geographical areas, 2005 Source: ISTAT, 2008

Geographical area	Surface irrigated by irrigation system, hectares									
	surface run-off and infiltration		ground watering		sprinkling		micro-irrigation		other	
	ha	%	ha	%	ha	%	ha	%	ha	%
North	695,586	88	216,269	94	629,741	64	100,825	19	34,756	35
Central	10,424	1	2,334	1	139,150	14	26,590	5	16,354	16
South	82,840	11	12,045	5	212,233	22	411,001	76	49,222	49
Italy	788,850	100	230,648	100	981,124	100	538,416	100	100,332	100

Assessment and perspectives

Like all European Union countries, Italy is dedicated to the difficult task of implementing the water framework directive 2000/60/EC. In particular, the European directive calls for Member States to have water management systems by 2009, by drawing up Management Plans for the individual basins/districts. The Management Plans comprise a synopsis of the strategy for water bodies protection set by the WFD. In fact, the Management Plans call for: physical characterization of the territory (including the so-called "typification" of water bodies), pressure and impact studies (based on the DPSIR scheme), economic analysis, monitoring and assessment programs.

Italy has shown a serious delay in the implementation of the WFD, and today the strategy for reaching the objectives consists in making the most of what already exists, starting from Protection Plans, where they exist.

The Water Protection Plan (WPP) is the key planning tool for the

definition of action strategies on water and is developed by the regions. Moreover, the WPP comprises a sectoral part of the Management Plan of the water Districts required by the directive. Decree 152/06 required that the Water Protection Plan be approved no later than December 31, 2008; this is the present situation:

- WPP has been adopted in the regions of Veneto, Liguria, Marche, Campania, Apulia and Sicily;
- WPP has been approved in Valle d'Aosta, Piemonte, Lombardia, autonomous province of Trento, Emilia-Romagna, Toscana, Lazio and Sardegna;
- Transition Plan has been approved for delimitation of draining basins in sensitive areas in the autonomous province of Bolzano;
- WPP has been pre-adopted in Umbria.



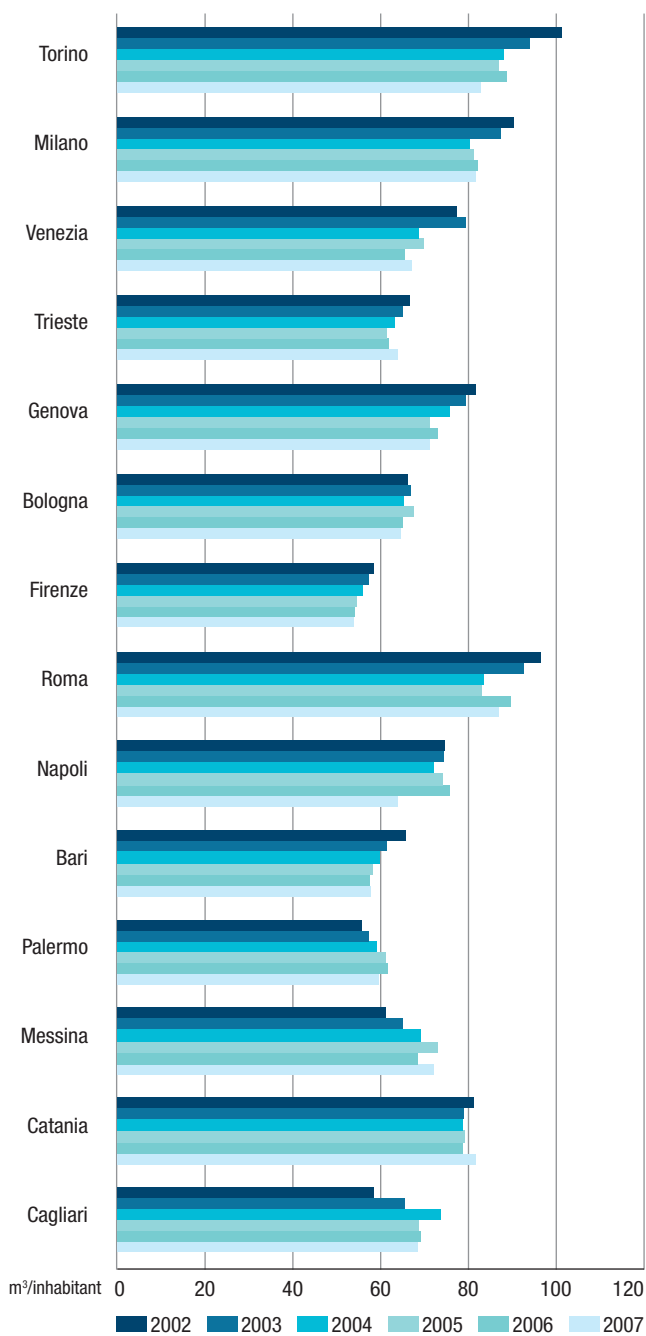
Water

Figure

6

Water consumption for household use in urban areas, 2002-2007

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT, 2008

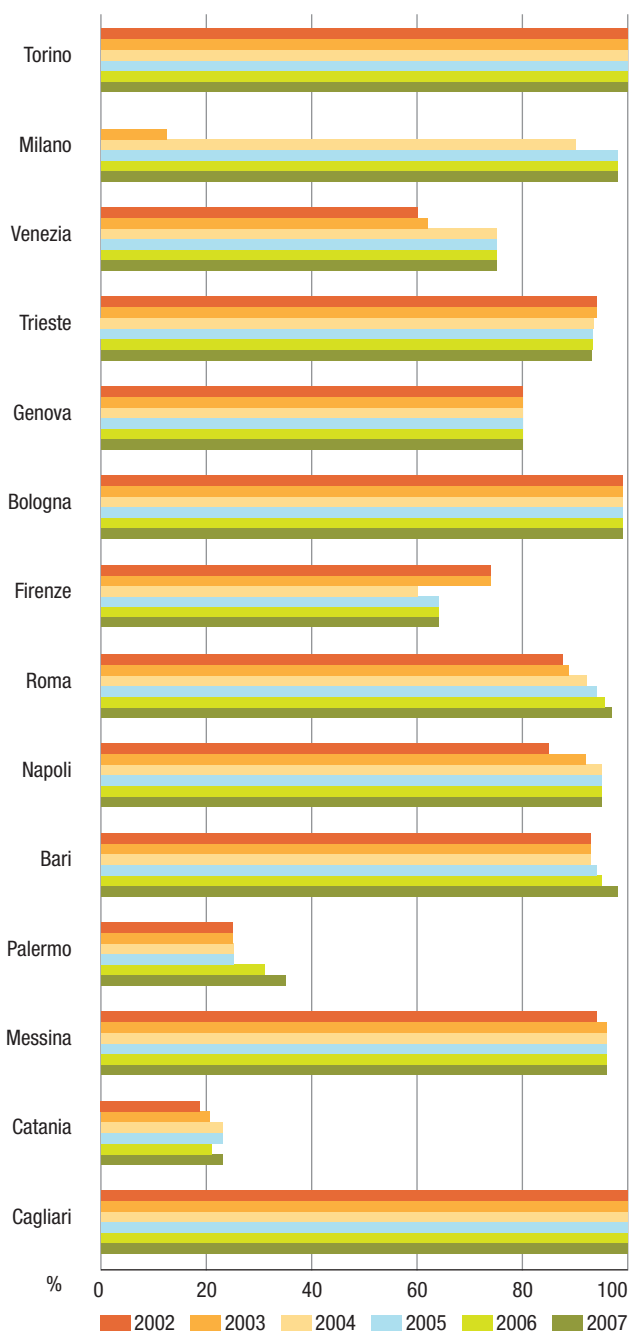


Figure

7

Percentage of population resident in urban areas served by wastewater treatment plants values %, 2002-2007

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT, 2008





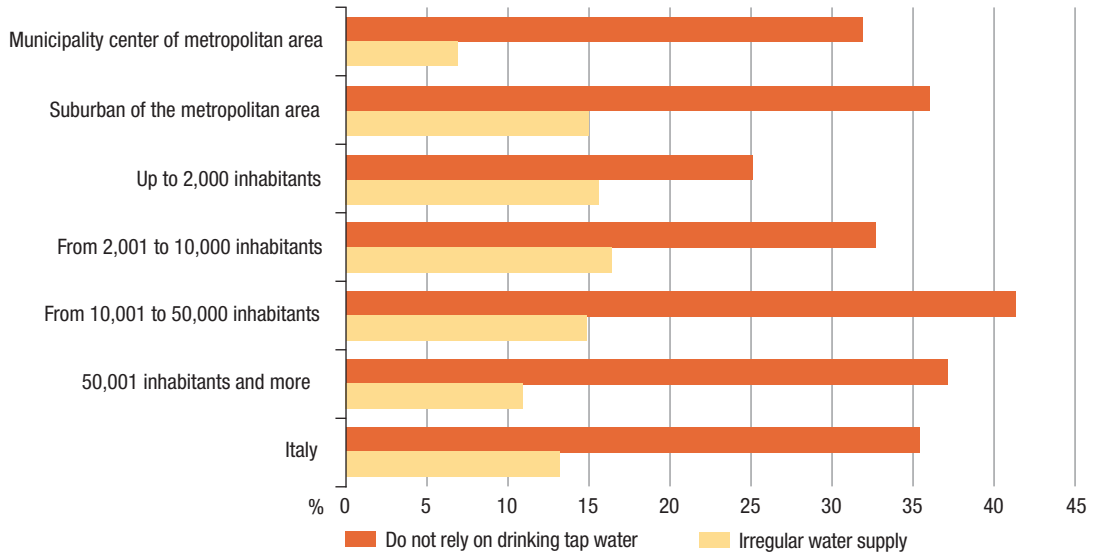
Water

Figure

8

Households claiming to have water distribution problems, by community type, (per 100 households from the same zone), 2006

Source: data processing by the Italian Ministry for the Environment, Land and Sea on data provided by ISTAT, 2008



Monitoring of coastal marine environment

The Ministry of the Environment, accordingly to its institutional duties, has for almost 20 years kept the quality of the Italian coastal marine environments carefully under monitoring in cooperation with the 15 coastal Italian regions, with all technical and research specialists from main technical and research bodies, and Regional Environment Protection Agencies (ARPAs).

The monitoring is intended to check the state of health of coastal marine ecosystems and is an essential tool for assessing and directing territorial management policies of the coastal areas. The coastal marine environment monitoring also give fundamental support to decision making for handling pollution effects arising from maritime transport and human activities along the coast and is part of monitoring programs since many years.

The latest monitoring program was conducted from June 2001 to January 2007; in August 2008, a new monitoring program began, which is presently carrying out more extensive studies, compared to those of the past.

The monitoring programs focus on the assessment of the environmental quality of the sea, leaving out any aspects associated with its "state of health". In this sense, tests normally called for in programs to determine whether the water is safe for bathing are extremely few. Instead, much time and space are dedicated to studies on the dynamics of free-living fauna and flora populations, such as planktons or those living on the sea bed, such as in benthonic zones, and on factors determining their changes; the programs also carry out studies on the presence of chemical pollutants by analyzing marine sediments and mussel population (bivalve mollusks), which are environmental sections able to conserve for months, and sometimes even years, the "memory" of

all the substances with which they have come into contact.

Since 2001, there have been 81 monitored marine areas, identified through statistical analysis of data collected from previous programs and scattered along the entire Italian coastline, as shown in figure 9; of these, 63 areas (considered "critical areas") are located in areas most subjected to environmental impact by industrial plants, urban areas or river transfers. In each region, "certain control" areas (e. g. areas as close as possible to a natural condition called "zero point") have been put in support of these critical areas, in order to accurately evaluate the level of risk of the critical areas. Most of these "certain control" areas have been localized in protected marine zones.

In the period of 2001-2007, analyses called for by the Program were conducted, on a regular and contemporary basis and variable among the environmental sectors in all of the 81 areas: every two weeks, the water and population of free-living flora and fauna organisms (phytoplankton and zooplankton) are tested; every six months, contamination of sediment and mussels are tested; once a year bottom-dwelling mobile Benthic communities or else, grasslands of *Posidonia oceanica* are examined.

In addition, starting in 2008, in areas immediately overlooking the coast, microscopic algal communities living on submerged vegetable or rocky substrates are also studied during the summer in order to search for some particular toxin-producing species that, in recent years in some points of the Italian coastline, have given rise to abnormal proliferations with serious consequences to marine organisms and, sometimes, to beach bathers. The tests have also been extended to populations of *macroalgae* that populate the rocky sea bottoms and that serve as an effective indicator of the condition of the sea. Furthermore, the frequency of the tests on water, plankton, sediment



Water

and mussels have been decreased and tests on the sea bottom-dwelling communities have been increased in response to indications of the present EU legislation and in consideration of the greater capacity that these components have to provide integrated answers in the space and time of the variations in the characteristics of the marine environment.

All tests are made simultaneously in all 81 areas with regular frequency, variable by environmental component. Table 4 summarizes the data on the overall sampling and testing conducted during the course of the monitoring program 2001-2007.

All data collected from regional laboratories are sent to a central database called Sea Protection System (SiDiMar) which files, verifies, and makes the information available on the web site of the Ministry (<http://www.minambiente.it>) where they are presented in an aggregate, geo-referenced, and statistical processed form, and reported through simple graphics, allowing consultation and understanding of the information even to non-expert users.

Table

4

Monitoring program of coastal marine environment 2001-2007

	N. of samplings	N. of tests performed (1)
Water	28,718	373,607
Plankton	17,342	18,233
Mussels	722	36,019
Sediment	708	43,956
Benthos	396	6.859
Total	47,886	478,674

Note: (1) Only the number of parameters examined and not the total of the measurements along the water column are considered.

Source: Ministry for the Environment, Land and Sea, 2009

Figure

9

Monitoring Program 2001-2007: identification of critical control areas

Source: Ministry for the Environment, Land and Sea, 2009



Activity of the Vigilance Committee for Water Resources Use (COVIRI)

The activity of the Vigilance Committee for Water Resources Use (COVIRI) is aimed at the protection of the consumer of the integrated water utility service, with special reference to the aspects of the correct determination and correct adjustment, on a periodic basis, of the water utilities service rate.

Being mainly a matter of control activity over administrative acts, at a first glance, it could seem irrelevant to the logics of territorial management, and specifically of the quali-quantitative use of the water resource. Still, in this regard, directive 2000/60/EC recognizes that the rate system is a fundamental instrument for reaching the environmental objectives that the directive itself establishes. As far as the specific sector of interest of the Committee is concerned, the rate system must take into consideration expenditures arising from technical-managerial aspects of the service as well as resource costs; the two profiles of costs are therefore included: environmental costs associated to the damage that the use of water resources causes to the environment, to ecosystems and to those who use the environment; and resource costs, i.e. opportunity costs forced onto other customers as a consequence of the intensive exploitation of the resources, beyond their level of restoration and natural renewal. With this in mind, in order to fulfill its duty of proposing a “Normalized Method” for the definition of the rate of the integrated water utilities service and of exercising vigilance on rates management, the Committee requires a series of information and data which, at present, are not easily obtainable; where they do exist, they often come from different subjects who have collected them using different methodologies and processed them using different methods and without adequate validation.

The Committee intended to fill the knowledge gap in the area by starting to plan a Computerized System for the Vigilance of Water Resources (SIVIRI), prepared in collaboration with ISPRA, aimed at the formation of a cognitive framework. The framework should be useful and necessary not only for defining the best activity strategies of the Committee itself, but also for identifying the policies needed to guarantee the lowest possible impact on the territory, both of the integrated water service structures and of the water drawing activity. SIVIRI, through collection and processing of the data provided by the Optimal Territorial Area Authorities (AATOs) and by each operator of the integrated water service, intends to offer:

- Reports aimed at the comparison of operators' performance, based on managerial, technical (among which water networks losses) and economic-financial indicators;
- Reports on water rates, volumes and consumption brackets, related average, maximum and minimum values, dispersion indices, annual average expenditure, sustainability;
- Information on planned and completed investments by the operating companies, investments per inhabitant, investments distribution by service and type of work, forms of financing;
- Information on the dimensional characteristics of AATOs, surveys, Area Plans (*Piani d'Ambito*), revisions, concessions, key data of operating companies.

These data will serve essentially to carry out comparisons among the different operational realities in order to promote the sector best practices and stimulate adjustments in situations of criticality.

SIVIRI will be accessible to all citizens who wish to learn about the technical and managerial characteristics of the service in the territory, as well as about its economic dimension, so as to assess e.g. the global quality of the service received in relation to the amount paid. Up to now, the Committee had based the data inserted in the Reports to Parliament on specific questionnaires sent to AATOs; starting this year, as a test, part of the data - which will be used for drafting the 2008 Report to Parliament - will be available through SIVIRI; if the test is successful, it will be extended to the full data set with regular yearly deadlines for data providers.

As far as the tariff leverage is concerned - i.e. the other instrument that directive 2000/60 considers available for stimulating water savings -, the Committee, in fulfillment of a precise law obligation, is working on a proposal of revision of the “Normalized Method”. It will keep in consideration the need to guarantee the full coverage of costs, also reflecting the principle of environmental costs recovery and the “polluter pays principle”.

Furthermore, among the activities set up by the Committee and specifically assigned to it by law, particularly important are the pre-definition of one or more models of convention (service contracts) that regulate the relationship between the AATO and the area operator, as well as the definition of minimum quality levels of services to be provided to the consumer. Lastly, among the ordinary activities of the Committee, verifying the correct drafting of Area Plans is of special importance. Area Plans, in the part where they identify an investment program for integrated water service infrastructures, have a clear impact on the use of the territory, assuming, from this point of view, coordination with the other territorial planning documents.



Biodiversity

The reference framework

The Convention on Biological Diversity (CBD) made in Rio de Janeiro in 1992 represents Italy's most important international commitment in the field of biodiversity.

CBD main targets are the conservation of biological diversity (as far as genetics, species, community and ecosystem are concerned), the sustainable use of its components and fair and equitable sharing of the benefits arising from access to genetic resources and appropriate transfer of relevant technologies.

Besides this "umbrella" convention originated in 1992 United Nations Conference on Environment and Development that gave birth to other important conventions such as the Climate Change Convention, the United Nations Convention to Combat Desertification and the 2000 Cartagena Protocol on Bio Safety, Italy also subscribed other International conventions on specific topics: the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973), the Convention on the Conservation of Migratory Species of Wild Animals, also known as the Bonn Convention (CMS, 1979), the Ramsar Convention (1971) on Wetlands of International Importance, the Barcelona Convention (1976) to reduce pollution in the Mediterranean Sea, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979).

As a member State of the European Union, Italy implements the above mentioned international agreements in the framework of Community policies and by enforcing Community directives, more specifically Council directive 79/409/EEC on the conservation of wild birds, commonly referred to as the Birds directive and Council directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, commonly referred to as the Habitat directive.

The Sixth Environment Action Programme of the European Union 2002-2012 underlined the importance of strengthening EU environmental policy by increasing knowledge on biodiversity, on possible threats and on present trends, so as to define targeted and efficient political tools.

In 2001, Göteborg European Council decided "that biodiversity decline should be halted with the aim of reaching this objective by 2010"; in 2002, during the World Summit on Sustainable Development in Johannesburg, some 130 world leaders shared this opinion and set the target of appreciably reducing the rate of biodiversity loss at international level by 2010. This world commitment led CBD to design a "Strategic Plan" including the

2010 Target. In May 2006 in the Communication "Halting the loss of biodiversity by 2010 — and beyond. Sustaining ecosystem services for human well-being" (COM (2006) 216 final), the European Commission thoroughly analysed the topic "biodiversity" by checking the adequacy of the proposed solutions and developing an Action Plan for 2010 and beyond indicating the main sectors of intervention, the aims to be pursued and the necessary supporting measures.

Each member State has to adjust its strategy and action plan in compliance with the Community Plan.

The Action Plan identifies four main intervention areas, ten major targets and the related operational aims consisting in 150 actions.

Areas	Priority/objectives
1) Biodiversity in the EU	
	1 to safeguard the EU's most important habitats and species
	2 to conserve and restore the biodiversity and ecosystem services in the wider EU countryside
	3 to conserve and restore the biodiversity and ecosystem services in the wider EU marine environment
	4 to reinforce compatibility of regional and territorial development with biodiversity in the EU
	5 to substantially reduce the impact on EU biodiversity of invasive alien species and alien genotypes
2) The EU and global biodiversity	
	6 to substantially strengthen effectiveness of international governance for biodiversity and ecosystem services
	7 to substantially strengthen support for biodiversity and ecosystem services in EU development assistance
	8 to substantially reduce the impact of international trade on global biodiversity and ecosystem services
3) Biodiversity and climate change	
	9 to support biodiversity adaptation to climate change
4) The knowledge base	
	10 to substantially strengthen the knowledge base for conservation and sustainable use of biodiversity in the EU and globally

Biodiversity

The state of biodiversity in Italy

CBD IV National Report (www.biodiv.org) shows a summary of the great variety and of the state of biodiversity in Italy, the ongoing activities for its safeguard and sustainable use, considering the genetics and species as well as the ecosystems and landscapes.

In 2005 the Ministry for the Environment published the volume "The Status of Biodiversity in Italy – A contribution to the National Strategy for Biodiversity" (www.minambiente.it). The document summarizes the status and trends of biodiversity in Italy. In the same year the DVD "GIS Nature" was produced, collecting cartographies and database nationally relevant. Beside these two knowledge tools, that have been developed within the framework of 2010 Target national implementation, further efforts have been made to deepen topics related to taxonomic and distributive knowledge of fauna and flora species and the identification of communities, habitats and landscapes.

Italy is one of the richest countries in Europe and in the Mediterranean basin in terms of species biodiversity, including over 57,000 species in its fauna and over 6,700 species in its higher plant flora (196 *familiae* and 1,267 *genera*). Within European countries, Italy has the highest number of plants, as well as terrestrial and freshwater animals (46,200 species). As a whole, Italian terrestrial and inland water fauna represents more than

one third of the European species (35%). 1,130 bryophytes are known, which represent two thirds of all European species: 279 species Liverworts (divided in 81 *genera* e 40 *familiae*) - 851 species Mosses (divided in 210 *genera* e 55 *familiae*). Italy has one of the highest lichen diversity in Europe, the total number of species known in Italy reach 2,300 (14.4% of world lichen flora). The checklist of Basidiomycetes reports 4,296 entities (20% of the world's species). Italy has a very high rate of endemism, approximately 10% of animal species and 13.5 % of the higher plant species. Considering terrestrial and inland waters invertebrates, 35% of them should be considered endemic. The non-endemic species can be classified as exclusively distributed in the Mediterranean region (13%) or in Europe (22%); the other species have a wide distribution in the Palearctic region (30%). With about 8,000 km of coastline, Italy is very rich in marine fauna and flora as well, being listed in the checklist 8,785 species, 10% of them live exclusively in Italian seas.

Unfortunately, alien species account for more than 2% of the whole Italian fauna; this percentage is surely underestimated, and this number has rapidly increased in recent years. Regarding vascular plant flora, according to recent estimates about alien species, they account for more than 15%.

Although there are not yet national official red lists, within a selection of 10,000 species of terrestrial and inland water fauna 4.4% was estimated to be endangered, 8.5% vulnerable, and approximately 20% very rare and considered nearly threatened. Finally,

Table

1

Protected areas: Official List of Protected Areas (EUAP), 2000, 2002, 2003 and 2009

Year	N. protected areas	Protected surface, hectares			% of national surface (a)	ha/100 inhabitants
		on land	at sea	total		
2000 (b)	669	2,752,951.7	260,992.4	3,013,944.1	9.1	4.8
2002 (c)	752	2,788,171.7	266,220.4	3,054,392.1	9.3	5.0
2003 (d) (e)	772	2,911,851.9	2,820,673.4	5,732,525.3	9.7	5.1
2009 (f)	875	3,094,659.0	2,818,464.0	5,913,123.0	10.3	5.2

Notes:

(a) net of marine surface;

(b) 3° EUAP update of July 20, 2000;

(c) 4° EUAP update of July 25, 2002; includes the National Parks of Orosei Gulf and Gennargentu accounting for 73,935 hectares;

(d) 5° EUAP update of July 24, 2003 published on the Ordinary Supplement n. 144 to the Official Journal n. 205 of September 4, 2003;

(e) surface at sea includes marine surface of the sanctuary for marine mammals accounting for 2,557,258 hectares;

(f) 6° EUAP update (the procedure is coming to an end).

Source: Ministry for the Environment, Land and Sea, 2009

Biodiversity

46 species within this small selection are to be considered regionally extinct. Regarding plant flora, different studies have been undertaken to prepare national lists of endangered species of vascular plant, lichens, bryophytes, fungi and freshwater algae. In Italy, there are 875 protected areas including: national parks, marine natural reserves, international marine sanctuary for cetaceans protection, state and regional natural reserves, regional parks. The total land surface of protected areas amounts to 3,094,659 hectares or 10.3 % of the total national land sur-

face. The total sea surface of marine protected areas amounts to 2,818,464 hectares. The international marine sanctuary "Pelagos" for the protection of cetaceans is a unique example of protected area in the high seas beyond the national jurisdiction, as agreed by Italy, France and the Principality of Monaco (table 1). Moreover, there are 2,284 SCIs (Sites of Community Importance) designated by Italy under directive 92/43/EEC and 591 SPAs (Special Protection Areas) classified by Italy pursuant to directive 79/409/EEC. SCIs total surface amounts to 4,523,000 hectares;

Table

2

Number, extension and percentage of Special Protected Areas (SPAs), of Sites of Community Importance (SCIs) of Natura 2000 Network, in each region, december 2008

Region	SPAs			SCIs (a)			Natura 2000 (b)		
	n. sites	surface hectares	%	n. sites	surface hectares	%	n. sites	surface hectares	%
Piemonte (c)	50	307,880	12.1	122	282,345	11.1	141	396,837	15.6
Valle d'Aosta (c)	5	86,315	26.5	28	71,619	22.0	30	98,933	30.3
Lombardia	66	297,337	12.5	193	224,201	9.4	241	372,067	15.6
Trentino - Alto Adige	36	269,646	39.8	192	301,446	44.7	196	323,230	48.3
Veneto	67	359,822	19.5	102	369,640	20.1	128	414,679	22.5
Friuli - Venezia Giulia	8	116,450	14.8	56	132,170	16.8	60	149,733	19.1
Liguria	7	19,615	3.6	125	145,428	26.9	132	147,354	27.2
Emilia - Romagna	75	175,919	8.0	127	223,757	10.1	146	256,863	11.6
Toscana	61	192,072	8.4	123	286,839	12.5	143	362,725	15.8
Umbria	7	47,093	5.6	98	109,667	13.0	104	120,200	14.2
Marche (d)	29	131,013	13.5	80	102,608	10.6	102	146,213	15.1
Lazio (d)	39	408,187	23.7	182	143,107	8.3	200	441,630	25.7
Abruzzo (d)	5	307,921	28.5	53	252,587	23.4	57	387,076	35.9
Molise (d)	12	66,019	14.9	85	97,750	22.0	88	118,724	26.8
Campania	28	215,763	15.9	106	363,215	26.7	120	395,537	29.1
Puglia	10	26,666	13.6	77	465,518	24.1	83	474,597	24.5
Basilicata	14	156,282	15.6	47	55,462	5.6	50	164,774	16.5
Calabria	6	262,256	17.4	179	85,454	5.7	185	319,392	21.2
Sicilia	29	387,158	15.1	217	384,065	14.9	232	568,736	22.1
Sardegna	37	296,217	12.3	92	426,251	17.7	121	529,838	22.0
Italia	591	4,366,631	14.5	2,284	4,523,129	15.0	2,559	6,189,138	20.6

Notes:

- in July 2006 pSCI have become SCI
- number and extension of the Natura 2000 Network sites have been estimated avoiding overlaps among SCIs and SPAs
- Given that the site IT201000 belongs both to Piemonte and to Valle d'Aosta, the extension has been estimated assigning to each region the area of the site that belongs to its territory
- Given that the site IT7110128 belongs to Abruzzo, Lazio and Marche and the site IT7120132 belongs to Abruzzo, Lazio and Molise, the extension has been estimated assigning to each region the area of the site that belongs to its territory

Source: Ministry for the Environment, Land and Sea, 2009



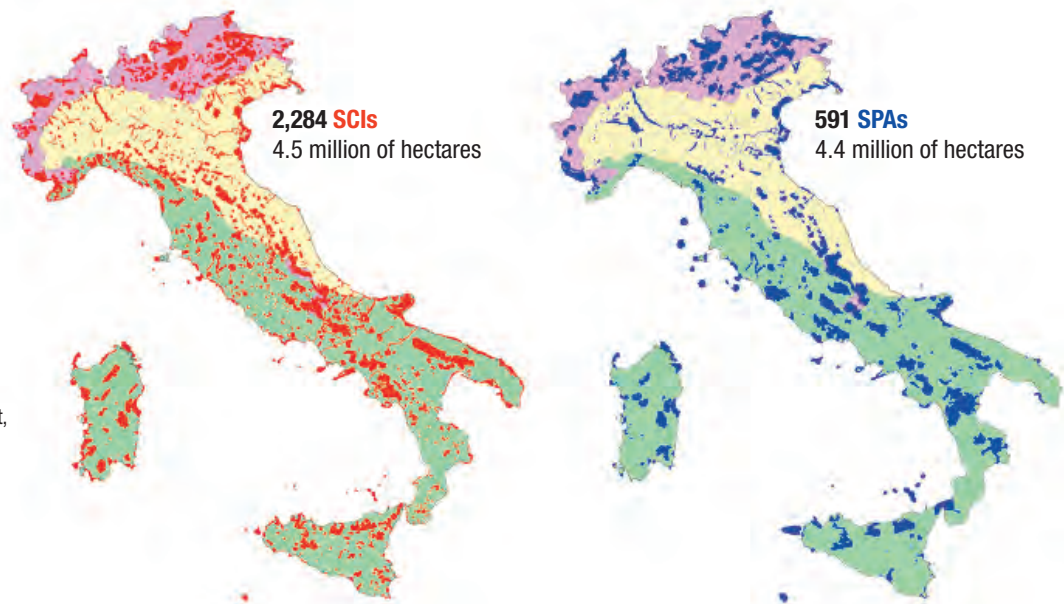
Biodiversity

Picture

1

The distribution of Sites of Community Importance (SCIs) and of Special Protected Areas (SPAs) in Italy in December 2008

Source: Ministry for the Environment, Land and Sea, 2009



SPAs total surface amounts to 4,367,000 hectares (figure 1 and table 2).

The Italian territory protected by different types of protected areas covers more than 20% of the country. In 2008, a Report on the conservation status of species and habitats protected by the Habitat Directive (Second National Report, art. 17), allowed to identify the need for a closer monitoring of national and local realities and highlighted that there is still much work to be done, although positive trends were reported in many cases (table 3).

Table

3

Conservation status of habitats and species of community interest value %, 2008

	Favourable	Inadequate	Bad	Unknown
Habitat	61	27	3	9
Plants	59	30	3	8
Invertebrates	17	28	47	8
Fish	12	46	20	22
Amphibians	33	50	5	12
Reptiles	41	17	2	40
Mammals	20	39	27	14

Source: Ministry for the Environment, Land and Sea, 2009

Assessments and future perspectives

Despite the lack of a national strategy, the commitments assumed following the ratification of international conventions and agreements were not hindered. Nonetheless, the need to provide an institutional framework to the coordination between the various sector-based policies and action levels on the territory strongly emerged from all sectors, due to the cross-sectoral nature of biodiversity.

The mid-term progress report on the implementation of the European Action Plan for Biodiversity has stressed that, despite all efforts, Italy and other EU countries have showed a considerable delay as to the attainment of 2010 Target to halt the loss of biodiversity.

A national study on global and community objectives concerning biodiversity for the attainment and overcoming of 2010 Target has identified the stages that will provide Italy with a National Strategy for Biodiversity by 2010 and beyond. Thanks to the wide cooperation among the various parties involved, the work initiated in 2005 and continued in the following years produced a very important document, the CBD IV National Report. The report contributed to share an institutional platform to develop a National Strategy, especially taking into account its real implementation on the territory.

Within this framework, the State Regions Permanent Conference represents the institutional seat to approve the National Strategy for Biodiversity by 2010, that has been declared the International Year of Biodiversity.



Soil use

The reference framework

The new European Soil Charter provides a definition of soil based on three main functions: eco-systemic regulation, archival function of soils containing records of natural and human history, functions for social and economic activities: “Soil is one of humanity’s most precious assets. It is so obviously essential to life that it is sometimes neglected among environmental components. From an environmental point of view, soil acts as interface between rocks, water, air and human beings”¹.

Nowadays, soil exploitation is radically changing landscapes, environment and ecosystems. Rural landscapes are changing due to intensive agriculture, abandoning land and forest exploitation. At the same time, coastal areas are undergoing deep changes to receive tourist and recreational activities.

Within this framework, urban areas and related infrastructures are among major “soil consumers”. Today, about 75% of European population lives in urban areas and by 2020 this share is estimated to reach 80%². During the same period, this percentage will reach or even exceed 90% in seven EU Member States³. Furthermore, it is estimated that over one fourth of European soil is used for urban purposes⁴, with used living space per person that has more than doubled in the last fifty years. Until recent years, the growth of European cities has been strictly linked to population increase⁵. Today, built up areas keep growing at high pace (figure 1) even in metropolitan areas with steady or even decreasing population. The European Environment Agency estimates that in the last twenty years European built up areas enlargement has increased by 20%, while population only by 6%.

This phenomenon is due to three main factors: new demographic dynamics (population ageing, household scattering), changing productive systems (new consumption and entertainment districts, industrial, commercial, administrative, regional-referred functions), life style (increase of inhabitable surface, refusal of high density, widespread urban development increase in urban green).

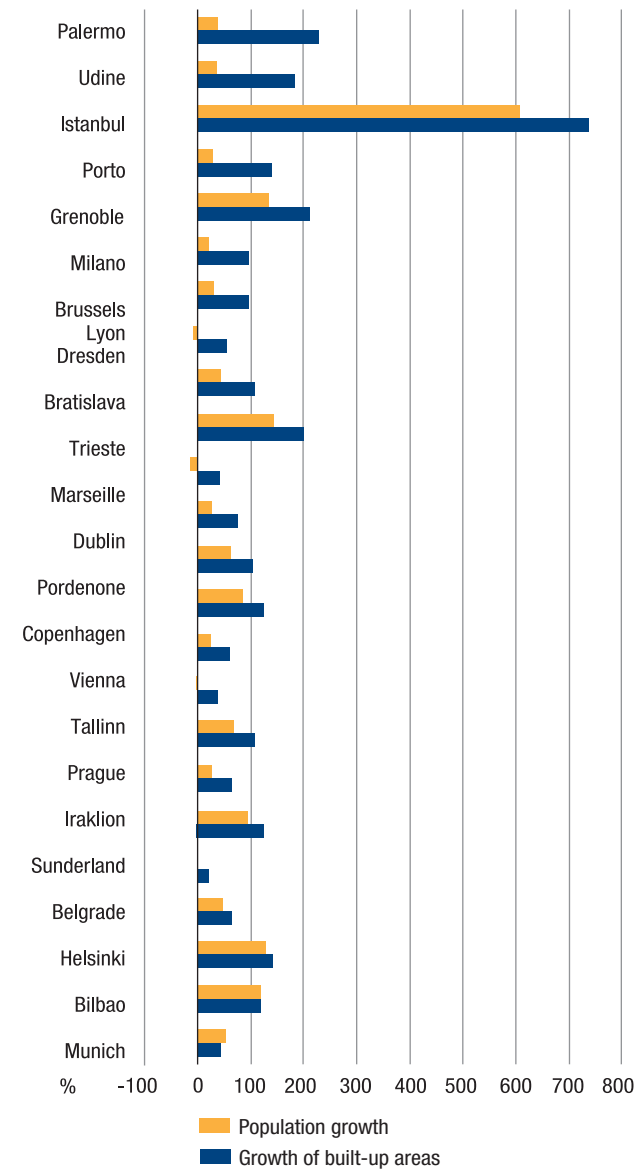
Besides consuming non-renewable resources, growth of urban areas also has relevant impact on other environmental components due to increase of energy demand, growth of the reference basin for services supply, traffic. For instance, energy consumption tend to be lower in compact urban areas as against areas with sprawled population, and urban waste and

Figure

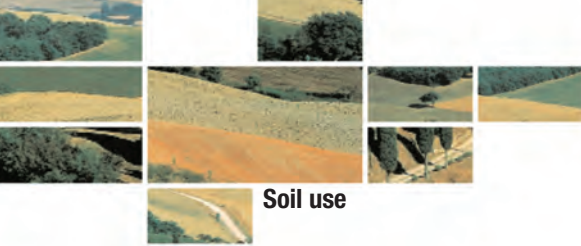
1

Population growth and increase of built-up areas in selected European towns (1960-2000)

Source: European Environment Agency, 2006



— 1 The European “Soil Charter” is divided into 12 points and was approved by the European Council in 1972. The Charter was revised in 2003 (Charter for the protection and sustainable management of soil) — 2 European Environment Agency, “Urban sprawl”, EEA Briefing, 04/2006 — 3 European Environment Agency, “Urban sprawl in Europe. The ignored challenge”, n. 10/2006 — 4 European Commission, communication “Towards a thematic strategy on the urban environment” COM(2004)60 of 11/02/2004 considers capital cities and urban settlements with population higher than 100,000 inhabitants (i.e. the 500 major towns in EU-25) as urban areas — 5 In Europe the urban population share has passed from 55% to 75% in the last fifty years.



Soil use

wastewater and sewage treatment seems to be eased by scale economies. These sectors seem to be directly linked to soil consumption.

The steady development of suburbs in major urban settlements also determines an increase in transport demand that is nearly completely met by road traffic. As a consequence, new transport infrastructures have been developed that, in turn, contributed to land consumption. In the 90s, 10 hectares/day land were used to build new highways and motorways on EU territory. The land used to build infrastructures on plain areas was usually the best agricultural land, due to minor building costs and following maintenance.

In most industrialised EU countries with high population density, soil consumption due to increased urbanisation and new infrastructures seems to be the most likely cause of soil degradation. More in detail, in 2000 Belgium reports over 20% of urbanised surface, Germany 8.1%, France 4.8% and a good portion of these areas have been occupied sacrificing agricultural land⁶ (figure 2).

This urban sprawl – seldom controlled – represents one of the most worrying phenomena affecting urban areas. This has been clearly expressed in the premise of the European Commission Communication on Thematic Strategy for Soil Protection (COM 2006/231) that acknowledges how soil degradation

be a serious problem in Europe, strictly linked to human activities, in particular to inappropriate agricultural and forestry-related practices, to urban and industrial bloom and to tourism. The Strategy calls on Member States to adopt measures to limit soil sealing by restoring contaminated and abandoned sites first (brown fields) and using building techniques allowing to conserve as many soil functions as possible.

One year before, the Thematic Strategy on the Urban Environment⁷ remarked how adequate land planning could contribute to the reduction of urban bloom and loss of natural habitats and biodiversity.

Moreover, integrated management of urban environment should ease sustainable land planning, thus reducing soil sealing, promoting urban biodiversity and increasing citizens' awareness.

In May 2007, EU Ministers in charge of territorial issues subscribed the so-called "Leipzig Charter"⁸. Among other things, the Charter considers that compact urban settlements are needed to allow resource sustainable and efficient use. Attaining this target is possible through careful urban- and land-planning by preventing settlement sprawl through soil balance tools, closely linking urban space demand and offer.

However, commitments are still too general to tackle this problem exhaustively.

Figure

2

Urban settlements development and other artificial land development in Europe 1990-2000

Source: European Environment Agency, 2005

Urban and infrastructure development

- 1 to 5 %
- 5 to 10 %
- More than 10 %

Urban zones 1990

- More than 50,000 people

Green background index

- 0 to 60 %
- 61 to 100 %



— 6 ISPRA, "Rapporto sulle aree urbane" (Report on Urban Areas), 2007 — 7 European Commission, "Thematic Strategy on the Urban Environment", (COM 2005/718) — The "Leipzig Charter" has been agreed upon by European Ministers in charge of land issues on EU territory during the "Informal Ministerial meeting on urban development and territorial cohesion" that took place in Leipzig on May 24 and 25, 2007 — 9 Urban sprawl means literally "coarsely laying down"

Soil use

Soil consumption in Italy

Comparing population and settlement dynamics in several Italian municipalities, some typical features of Italy's recent urbanisation emerge: until the mid 70s, settlement development trends follow demographic growth. In the reconstruction years of post Second World War period there is a slow, though steady growth; from the 50s onwards, both demographic and settlement development strongly accelerate with same intensity. Only from the mid 70s the two dynamics decidedly diverge, since demographic growth nearly reset to zero in almost all local frameworks. Urban sprawl, on the contrary, keeps increasing with the same growth rates (figure 3).

Demographic growth and urban sprawl are clearly no longer connected.

From a qualitative point of view, uncontrolled urban sprawl⁹ describes urban settlements characterised by disorder, very low density, absence of qualified urban services and landscape fragmentation.

According to the European Commission, urban sprawl is one of the most urgent problems to be tackled by implementing policies aiming on one hand at reducing environmental impact due to progressive loss of agricultural and natural soil¹⁰, and on the other hand at limiting public expenditure due to excessive settlement sprawl¹¹.

Urbanisation of coastal areas plays a particularly important role also because of the physical conformation of the country. In Italy about 30% of population lives in 642 municipalities located along the coastline, without taking into account seasonal and tourist flows. In the last decades, Italian coasts (over 8,000 km) underwent a strong anthropization process; in many cases, this process has changed natural and environmental features of the territory. Especially in the most accessible coastal areas there was a concentration of urbanisation, tourist activities, infrastructures (ports, tourist ports), thus giving rise to irreversible changes often in conflict with coastal protection.

Overall knowledge of soil and territory plays a fundamental role to carry out analytical and efficient studies on ongoing changes. However, no harmonised and reliable data on the national territory are available. The only cartography at national level is the European project Corine Land Cover that compares 1990 and 2000 data on large-scale soil use changes. The survey points out that agricultural land in Italy has reduced by 1.6%, to the advantage of woodland or semi-natural areas (1%) and urbanised areas (0.6%)¹².

An updating of the project is currently ongoing, thus enabling the output of a database of land use and cover changes between 2000 and 2006; the system will be based on European satellite images related to 2006¹³.

A significant signal of the development of urban sprawl in Europe in the last fifty years can be found in the Murbandy (Monitoring Urban Dynamics) and Moland (Monitoring Land Use Changes)

projects; these projects report the development of several European cities, among which Milano, Palermo and the Padova-Venezia conurbation. The programme target is to survey changes, to understand them and to develop urban growth scenarios for some selected urban areas. Though the project seems to be very well structured as to the geographical survey methodology, it seems to be less useful to understand social and economic structures underlying soil use changes. The areas under study are in fact not defined by administrative borders but rather dictated by urban sprawl itself, thus making comparison of geographical and statistical data impossible, while the critical aspects of recent urban dynamics are to be found in the relationship between society and its territory.

Besides national and European surveys, local authorities as well as many regions are collecting autonomously data and information on the situation of soil use on their territory.

In Lombardia, a study carried out by the Italian Institute of Urban Planning (INU) has revealed that urban areas have increased by 13 hectares/day in the period between 1999-2004, as if every year in Lombardia a town like Brescia (5,000 hectares) were built or agricultural land equivalent to the surface of Pavia were lost. Also the province of Turin has established an observatory on land use, documenting changes from 1820 to 2000.

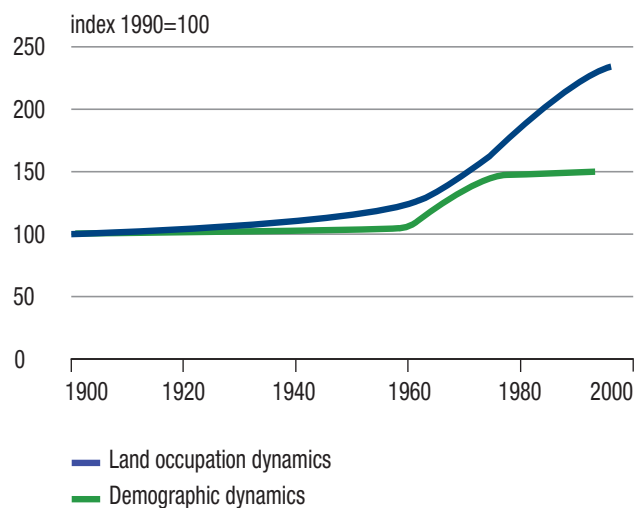
The municipality of Cassinetta di Lugagnano, in the province of

Figure

3

Soil use for urban and demographic purpose. Typical urbanisation trend in Italy, 1900-2000

Source: AA.VV., "No Sprawl", 2006



—10 As already said, calls on to the retaining of urban sprawl to limit soil pollution and erosion can be found in 2001 EU "6th Environmental Action Programme", in 2002 European Commission Communication "Towards a thematic strategy for soil protection", and in 2003 "European Soil Charter" — 11 Italy's most famous research on this issue is reported in Camagni, R., Gibelli, M. C., Rigamonti, P. (2002), I costi collettivi della città dispersa, Alinea, Florence — 12 ISPRA, Tematiche in primo piano, 2007 — 13 Thirty-eight countries among which Italy joined in the Corine Land Cover 2006 initiative, co-financed by Member States and the European Commission



Soil use

Milano, was awarded with the national prize of the “Sound Municipalities Association” in the category “Land management” due to the approval of its Municipal Structural Land Plan with growth equal to zero, first experience of this kind in Italy.

Assessments and future perspectives

Some European countries have already developed specific policies aiming at restraining urban growth to combat soil consumption. Germany’s and Great Britain’s experiences in this field are particularly interesting. In Germany, a programme for environmental policy was approved back in 1998 with the aim of decoupling economic development and land consumption, thus limiting land occupation to urban purposes and setting the threshold of 30 hectares/day, equal to about one fourth of the ongoing trend of that period; in Great Britain too, planning and monitoring procedures for urban development have been applied for several years.

In Italy to date there is neither approved legislation nor national policies finalised to explicitly retaining soil consumption. It should be considered, however, that increasingly numerous experiences in this sector originate from public opinion, such as appeals, law proposals, local experiences.

The difficult target of decoupling economic development and urban sprawl certainly requires a number of different tools.

In 2007 INU established a national observatory on soil consumption with the aim of collecting organised data that are presently only partially available. It defined methodology and common indicators for the monitoring of soil consumption. INU also developed a draft proposal of national legislation essentially based on the idea of “Preventive ecological compensation”, i.e. starting from the assumption that any change in soil use be compensated outside interested areas, however within the same municipality, through the cession of areas and their natural fittings.

The situation at regional level is different: the issue of retaining soil consumption has been taken into account by some legislation. Among these, the most convincing formulation is for sure that of Toscana region: it is the first region to state, among the founding principles of its legislation for land management that “new land commitments for settlement development and infrastructural purposes are solely permitted when no alternatives to reuse and reorganize existing settlements and infrastructures are available”¹⁴. Similar provisions are contained in urban legislations in Liguria (regional law 36/97), Emilia-Romagna (regional law 20/00), Campania (regional law 16/04) and Veneto (regional law 11/04).

Within this framework, land planning of wide areas plays a fundamental role (as defined by law 142/90 and legislative decree 112/98), establishing the competences of provinces in urban planning and in the sector of soil protection and territory

development, in disaster-control service, in the development of cultural-landscape heritage, viability and transport. Moreover, this planning is the most suitable to ensure physical and environmental land integrity, placing itself in between regional and municipal planning and aiming, among other, at defining specific guidelines on land intended use in relation to the predominant uses of its components.

About every other year, INU carries out a survey to monitor the implementation level of “wide area planning”. The most recent survey, carried out in 2007, highlights that after 17 years from the enforcement of law 142/90¹⁵ Italy is still suffering great delay (table 1). Out of 107 provincial plans envisaged, only 55 are approved, 11 adopted, while 35 are still being worked out. It must be highlighted that 7 provinces have not yet started planning. There is a strong division between Northern and Southern Italy. While in Northern-Central Italy all provinces have plans adopted or approved (with the exception of Veneto, Friuli-Venezia Giulia and Lazio, where some provinces are still defining tools), planning is very disappointing in Southern regions. In peninsular regions (Molise, Campania, Puglia, Basilicata and Calabria) only one province has an approved plan (Vibo Valentia) and one single plan has been adopted (Napoli). In Sicilia only one out of 9 plans has been approved and in Sardegna 3 plans have been approved and one adopted¹⁶.

Land planning policies are often linked to market dynamics. They should rather mirror a vision of urban development, whereby sensitivity to environmental and social issues needed to be perfectly embedded within land legislation policies. Within this context, areas where production has ceased that are going to receive new use destination play a quite relevant role, especially in terms of economic potential and requalification of urban areas, thus avoiding consuming not yet built up areas. These areas (brown fields) are often located within urban areas. In Italy, regions in the North show the highest number of brown fields; these areas experienced the most advanced industrial development in the past decades, such as Genova with the area of the Porto Vecchio, Torino, with the Environmental Park, and Milano with the Bicocca area.

Southern Italy is instead characterised by the presence of a few, large industrial areas, testifying concentrated and fragmented development of a limited number of areas¹⁷ (see the box on restoration of contaminated sites).

— 14 Article 3, paragraph 4, regional law 1/2001 — 15 Law of June 8, 1990, n. 142, “Legislation on local authorities” — 16 Four new provinces have been recently created in Sardegna — 17 ISPRA, Environmental data Yearbook 2008. Key Topics, 2009

Soil use

Table

1

“Wide area” planning in Italy, 2007

Source: Italian Institute of Urban Planning INU, 2008

Region	Number of provinces	Approved planning	Adopted planning	Ongoing planning	Under revision planning
Piemonte	8	5	3	0	1
Valle d'Aosta	1	1	0	0	0
Lombardia	11	10	1	2	8
Trentino-Alto Adige	2	2	0	0	0
Veneto	7	0	2	5	0
Friuli-Venezia Giulia	4	0	0	2	0
Liguria	4	3	1	0	1
Emilia-Romagna	9	9	0	0	3
Toscana	10	10	0	0	0
Umbria	2	2	0	0	0
Marche	4	4	0	0	0
Lazio	5	1	2	2	0
Abruzzo	4	4	0	0	0
Molise	2	0	0	1	0
Campania	5	0	1	4	0
Puglia	5	0	0	5	0
Basilicata	2	0	0	2	0
Calabria	5	1	0	4	0
Sicilia	9	1	0	8	0
Sardegna	8	3	1	0	0
Total	107	56	11	35	13



Box

1

Restoration of contaminated sites

Continuous or accidental spills and release of chemicals to the soil and to groundwater and streams, as well as waste contamination, are among the main causes of interaction between productive activities and surrounding environment. Contamination can negatively impact on human health, both directly and indirectly. Within this framework, contaminated sites restoration becomes not only a tool to protect both territory and human health, but also to re-launch socio-economic development of entire areas by favouring the conversion of totally unproductive land into improved environmental, urban and economic areas.

Sector-related legislation has evolved over the years to adapt to different techniques and methodologies and to meet the requirements of different areas; nowadays, the main efforts are focused on eliminating past bad practices by providing legislative basis for new orientation of industrial culture, trying to improve both territory and environment by working out new sustainable models to manage and use sites that underwent restoration.

A first, systematic approach to this issue can be found in the legislative decree 22/97; it is based on the polluter pays principle and sets the main criteria to develop safety measures and carry out contaminated sites restoration. The executing decree¹ disciplines some technical aspects of restoration activities, with special reference to criteria to identify contaminated sites of national interest, acceptable limits of soil contamination, analysis procedures, general criteria to provide safety measures, polluted sites restoration, environmental clean-up and drafting of related projects.

Ministerial decree n. 468 of September 18, 2001 (Regulation on the “National Plan for Restoration and Environmental Clean-up”) lists the first fourteen Sites of National Interest (SNIs) to undergo restoration, defines prioritising actions, criteria to identify beneficiaries, financing measures, monitoring and check legislation. Besides identifying further sites of national interest, law 179/02 (Environmental annex of 2002 financial law), introduced new measures on the implementation of restoring actions in contaminated areas. Law 266/05 included two new sites of national interest and promoted negotiating procedures between the parties concerned, to be enforced in order to convert contaminated sites of relevant public interest into industrial areas.

Legislation on old hazardous sites has been reformulated by the legislative decree 152/06 and the following legislative decree 4/08. This legislation aims at reducing (or eliminating) pollution sources, identifies principles and application fields of restoration-related legislation and describes procedures, criteria and operation modes to carry out the necessary actions for area clean-up, in accordance with European principles and measures.

A mixed criterion is used to establish compulsory restoration, referring first to screening values called “Threshold concentration of contamination” (TCC) and, in case these are exceeded, to site-specific health and environmental risk analysis to be carried out to determine the “Threshold concentration of risk” (TCR); in the event of TCC exceeding values, restoration and safety measures become compulsory.

According to some estimates, SNIs identified by the law currently cover about 3% of the national territory and are characterised by some common features (table). The average area size is usually very large, infrastructural levels are on average higher than in other productive settlement areas and are largely under-exploited, the majority of sites is located close to large trunk roads (highways, airports, ports, logistic centres). Moreover, from a contamination point of view, level and nature of pollution greatly vary and require differentiated actions. Only in few cases it is possible to attract new investors and promote industrial conversion for these areas, given the lack of public sector interventions supporting the overall re-industrialisation of the site. There are manifold problems related to the management of contaminated sites or potentially contaminated sites, often involving very different topics. SNIs comprise Italy’s most important industrial areas: among these, petrochemical plants in Porto Marghera, Brindisi, Taranto, Priolo, Gela; urban and industrial areas of East Napoli, Trieste, Piombino, La Spezia, Brescia, Mantova; waste landfills. Contamination is a quite complex issue, since in most cases industrial activities with different source and intensity have followed one another over decades, thus remarkably compromising the use of landscape and environmental resources.

The presence of organic and inorganic pollutants both in groundwater, streams and sediments, with con-

— 1 DM 471/99 “Regolamento recante criteri, procedure e modalità per la messa in sicurezza, la bonifica ed il ripristino ambientale dei siti inquinati, ai sensi del DLgs 22/97”

Soil use

centration values exceeding in many cases the permitted limits by million times, imposes the use of more complex restoration technologies applied in sequences to improve these areas.

Chemical/physical features and toxicological properties of pollutants, geologic and hydro geologic characteristics of areas, problems related to the construction of environmental clean-up facilities and to human health and population safety are among the issues that are usually to be taken into account. The development of restoration programmes is therefore targeted to clean-up environmental damage, restore areas for urban development, while at the same time protecting natural soil that has not yet been built-up nor has been used for industrial purposes.

To date, authorised and/or initiated restoration projects follow the procedures envisaged for by Ministerial decree 471/99, unless the proposer requires new formulation of restoration objectives in compliance with legislative decree 152/06; projects submitted after the decree publication follow the procedures envisaged for by the latter. Ten years after the first law on SNIs has been enforced, the share of released and/or restored areas is still limited and the implementation of restoration activities is rather inhomogeneous on the national territory.

The introduction of art. 252-bis (Sites of relevant public interest for industrial reconversion) within legislative decree 4/08 envisages public financing and several elements to provide maximum speed to polluted areas reuse procedures by private subjects; this could lead to increased development of restoration activities and to productive restoration of old hazardous sites for industrial use.

Programme Agreements (already subscribed for SNIs in Laghi di Mantova and chemical pole, in Brindisi, East Napoli, Priolo, Piombino, Massa Carrara and others) are another effective tool to ensure coordinated actions among the various parties involved in restoration activities and in the implementation of speedier administrative procedures.

CIPE² deliberation of December 21, 2007 on the implementation of consistent regional, European and national policy as defined in the National Strategic Reference Framework (NSRF) 2007-2013, envisaged the drafting of the Special Strategic Plan (SSP) also called "*National special programme for the economic-productive restoration of contaminated industrial sites*", subsequently approved by CIPE deliberation of April 2, 2008, n. 61.

The SSP main objective is to increase competitiveness of economic-productive systems and capacity of attracting investors by working on quality and economic-environmental efficiency of contaminated industrial sites through their restoration, with the final aim of renewed industrialisation. SSP envisages two main priorities: 1) conversion for industrial purposes and environmental restoration; 2) technical assistance and related actions. The activities envisaged are mainly the setting up of infrastructures, the completion of industrial services, environmental restoration of polluted sites and support to central and local authorities in the definition of efficient restoration models and contaminated sites reuse for productive purposes.

In order to comply with SSP, regions have submitted a list of sites that should undergo restoration and reuse for industrial purposes and be monitored. SSP was assigned resources amounting to about 3 billion euros that could be reallocated.

Soil use

Sites of National Interest, by region, land -and sea surface, and main contamination types, 2008

Source: Ministry for the Environment, Land and Sea, 2009

Region Site name (SIN)	Surface (hectares)		Main contamination types
	Ground surface	Surface at sea	
Piemonte			
Casale Monferrato	74,325	—	Asbestos
Balangero	317	—	Asbestos
Pieve Vergonte	15,242	—	Chemical
Basse di Stura	163	—	Iron and steel Landfills
Serravalle Scrivia	74	—	Chemical Landfills Waste
Valle d'Aosta			
Emarese	15	—	Asbestos
Lombardia			
Sesto San Giovanni	256	—	Iron and steel
Pioltello - Rodano	85	—	Chemical Landfills
Cerro al Lambro	6	—	Landfills Waste
Milano - Bovisa	43	—	From gas production Hydrocarbon stocks
Brescia - Caffaro	263	—	Chemical Landfills
Laghi di Mantova e Polo chimico	1,030	—	Petrochemical Refinery Chemical
Broni	14	—	Asbestos
Trentino-Alto Adige			
Bolzano	26	—	Chemical
Trento nord	24	—	Chemical
Veneto			
Venezia Porto Marghera	3,221	2.566	Petrochemical Chemical Electric
Mardimago - Ceregnano	57	—	Manufacturing Landfills

Soil use

(cont.d)

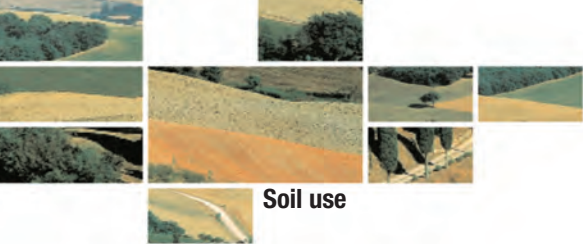
Region Site name (SIN)	Surface (hectares)		Main contamination types
	Ground surface	Surface at sea	
Friuli-Venezia Giulia			
Trieste	502	1,196	Iron and steel Refinery Landfills
Laguna di Grado and Marano	4,198	6,831	Petrochemical Iron and steel Landfills
Liguria			
Cengio and Saliceto	22,387		Chemical Waste
Pitelli	338	1,571	Landfill Waste Shipyard industry
Cogoleto - Stoppani	46	168	Chemical
Emilia-Romagna			
Sassuolo - Scandiano	(1)	—	Manufacturing
Fidenza	25	—	Chemical
Toscana			
Piombino	931	2,120	Iron and steel Landfills
Massa and Carrara	1,648	1,891	Iron and steel Asbestos Landfills
Livorno	656	1,423	Electric Refinery Hydrocarbon stocks
Orbetello (Former Sitoco area)	64	2,646	Chemical
Landfill Le Strillaie	53	—	Landfills Waste
Umbria			
Terni - Papigno	655	—	Iron and steel Landfills
Marche			
Basso Bacino del fiume Chienti	2,641	1,191	Manufacturing
Falconara Marittima	108	1,164	Refinery
Lazio			
Frosinone	(2)	—	Landfills
Bacino del fiume Sacco	117,086	—	Chemical Manufacturing

Note: (1) n. 23 località; (2) n. 119 discariche

Soil use

(cont.d)

Region Site name (SIN)	Surface (hectares)		Main contamination types
	Ground surface	Surface at sea	
Abruzzo			
Fiumi Saline e Alento	1,137	778	Manufacturing Landfills Waste
Bussi sul Tirino	234	—	Chemical Landfills Waste
Molise			
Campobasso - Guglionesi II	4	—	Waste
Campania			
East Naples	834	1,433	Petrochemical Refinery Hydrocarbon stocks
Littoral Domizio Flegreo and Agro Aversano	157,025	22,412	Landfills Waste
Napoli Bagnoli - Coroglio	945	1,494	Iron and steel
Littoral Vesuviano areas	9,615	6,698	Landfills Waste
Sarno river hydrographic basin	42,664	—	Manufacturing Waste
Pianura	156	—	Landfills Waste
Puglia			
Manfredonia	304	853	Chemical Landfills
Brindisi	5,733	5,590	Petrochemical Electric
Taranto	4,383	6,991	Iron and steel Manufacturing Refinery
Bari - Fibronit	15	—	Asbestos
Basilicata			
Tito	315	—	Asbestos Waste
Industrial area in Val Basento	3,330	—	Chemical Asbestos
Calabria			
Crotone - Cassano - Cerchiara	868	1,452	Chemical Iron and steel Landfills



Soil use

(cont.d)

Region Site name (SIN)	Surface (hectares)		Main contamination types
	Ground surface	Surface at sea	
Sicilia			
Gela	795	4,563	Petrochemical Landfills
Priolo	5,815	10,085	Petrochemical Refinery Electric
Biancavilla	330	—	Asbestos
Milazzo	549	2,190	Petrochemical Refinery Landfills
Sardegna			
Sulcis - Inglesiente - Guspinese	61,918	89,121	Petrochemical Chemical Electric
Industrial areas in Porto Torres	1,844	2,762	Petrochemical Iron and steel Electric



Economics instruments

As noted by the Minister of environment in the hearing at the Senate of the Republic (Environment Commission, 17 June 2008) at the time of her taking office, "the fundamental point is to begin to gradually move taxation from citizens' income to environmentally harmful behaviours, without altering the tax burden. Only in this way individuals and businesses will be able to make their choices orientating them gradually towards more virtuous environmental behaviours"¹. Regarding environmental taxation it will therefore be appropriate to propose "initiatives that have as a model the reduction of taxes for those who save energy and do not pollute and, on the contrary, increase the tax burden on those who do not save energy and do pollute".

The objective of government's fiscal measures, therefore, will be "to value the environment as an economic good and favour the development of businesses which specialise in environment defence with the construction, for example, of facilities for waste incineration with energy recovery, water treatment and production of renewable energy".

It is essential to turn over "the relationship between ecology and economy, up to the point where we understand that the economy is a subset of the environment and that the environment is the natural limit to any economic undertake".

The use of economic instruments for environmental policy is based on a series of concepts such as the Polluter-Pays-Principle (PPP), the User-Pays-Principle (UPP), the internationalization of externalities (external costs, social costs), the principle of integration of environmental policies in sector policies (e.g. energy, transport, industry) and in economic-financial and fiscal policies, and in general on the principle of sustainable development; all principles discussed at OECD and internationally in the '70s and '80s, adopted and developed in the European Union, with their inclusion in the treaties.

Traditionally, environmental policies have been based mostly on regulatory instruments (command & control), such as the determination of rules, standards, limits, restrictions and prohibitions, and on voluntary instruments, such as voluntary agreements (between businesses, administrations, businesses and administrations), information, training, the development of ecological etiquettes and the exchange of best practices.

Once minimal environmental conditions guarantee good public health conditions using regulatory instruments, economic instruments demonstrate their substantial effectiveness - if well conceived in terms of level, structure and environmental problems tackled - for their capacity to give an immediate price signal to consumers and producers, steering their activities while simulta-

neously respecting their preference functions and the costs which they impose on the economic and environmental system.

International references

The use of economic instruments in environmental policies is also supported in a series of strategic and operational documents relevant to our country: by the Agenda 21 of Rio (1992); by the Delors White Paper "Growth, competitiveness, employment" of the European Union (1993); by the European Strategy for Sustainable Development (2000) and its adjournment (2005); by the 6th Environment Action Programme of the EU (2000); by Italy's National Strategy for Sustainable Development (2002); in the decisions and recommendations of the OECD from 1975 to today; in the Green Paper of the European Commission on "Market-based Instruments for Environmental Policies" (2007).

In particular, the Green Paper of the European Commission explores the opportunity, valuating it positively, of a larger use of instruments based on the market at national and European levels in the following areas:

- Evolution of the directive on energy taxation;
- Covering the cost of water;
- Sustainable management of waste;
- Protection of biodiversity;
- Tradable permits for the reduction of air pollution at local level;
- Instruments for reducing the environmental impact of transport;
- Environmental fiscal reform experiences in numerous Member States.

Classification of the economic instruments for environmental policies

Several classifications of economic instruments for environmental policies are possible, based for example on the motivation (e.g. revenue, incentive mechanism of economic behaviour), on the economic sector (e.g. agriculture, energy, transport) or based on the environmental media that they influence (e.g. air, water, soil). The traditional classification the OECD uses helps to highlight the way it functions:

- Taxes, such as fuel tax or airplane noise tax;
- Tariffs, such as tariffs for the water and waste services;
- Subsidies (tax credits, exemptions, incentives) for certain modes of production (e.g. renewable energy sources) or consumption (e.g. acquisition of no polluting or less polluting goods);

— 1 Senato della Repubblica, XVI Legislatura – 13a Commissione, Resoconto della seduta del 17 giugno 2008



Economics instruments

- The creation of markets, when these do not already exist (e.g. the recent organization of a market of tradable permits for greenhouse gases or the appearance of an environmental risk insurance market);
- Sanctions (fines, penalties) applied when a standard, a limit or a prohibition is not respected.

So as to avoid some frequent misunderstandings, some aspects concerning the definitions of economic instruments for environmental policy should be made clear.

The first regards the necessary distinction between the taxes, which are any obligatory expenditures made without a counter-offer and calculated on the basis of a commodity which has environmental relevance (impact), and the tariffs, which are instead charged for a service and are in proportion of the service received. Tariffs may consequently be charged both by a public or private operator (taxes only by public). It is also possible to devise a tariff for a service (e.g. water or waste) which covers the cost of the service, and at the same time a tax which provides an additional incentive to save (for example when forecasts are for a trend of increasing their consumption beyond the load capacity of the natural system).

The second is that the naming or the tax (or economic instrument) official motivation (e.g. ecological incentives) may constitute in itself a criteria to define the instrument as “environmental”. Actually, the naming and the motivation are not sufficient, an analysis and evaluation of the measures and of their environmental impact is needed. Finally, whether earmarking is necessary to define a tax as environmental. Economic analysis suggests on the contrary to separate the moment of definition of taxation structure and of public expenditure; the earmarking seems justifiable as a solution for particularly urgent cases or for especially heavy accumulated environmental debt (e.g. the Environment Funds in Eastern Europe Countries after the fall of the Berlin Wall).

Certainly, in defining economic instruments for environmental policies in general, the idea of putting a price on the environment may be of great help; even though some examples where the environment can be considered “priceless” do, without any doubt, exist (e.g. species on the verge of extinction, long term radioactive waste), giving a value to the environment contributes to a use and consumption of environment which does not exceed its “natural limits” (sustainability).

Economic instruments used in Italy

In Italy some economic instruments with an important environmental impact have been in use for a long time, even if in most cases they were not introduced with an environmental motivation. A classic example is the excise tax on fuels, born essentially for revenue reasons (relative ease of collection and rates manageability). The EU directive which restructured the community frame-

work for the taxation of energy products and electricity (2003/96/EC, in force 1st January 2004) has widened the scope of the EU’s minimum levels of taxation, previously limited to mineral oils, extending it to all energy products, including coal, natural gas and electricity. In particular, the directive is intended to:

- reduce distortions of competition that currently exist between Member States as a result of divergent rates of tax on energy products;
- reduce distortions of competition between mineral oils and the other energy products that have not been subject to Community tax legislation up to now;
- increase incentives to use energy more efficiently (to reduce dependency on imported energy and to cut CO₂ emissions);
- allow Member States to offer companies tax incentives in return for specific undertakings to reduce emissions.

Improvements are possible to better reflect externalities and environmental costs in the prices for the use of energy products and electricity and to better orientate consumers and producers towards environmentally sustainable models.

Automobile taxes (both *one off* on the purchase of vehicles and *annually* on the circulation or possession) were also devised essentially for revenue reasons; they also can be used to reflect the impact on the environment, allowing consumers’ choices that take into account real costs and, indirectly, encouraging manufacturers’ choices of models to produce. In recent years the tax structure has started to include such elements, even if it is possible to act more thoroughly from the point of view of economic and environmental efficiency.

Italy has long been at the forefront in *road pricing* adopting motorway tariffs which have financed the development of the national highway network (IRI-Autostrade model). The privatisation of the Autostrade Company in 1999 has modified the nature of the tariffs (paid now for a service provided by private owners); in the frame of a concession to private operators, it would however still be possible to influence the tariffs in an environmental sense.

2nd generation economic instruments

Numerous economic instruments have been introduced (or transformed) in a non-systematic way in our Country during the 90’s and it would be useful to evaluate them in terms of environmental effectiveness and economical efficiency.

In synthesis among the major instruments it is worth mentioning:

- 1991: tax on plastic bags (later transformed into a tax on the raw material, the polyethylene film, then abandoned);
- 1991: contributions to the consortia for the recycling of specific waste streams (e.g. batteries, used oils, packaging), with numerous modifications of economic and juridical nature in the following years, until today’s integration within the CONAI system;
- 1992: water tariffs (the reform of the sector, known as the Galli act, introduced the principle of the full coverage of costs of the integrated water cycle);

Economics instruments

- 1994: tax on aircraft noise, from 2000 has become a regional tax;
- 1995: tax on waste landfill;
- 1996: tax on SO₂ and NO_x emissions from large thermal plants;
- 1997: tariffs on waste (the reform of the sector, known as the Ronchi decree, intended to pass from a tax to a tariff based on volume/quantity with the full coverage of costs and forms of incentives for recycling);
- 1997-98: incentives for old vehicles scrapping, with an explicitly ecological second phase;
- 1999: tax on CO₂ emissions (*carbon tax*, as part of the excise on fuels), suspended after 2 years for fear of inflationary effects; it entailed partial earmarking to the reduction of labour social contributions.

Environmental taxes statistics

The valuable work done by Istat, in harmony with classifications by OECD, Eurostat and the European Environment Agency (EEA), allows a historical analysis of the environmental taxation revenue in Italy from 1990 to 2007.

Table 1 shows how the most important part regards energy (particularly mineral oils, methane gas and electricity) and transport (taxes on the purchase and the circulation/possession of vehicles); pollution taxes are minimal and resource taxes non existent.

Two warnings of caution are however necessary: by their nature and definition, data concern only environment taxes (not, for example, tariffs), and give absolute values on revenue, not evalua-

Table

1

Nominal revenue from environmental taxes in Italy - Years 1990-2007

(values in current prices; million euros)

Category	1990	1995	2000	2005	2006	2007
ENERGY						
Border surtax on LPG	154	219	71	36	28	29
Border surtax on mineral oils	146	155	93	46	55	33
Excise duty on mineral oils and derivatives	16,095	22,844	22,172	23,236	23,924	23,193
Excise duty on uncondensed gas	289	526	615	716	488	460
Local surtax on electricity of municipalities and provinces	726	920	1,220	1,420	1,448	1,469
Excise duty on electricity	1,228	1,590	1,859	1,346	1,400	1,456
Excise duty on methane gas	685	3,410	4,560	4,549	4,794	4,917
Tax on coal consumption	-	-	56	49	41	45
Total energy taxes	19,323	29,664	30,646	31,398	32,178	31,602
TRANSPORT						
Public motor vehicle register tax (PRA)	407	910	1,034	1,211	1,299	1,317
Provincial tax on motor vehicle insurance	-	-	1,370	2,110	2,130	2,160
Motor vehicle duty paid by firms	627	686	1,006	1,166	1,228	1,320
Motor vehicle duty paid by individuals	1,996	2,747	3,290	3,808	4,034	4,044
Total transport taxes	3,030	4,343	6,700	8,295	8,691	8,841
POLLUTION AND RESOURCES (1)						
Regional special tax on waste landfill dumping	-	-	322	234	233	233
Tax on SO ₂ and NO _x emissions	-	-	50	20	17	14
Provincial tax for environment safeguard (waste surcharge)	-	109	145	200	214	217
Regional tax on aircraft noise emissions	-	5	-	..	-	-
Contribution on hazardous pesticides and phytosanitary products	-	-	-	2	2	7
Total pollution and resources (1) taxes		114	517	456	466	471
Total environmental taxes	22,353	34,121	37,863	40,149	41,335	40,914

(1) There are no environmental taxes in Italy in the 'resources' category ... phenomenon occurred in non significant measure

Source: ISTAT, 2009 (with minor adaptation in tax names) (http://www.istat.it/dati/dataset/20090205_00/, English version)



Economics instruments

tions on their structure, effectiveness and impact. Nevertheless they reveal some elements that deserve deep consideration. The simple conversion from current values to today's values (euro at constant 2007 prices) allows to see how, after a significant growth between 1990 and 1995, the environment tax revenue has progressively declined in real terms (at constant

values) in the years after, up to 2007 (table 2). Table 3 shows how the weight of environmental taxes compared to total fiscal revenue has diminished between 1990 and 2007 from 8.65% to 6.20%. Table 4 shows how the weight of environmental taxes has diminished also as a share of GDP, from 3.19% to 2.66%.

Table

2

Real revenue from environmental taxes in Italy - Years 1990-2007 (values at 2007 constant prices; million euros)

Category	1990	1995	2000	2005	2006	2007
Total environmental taxes in current €	22,353	34,121	37,863	40,149	41,335	40,914
GDP deflator	1.6637	1.3000	1.1597	1.0375	1.0172	1.0000
Total environmental taxes in € at 2007 values	37,189	44,357	43,910	41,655	42,046	40,914

Source: elaboration by the Ministry of Environment on ISTAT figures, 2009

Table

3

Share of environmental taxes in Italy in per cent of total fiscal revenue - 1990-2007 (% of total taxes and social contributions)

Category	1990	1995	2000	2005	2006	2007
Energy	7.48	7.95	6.23	5.47	5.20	4.79
Transport	1.17	1.16	1.36	1.45	1.40	1.34
Pollution and resources	-	0,03	0,11	0,08	0,08	0,07
Total	8.65	9.14	7.70	7.00	6.68	6.20

Source: ISTAT, 2009 (http://www.istat.it/dati/dataset/20090205_00/, English version)

Table

4

Share of environmental taxes in per cent of GDP – 1990-2007 (% of GDP)

Categoria	1990	1995	2000	2005	2006	2007
Energy	2.76	3.13	2.57	2.20	2.17	2.06
Transport	0.43	0.46	0.56	0.58	0.59	0.58
Pollution and resources	-	0.01	0.04	0.03	0.03	0.03
Total	3.19	3.60	3.18	2.81	2.79	2.66

Source: ISTAT, 2009 (http://www.istat.it/dati/dataset/20090205_00/, English version)



Economics instruments

Environmental tariffs: water and waste

Water

As observed by COVIRI - the Vigilance Committee for Water Resources Use set up at the Ministry of Environment and entrusted to guarantee the implementation of the principles of the law on water services reform, with particular reference to efficiency, effectiveness and economy of the service, to the regular definition and the regular adjustment of tariffs, and to consumers' interests protection - "research on the tariffs has always been, historically, fragmentary and incomplete because of the lack of statistically significant data coming from operators. A survey wishing to offer an informative outline on the tariffs applied in Italy in the water services cannot, in fact, be limited to comparing the value of the average real tariff (TRM) approved in the Area Plans (*Piano d'Ambito*); it must collect and analyse the data related to the manner with which each AATO (Optimal Territorial Area Authority) has defined the tariff structure: fixed part, consumption brackets, tariff values and their differentiation according to different uses"¹.

It should thus allow to understand to what extent the costs of the integrated water cycle service are covered (following the indications of the 1994 Galli act) and to what extent the user-pays and polluter-pays principles, adopted both at the EU and at OECD, are followed.

Significant improvements have been registered in the latest COVIRI Report to the Parliament thanks to the contribution of 58 ATO (out of the 92 in which the territory was divided on 31.12.2007) which answered the tariffs survey. In this way it has been possible to know in better detail the tariff structures applied in 2006 to 72% of population (table 5), as well as to determine the consequent expenditure for water services. It is however a reference picture which "still appears very confused and is far from the transparency and clarity requirements

needed for the interpretation of the sector development policies"¹. For example, data valid for analysis refer to approximately half of the population.

The Report also contains the best available information related to the level of investment (form of financing, planned level, level carried out) and to the degree of implementation of the integrated water service, as well as important reflections related to issues still open and unresolved; these are all essential elements to be taken in to consideration when evaluating tariff levels and structures.

The surveyed 356 tariff basins for drinking water are characterized by diversified tariffs and consumption brackets. The trend however is well defined: the process of formation of unified single administrations at the ATO level determines a reduction of the tariff structures, bringing closer together the prices of citizens living in adjacent areas. It remains to be evaluated to what extent tariffs reflect and cover costs underlying the availability and use of the service.

The tariff structure in most cases is made up of a first consumption bracket with a "subsidized" tariff, a second bracket with a "normal" tariff, third and fourth brackets with levels superior to the TRM (Average Real Tariff), which compensate in part the subsidy of the first bracket.

Data concerning turnover show that approximately half of the overall consumption is priced with the subsidized tariff of the first consumption bracket (54%), while the volume of the third and fourth brackets add up to 18% (table 6). To compensate for the lower revenues from subsidized tariffs of the first consumption bracket, an increase of the tariffs of the third and fourth ranks needs to be more than triple the reduction applied to the first.

The comparison between the average tariffs applied to different users shows how agriculture, animal breeding and craft-work sectors obtain more advantageous tariff conditions compared to households, industry and commerce. These are

Table

5

Water Tariffs - available data

	Available data	Total	%
ATO ⁽¹⁾	58	92	63
Population covered (x 1,000) ⁽²⁾	40,980	56,996	72
Tariff basins for drinking water	356	-	-

Notes: (1) 31.12.2007 (2) Population census, ISTAT 2001

Source: data processing by the Italian Ministry of Environment, Land and Sea on data provided by COVIRI figures, Report to Parliament, 2007



Economics instruments

environmentally harmful subsidies (as defined by the OECD) with important non-environmental motivations but which would deserve a review from an environmental sustainability standpoint.

The data availability for the diversified tariff structures, fixed parts and sewage and treatment charges in 266 tariff basins allows to calculate the average annual expenditure, comprehensive of VAT, at different levels of consumption. Table 7 shows how the average annual expenditure, with varying consumption, passes from €109 for 100 m³, to €344 for 250 m³, with a very high variability however at each level of consumption. For a consumption of 200 m³/year, the average level assumed for a typical household consisting of three people, the average expenditure is €250 per year, with a maximum value of €587 and a minimum of €81.

The tariff homogeneity on a large scale, and at the extreme on the entire national territory (as is the case with electricity and telephone

services), does not constitute in reality an environmental or economic objective; the wide variability of water tariffs would not be in itself a problem if it reflected the resource scarcity in the different areas and the related costs structure; in many cases the variability reflects instead, at least in part, scale and scope economies still to be achieved in the management of water.

In the last two years analysed by the COVIRI Report, the averages of tariffs applied to the various consumption brackets for drinking water - as well as to sewage, treatment and the fixed part of the tariff - highlight a general increase, in line with the limits to annual tariff increase which the "tariff method" prescribes for the average receipts of water service operators. Between 2002 - year in which in many areas the reform had not yet been initiated and the CIPE tariffs were still applied - and 2006, tariffs have increased on average by 46.6% in nominal terms (table 8); in real terms, after neutralizing inflation (11.4% in the 4 years), by 35.2%. To correctly assess these figures one should consider that the pre-existing tar-

Table

6

Volume turnover by consumption brackets

Consumption brackets	Mln m ³	%
I	798	54
II	404	28
III	192	13
IV	73	5
Total	1,468	100

Source: COVIRI, 2007 Report

Table

7

Average annual expenditure, including VAT, for consumption that varies between 100 and 250 m³/year (266 tariff basins)

	Consumption (m ³ /year)			
	100	150	200	250
Population weighted average	109	170	250	344
Maximum	217	402	587	772
Minimum	44	63	81	100
Standard deviation	25	43	65	95

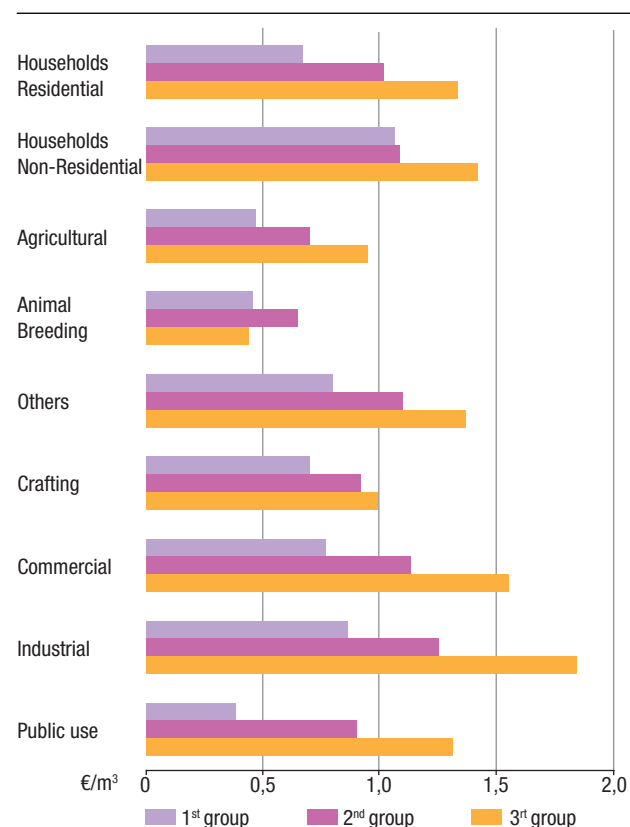
Source: COVIRI, 2007 Report

Figure

1

Value of the tariff brackets in various uses

Source: COVIRI, 2007 Report





Economics instruments

iff levels were generally low and largely inferior to the economic pay-off threshold; among others, they did not include certain costs (above all investments) which the new tariff method includes now in the tariff.

The social problem represented by the sharp increase of water tariffs in the last years, likely to continue in the next years, must not be underestimated, especially for the impact on the low income segments of the population. There are however, as has been shown by OECD on several occasions, various instruments to tackle the social aspects directly (e.g. income tax reductions, fiscal bonuses or direct social contributions); for an effective and efficient environment policy, the price signal should be kept as an indicator of the resource cost and scarcity for all the consumers and users.

The comparison with international data concerning some large foreign cities - even when correcting the overall expenditure for water services by taking into account the differences in purchasing power - makes evident that Italian tariffs determine on average a significantly lower level of expenditure. Nonetheless, also in this case, the absolute level of the prices is of relative interest (one could easily expect that a m³ of water in Stockholm or Helsinki would be less expensive than in Athens or in Seville);

what is of interest for a sound policy integrating environment and development is that tariffs reflect relative scarcities of the water commodity and of related costs structures.

Waste

As reported in the waste chapter, municipalities which, following the reform in the sector, have transformed the tax into a tariff have grown in time from 225 in 2000 to 1,193 in 2008 and from 2 to 17 million in terms of population⁴; but this is still a limited fraction of the country: 15% of municipalities and 29% of population.

Furthermore, in the majority of cases, despite some interesting experiments (e.g. payment by the bag, payment by weight with a magnetic card for the access to the waste container), it has not been possible to connect the tariff to the volume, the weight or the waste content, so as to make individuals directly responsible for waste production.

The transition from a tax proportional to the surface area of the dwelling to a tariff commensurate to the number of inhabitants of the same dwelling is a positive step forward in the waste management policies; but the inability to apply, on a large scale, tariff mechanisms which encourage individual consumers to re-

Table

8

Average annual expenditure and average annual cost of water

	CIPE 2002	COVIRI		Variation 2004/2002 (on average expenditure)	Variation 2006/2004 (per basin)	Variation 2006/2002 (on average expenditure)
		2004	2006			
Average annual expenditure, €	182	240	266	32.0%	11.0%	46.6%
Average annual cost, €/m ³	0.91	1.20	1.33			

Source: SMAT (2004) and COVIRI, 2007 Report

Table

9

Waste emergency in Naples and Campania – Separate Collection – prices for each 100 kg of recyclable waste delivered

Paper	1.84 euros	(cardboard, paper, boxes, drink cartons, newspapers, magazines, leaflets)
Plastic	18.93 euros	(bottles, bags, detergent and personal hygiene containers, jars, trays)
Glass	2.17 euros	(bottles, containers, jars)
Aluminium	28.80 euros	(drink cans, trays, sheets, spray cans, food cans)
Steel	5.63 euros	(tins, cans, spray cans, tops)

Source: Presidency of the Ministers Council, Under-Secretary of State Structure for waste emergency in Campania, 2009 (www.emergenzarifiuticampania.it)

— 4 ISPRA, Waste Report, 2008



Economics instruments

duce their personal waste and to increase the share of waste sent to recycling, establishes an important area for challenge and development in the next years.

Among the good practices which match sustainable environmental behaviour and economic benefits, it is worth while mentioning - symbolically - the adoption, as of 9 December 2008, in the area hit by the waste crisis in Naples and Campania, of an interesting incentive mechanism for recycling, introduced within the instruments package adopted to overcome the emergency. All citizens of Campania Region, the voluntary associations enlisted in the regional and national album of the Civil Protection Department and Campania parishes may collect and deliver paper and cardboard, plastic, glass, aluminium and steel packages directly to the Deposit Centres organised in agreement with the National Packaging Consortium (CONAI), receiving in exchange a corresponding payment. At the moment there are 28 Deposit Centres distributed in the 5 provinces of the Campania Region. The prices are shown in table 7.

The creation of markets

In a chapter on economic instruments for environment policies, it is impossible not to mention briefly the instruments adopted in Italy to create markets in the border zone between environment and energy (see chapter on energy and climate change for more information).

The experience of the creation of markets for the rights of emission was developed in the USA in the '70s, remaining tied to certain areas or groups of States and single gases. With the European directive 87/2003 (the *emissions trading scheme* directive) the instrument finds its widest development in terms of territory and population involved, creating emission ceilings at

national and European levels for CO₂ and mechanisms for the exchange of available quotas (*cap & trade*).

Green certificates are aimed at the adoption by energy producers of production targets, limited but certain and progressive in time, for renewable energies. White certificates, correspondingly, aim at the adoption of targets related to energy saving (box 1).

Green certificates and white certificates can be considered in many ways regulatory instruments (*command and control*).

However both certainly have significant economic effects and determine the strengthening or the creation of markets for renewables and for energy saving which would have difficulty in spontaneously establishing themselves, in the absence of mechanisms which correct the market reintegrating environmental costs and externalities.

All the more so, the market for emissions rights introduced Europe-wide in the recent years represents - with all its criticalities and specific aspects which can be improved upon - an extraordinary and unprecedented example of international cooperation in building a market. Among the elements at stake in the European debate for the revision of the emissions trading directive are: a) the broadening to sectors until now excluded from the market (e.g. air transport, maritime transport); b) increasing the emissions to be included into the market (e.g. all the 6 greenhouse gases of the Kyoto Protocol); c) the initial allocation of rights (e.g. historical, economic or available technology potential criteria); d) the issue of double taxation (better to proceed with a market of ETS rights or with a tax on CO₂? Is there equivalence, duplication or a mutual reinforcement of measures?); e) the connection between European markets, with third country markets, with projects developed in the area of "flexible mechanisms" of the Kyoto Protocol (*Clean Development Mechanism, CDM, and Joint Implementation, JI*); f) the mechanisms which will determine the future reductions of emissions ceilings, connected to

Table

10

Overview of the environment-energy incentives in the 2009 financial bill

Type of intervention	Incentive	Maximum amount, €	Time limit
	<i>% Income tax deduction</i>		
Replacement of heating equipment with condensation heaters	55	30,000	31 Dec 2010
Low heat dispersion window/door frames	55	60,000	31 Dec 2010
Installation of solar panels for water heating	55	60,000	31 Dec 2010
Energy requalification of existing buildings	55	100,000	31 Dec 2010
Purchase of high efficiency engines	20	1,500	31 Dec 2010
Inverters	20	1,500	31 Dec 2010
Replacement of refrigerators	20	200	31 Dec 2010
Installation of Lpg/Methane equipment	<i>Direct contributions</i>		
		<i>Lpg 350</i>	31 Dec 2010
		<i>Methane 500</i>	

Source: Ministry of Economic Development, 2009



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the measures of the Energy and Climate Change package of the European Union and the post-Kyoto negotiations.

Finally, the development of an insurance and bond market for environmental, climatic and hydrological risks should be mentioned, it could assume important dimensions in the years to come.

Among the possible future developments outside the energy sector, it is worth while mentioning the possibility to establish markets for rights in relation to fishing quotas in well-defined areas and in relation to specific species at risk, and concerning water in certain areas with an excess of demand compared to the available supply.

Subsidies, incentives, aids, exemptions

Whilst the environmental taxes, as already indicated, did not have great development in the last decade, numerous incentives favourable to environmental goods and services have been introduced by the 2007 and 2008 financial bills. Many have been confirmed, revised and even reinforced in the 2009 financial bill. An updated picture of the major incentives in force is reported in table 10. These are mainly measures linked to objectives concerning energy saving and efficiency, in connection with emissions reduction. The prevailing mechanism used is that of tax deductions.

Apart from subsidies, incentives, aids and exemptions *favourable* to the environment, there is a problem of subsidies, incentives, aids and exemptions *harmful* to the environment (e.g. in agriculture, fishery, road freight transport). As suggested by the OECD and the European Commission Green Paper, an economic-environmental analysis of such measures would be useful so as to progressively reduce their impact.

Environmental measures in stimulus packages against the economic and financial crisis

The global economic and financial crisis following the degradation of sub-prime loans and the flattening of financial bubbles has seen many countries adopting packages of anti-crisis measures. These often contain measures aimed at the development of the so-called green economy or at least supporting a re-orientation towards an environmentally-friendly model of development. Italy has adopted a first package of anti-crisis measures in November 2008; a second package has been prepared in February 2009 and a third block of measures is presently under preparation.

The *1st Package of anti-crisis measures* (decree-law 29/11/08, n.185, converted into law n.189 of 27/01/09) includes a long series of measures to support family income, businesses and jobs. Only one measure is clearly environmental and is related to en-

ergy efficiency; it renews the 55% deduction of the income tax for home restructuring. The cost estimate for the entire package amounts to 40 billion euro for the period 2009-11, equal to 0.2% of the annual GDP. In addition to financial measures, there are several measures of administrative, organisational and operational nature which do not involve an economic expense. No SEA of the plan is foreseen, not even in a proportionate and abbreviated form.

The *2nd Package of anti-crisis measures* (decree-law 10/02/09, n.5) in support of industrial sectors in crisis is characterized by a strong environmental motivation, with the renewal and the strengthening of incentives for the introduction of vehicles with a low environmental impact and the scrapping of old vehicles, and the broadening of incentives for home restructuring to the purchase of low consumption electric appliances, televisions, computers and furniture. The measures are illustrated in table 11.

The cost estimate of the second package amounts to 2 billion euros in the period 2009-14, covered essentially by residual sums not spent in the preceding years. No SEA is contemplated. The financial evaluation for the car sector (pinpointed as a key sector to be sustained in times of crisis) indicates a total value of the incentives for 2009 estimated in 1.2 billion euro. It is expected to be compensated by more than 50% from the increased income deriving from VAT and the effects on the induced sector ("*indotto*").

The demand increase for new cars should allow in 2009 a reduction of the use of the temporary lay-off fund ("*cassa integrazione*") estimated in 11.2 million hours (2.8 for Fiat and 8.4 for the induced sector) with an estimated saving of 500 million euros. The environmental benefits, appraised in relation to the expected replacement of 460,000 vehicles in 2009 (Euro 0/1/2 with Euro 4/5), include:

- CO₂ emissions: -30%;
- Hazardous emissions (PM, NO_x, HC): -40%.

The *3rd Package of anti-crisis measures* in preparation should include, inter alia, measures against unemployment for temporary contracts and requalification of housing and buildings based on environmental criteria. A reorientation of EU structural funds in agreement with the Regions is possible. The expenditure estimate by the Presidency of Ministers' Council amounts to additional around 40 billion euros.

Economic instruments and fiscal federalism

The institutional tendency of the country oriented towards federalism and measures being prepared at Parliament and Government level let catch a glimpse of the possibility of a fiscal federalism that could use environmental taxation and economic



Economics instruments

Table

11

The 2nd Package of anti-crisis measures (decree-law 10 February 2009, n.5)

<p>Incentives for buying cars</p>	<p>A bonus of 1.500 euros for the purchase of a Euro 4-5 car (below 130 gCO₂/Km if diesel, below 140 if gas)² with contemporary scrapping of an old vehicle (more than 10 years). A bonus of 1.500 euros for the purchase of an ecologic car (methane/electric/hydrogen) without scrapping. In case of scrapping, incentives are cumulated (3.000 euros). Ecologic cars with particularly low CO₂ emissions can reach a bonus of 3.500 euros.</p>
<p>Incentives for buying light commercial vehicles</p>	<p>A bonus of 2.500 euros for the purchase of new vehicles with the contemporary scrapping of Euro 0-1-2 vehicles registered before 31st December 1999. Incentives up to 4.000 euros for the purchase (without scrapping) of innovative new vehicles (methane/electric/hydrogen). Incentives can be cumulated with scrapping.</p>
<p>Scrapping of motorcycles and mopeds</p>	<p>Incentive of 500 euros for the purchase of a new motorcycle Euro 3 up to 400 cubic centimetres, with contemporary scrapping of a motorbike or moped Euro 0-1.</p>
<p>Installation of anti-particulate devices on public transport vehicles</p>	<p>Extraordinary financing (55 million euros, 44 of which to be drawn from higher Vat revenue) of contributions for the installation of particulate emissions abatement devices for exhausted gases by local public transport companies, in cooperation with the Ministry of Environment and Regions. 25% of cost is reimbursed (max 1.000 euros per vehicle).</p>
<p>Incentives for the conversion to Lpg/Methane</p>	<p>The State contribution for transforming gas engine cars towards lower-environmental impact cars increases from 350 to 500 € (for Lpg) and from 500 to 600 € (for methane).</p>
<p>How incentives work in practice</p>	<p>Incentives work as discounts that the consumer receives directly from the car dealer who will then recover the sum by a tax credit. Sale contracts must be signed between 7th February and 31st December 2009, vehicles registered within 31st March 2010. The intervention of SACE (Export Credit Insurance Agency) is introduced for guaranteeing financing for the purchase of vehicles entitled to incentives.</p>
<p>Furniture and EEE (electric and electronic equipment)</p>	<p>Tax deductions (split over 5 years) are introduced for the purchase of furniture, high-energy efficiency domestic electric appliances, televisions and computers; they must be connected to domestic restructuring works: the existing incentive for domestic restructuring works is extended to the purchase of these durable goods, with a 20% deduction of costs incurred, up to a maximum of 10.000 euros. Within one month the Prime Minister promotes a protocol of agreement with durable goods producers where commitments are defined for maintaining employment levels, for respecting timely payment modalities with suppliers and the distribution network, for the promotion of initiatives stimulating demand and for improving services.</p>
<p>Firms supporting measures</p>	<p>District taxation. Accounting re-evaluation of real estate property</p>



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instruments. The actual nature of federalism, similar to subsidiarity at European level, contemplates that a policy (or a measure, in the case of economic instruments) is taken at an institutional level as close as possible to the scale of the environmental problem. Some experiences and proposals from recent years follow below.

Arcipelago della Maddalena National park

Amongst the three small islands of Budelli (Spiaggia Rosa), Razzoli and Santa Maria, there is a little bay of difficult access and of high natural and marine value.

The Park has instituted an environmental fee for the access to the bay based on:

- Nature of the vessel (motor or sail);
- Dimension (length).

The protected areas seem to be an interesting laboratory for the use of economic instruments, also in light of their financial difficulties. This is true also for the historical-artistic, architectural and landscape heritage of the country. With regard to this issue, it is worth recalling the intense public discussion on the proposals for the institution of access tariffs to areas of high natural, environmental or artistic value of places like Capri and Venice.

Tax on tourism

On various occasions the introduction of a tax on tourism has been proposed, for example in a form which reminds of the old visitor tax, abandoned in its time for the high operational cost compared to the revenue produced.

In the latest formulation proposed, 42 Italian Mayors (of differing political orientation, e.g. Firenze, Roma, Venezia, Palermo and Taormina) had asked for the introduction in the 2008 financial bill of a tax on tourism:

- 5€ per night in large cities;
- 2€ per night in small cities.

The measure however found a strong aversion by the sector business associations.

In any case, a fixed sum price, as proposed, would surely have a different impact on the price of a single night, for example in a camp site (10-20€), in a medium class hotel (50-100€) or in a luxury hotel (200-400€). A percentage rate or a progressive rate would probably allow for a better acceptance of the proposal by operators and tourists. It must be underlined how such a proposal may find a full justifiability on economic-environmental grounds: it would constitute a contribution to expenses incurred to satisfy, during most crowded periods, peaks in demand for water distribution and sewage treatment, for waste collection and treatment, and the costs of construction and maintenance of local transport infrastructures.

Measures in urban areas

The cities of Singapore, London and Stockholm have adopted important economic instruments for the access to central urban

areas and are widely quoted in literature and debates on environmental policies. Italian cities also, especially in the last decade, have developed systems of tarification and access and tarification to parking and historical urban areas (for example, Roma and Bologna; in 2008 Milano adopted the Ecopass for the access to the historical centre, with many similarities to the London experience).

The 8,100 Italian Municipalities have at their disposal a wide spectrum of measures for the control of traffic and many have been adopted in the last 15 years. Alongside the traditional instruments of command & control such as regulation and limitation of traffic or limitation of vehicles by category (automobiles and motorcycles Euro 0-5, tourist buses, ...), significant economic instruments are applied such as:

- access tariffs (pollution and congestion costs);
- parking tariffs (occupation of scarce space);
- multi-hour and season variations of prices, sometimes depending on the vehicles category and their polluting burden.

Local public transport with bicycles

Among the latest interesting developments in Europe and Italy, we register the launch of local public transport with bicycles (e.g. Paris, Lyon, Barcelona, Milano, Roma). The positive effects on the reduction in costs due to traffic congestion and on the reduction of emissions by traditional means of transport appear limited but certain. The use of economic instruments, in this case tariffs, appears particularly valid for the financing of the initial investment, its maintenance and operation. The tariff structure, usually with a free first period (typically half-an-hour) and successive strongly progressive periods, encourages the use over short journeys as a complementary mode to other means of transport (car, bus, underground). With adequate measures to mitigate the effects of road accidents, the positive consequences on the health of users of such systems may provoke significant effects on public finance.

Extraction of materials

Most Italian regions have introduced some form of tax/tariff/contribution on the extraction of materials from quarries (e.g. marble) and from river beds (e.g. sands and gravel).

The base for the calculation of the tax varies on the basis of:

- Quantity (weight in tons, raw or selected material);
- Volume (cubic meters, raw or selected material);
- Value (euro, excise or percentage).

The funds collected are in part tied to the recovery of the sites of extraction. In many cases the income is divided between the Region, the Provinces and the Municipalities in which the extraction takes place.

The relationship between the measure adopted and the environmental problem to be solved should be carefully evaluated. In many cases the measures aim much more at collecting revenue and recovery of the sites, than at influencing the production and



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consumption models (protection of the landscape, conservation of resources, reduction of the materials used for building and public works, incentivating eco-innovation in building activity, recycling of materials resulting from demolition). The rate level often seems inadequate when dealing with such aspects of the environmental issue.

Environmental tax reforms

Environmental tax reforms require a systematic revision of the fiscal system in an environmental sense. The major options available are:

- Elimination of subsidies, tax deductions and incentives which are harmful for environment;
- Introduction of new taxes which hit consumption and production which damage the environment;
- Modification of existing taxes;
- Introduction of subsidies, tax deductions and incentives favourable to the environment (economically justified).

The manoeuvre, in a historical phase considered to be characterized by an excessive tax burden, is often presented as fiscally “neutral” (from an income point of view, not necessarily from the point of view of distribution). It should however be noted that an environmental tax reform is valid and possible also in periods of growing tax burden or of strong reduction of taxes; as well as in phases of transition towards fiscal federalism.

The environmental tax reform has already demonstrated its practicability in many European countries, with a first wave of reforms successfully adopted in Finland (1990), Norway (1991), Sweden (1991), Denmark (1992), Netherlands (1992). Some other large European countries have followed the example with more limited but recognised success: Great Britain (since 1993), Germany (in 1999 and early 2000’s) and France (1999-2000, 2008). Also other non-EU countries (e.g. China, Korea, Turkey) have recently begun to develop measures in line with environmental tax reforms.

At the European Union level the problem of the unanimity rule in the fiscal field still stands; the recent Green Paper on market-based instruments for environmental policies is contributing to mature opinions on the opportunity of a wider use of economic instruments for environmental policies and climate change.

Italy too has tried over the years to introduce environmental tax reforms, but attempts did not succeed for various reasons: in 1990-91 the integrated package of economic instruments proposed in the financial bill (which already included markets for emission rights) did not manage to go beyond the adoption of a tax on plastic bags; in 1992 the start of the works of the SECA commission (Economic Instruments in the Environmental Field) at the Ministry of Environment was stranded because of the early elections; in 1994 the White Paper of the Minister of Finance Tremonti included in the general tax reform a shift of taxation

from labour and capital towards energy and natural resources which did not find application once more because of the early elections; in 1997 the 1st National Conference on Environmental Taxes resulted in the identification of a component of CO₂ in the excise on fuels (1999), but was then suspended for fear of inflationary effects.

Consequently wide margins appear in the Italian scene for a revision of the fiscal system in an environmental sense, for example with a reduction in the tax revenue from labour and business and its compensation with a taxation of the use of natural resources and the environment.

The international techno-scientific community is contributing in a significant way to the pondering of these themes with the work of OECD on taxation and environment, of EEA (e.g. the project on “Fiscal reforms in Europe in the next decades: implications for environment, eco-innovation and distribution of incomes”), the *Global Conference on Environmental Taxation* (Munich 2007, Singapore 2008, Lisbon 2009), the work of *Green Budget Europe* (platform of European experts on the use of economic instruments in environmental policies).

EU cohesion funds for the environment and renewable energies 2007-2013

The EU Community strategic guidelines on cohesion for 2007-2013⁵ establishes that Member States and Regions must pursue the objectives of competitiveness, attractiveness and development of the territories, focusing on waste management and water resources, sustainable mobility, efficiency and energy saving, scientific research and quality of environmental services.

The entire 2007-2013 programming is aimed at the implementation of the contents of the European Union Lisbon Strategy⁶ recently re-launched and re-orientated following the principles defined in the new Strategy for Sustainable Development⁷.

In order to ensure the integration of the environmental component in the development programs and to prevent and mitigate any negative effects generated by the implementation of interventions, the European Commission has required the application of the directive 2001/42/CE on Strategic Environmental Assessment (SEA) to the operational programs for the programming cycle 2007-2013. To finance the cohesion policies for 2007-2013 on the themes of environment, energy efficiency and energy saving, the European Union has allocated approximately 105 billion euros for all the Member States. An important share of this sum, equal to 54 billion euros, is designed to help Member States to improve the application of EU provisions related to environment; to improve water and waste management the program provides expenses amounting to 28 billion euros.

— 5 Council Decision, “Community strategic guidelines on cohesion”, 6th October 2006 (2006/702/CE) — 6 Communication to the Spring European Council, “Working together for growth and jobs: a new start for the Lisbon Strategy”, COM (2005) 24, 2.2.2005 — 7 European Council, “Renewed EU sustainable development strategy” DOC. 10917/06 — 8 The share of national co-financing must be added to these resources



Cross-cutting Instruments for Environmental Policy

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As far as Italy is concerned, the National Strategic Framework (*Quadro Strategico Nazionale - QSN*), approved in its final version on the 13th July 2007, is the strategic orientation document selecting the areas to be financed as well as defining methods and conditions for the funds expenditure. The document is the result of a wide-ranging and deep discussion among central and regional administrations, representatives of the institutional and socio-economic partnerships, in which environment and energy themes played an important role. The total amount funding of the QSN 2007-2013 is worth over 28.8 billion euros⁸ of which approximately 21.9 come from the European Regional Development Fund (ERDF) and 6.9 from the European Social Fund (EFS); in total approximately 8.9 billion euros have been allotted to environment and renewable energy matters. These resources have been divided among 42 Operational Programs financed by FESR and 24 financed by FSE, all characterized by significant endowments for environment and renewable energy.

Approximately 1.8 billion euros (20.7% of the total) are bound to investments on the railway network, 1.4 billion (15.7%) are for activities of urban and rural re-generation, and another 1.8 billion (20.7%) is attributed to the production of energy from renewable sources and to energy efficiency. The other funds are bound to operations for the management of waste and water resources, eco-innovation, bio-diversity, urban mobility

and risk prevention (table 12, figure 2).

In particular, in the energy sector, the 450 operational programs of the European Union cohesion policy 2007-2013 schedule investments of 4.8 billion euros in the field of renewable energies and 4.2 billions for energy efficiency and energy management measures. These investments, together with those for the railway network (23 billion euros), for urban mobility (6 billions) and for urban and rural re-generation (1.6 billions), concur to meet the EU objectives of combating climate change, set in the Climate-Energy package, and to promote the transformation in a low carbon intense economy.

Planned expenditure for investments in the production of energy from renewable sources and energy efficiency in Italy (approximately 1.8 billion euros in the 2007-2013 period) represents 20% of European funds for these themes (9 billions). They consist of about 340 million euros (18.4%) investments in solar, 390 millions (20.8%) in biomass and 790 millions (42.9%) in energy efficiency, co-generation and energy management (table 13, figure 3).

Table

12

EU resources for environment and renewable energy in Italy (QSN 2007-2013)

Expenditure categories	EU funds Millions of euros
Eco-innovation	524.5
Railways	1,839.8
Renewable energy	1,049.1
Energy efficiency	793.8
Waste management	338.1
Water resources	574.9
Biodiversity	57.1
Sustainable mobility	357.7
Risk prevention	396.1
Urban and rural re-generation	1,393.4
Other	1,550.8
Total	8,875.4

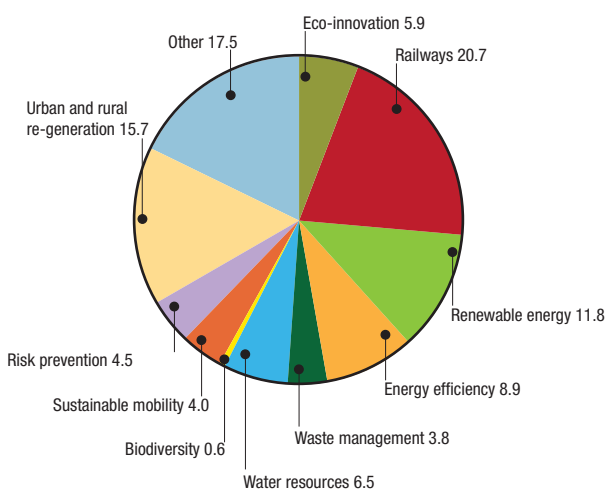
Source: European Commission, DG Regio, 2009

Figure

2

EU resources for environment and renewable energy in Italy values %, (QSN 2007-2013)

Source: European Commission, DG Regio, 2009





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Table

13

EU resources for renewable energy in Italy (QSN 2007-2013)

Expenditure categories	EU funds Millions of euros
Renewable energy: wind	75.4
Renewable energy: solar	340.2
Renewable energy: biomass	385.9
Renewable energy: hydroelectric, geothermal, others	256.2
Energy efficiency, co-generation, energy management	793.8
Total	1,851.5

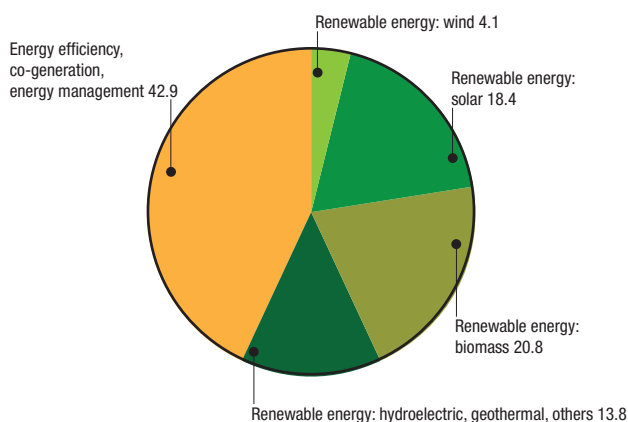
Source: European Commission, DG Regio, 2009

Figure

3

EU resources for renewable energy in Italy values %, (QSN 2007-2013)

Source: European Commission, DG Regio, 2009



Box

Energy efficiency securities (white certificates)

The decrees for white certificates of 20 July 2004 (revised and updated in 2007) fix the requirement for electricity and gas distributors with customer basins over 50,000 customers to make energy efficiency improvements upon final users, so as to obtain a predefined saving of primary energy in the period 2005-2012. For achieving the target the required distributor companies can:

- intervene directly;
- avail themselves of controlled companies;
- purchase Energy Efficiency Securities (TEE) issued by the Electricity Market Operator (GME) from the Energy Service Companies (ESCO) or from distribution companies which are not subject to requirements (but that are admitted by the decrees to operate on the offer side and have realized admitted interventions).

The decrees describe the typical kinds of interventions concerning civil and industrial sectors which are admitted.

The evaluation of savings achieved by admitted interventions has been assigned to the Authority for Electricity and Gas. To this end, the Authority has issued the guidelines for the preparation, execution and ex-post assessment of projects, as well as for criteria and modality of issuing the energy efficiency securities (including documentation proving results obtained which must be produced by the distributors).

For each ton of oil equivalent (toe) saved, a tariff contribution of 100 euros is recognized to distributors subject to energy efficiency requirements, a value which in practice works as a reference for the price of the TEE. TEE trading on the platform (market) of the Electricity Market Operator has grown exponentially in the first years of activity (table 1) and satisfies predefined targets; TEE market trading share compared to total market exchanges has grown from 17% in the first year to 35% in the third year. Two thirds of exchanges however are based on bilateral negotiation; since April 2008 there is an obligation to make prices public (table 2).

— 1 Decrees of July 20th 2004, issued by the Ministry for Productive Activities and the Ministry for the Environment, published in the Official Gazette of September 1st 2004; amended in 2007 by the Ministry of Economic Development and the Ministry for the Environment, Land and Sea, published in the Official Gazette of December 28th 2007

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Table

1

White certificates - Price of the TEE traded on the GME platform

	Energy saved per source		
	I - Electricity savings	II - Gas savings	III - Other fuels savings
2005/06			
TEE traded	15,024	10,086	76
Max price	84 €	98 €	36 €
Min price	69 €	90 €	32 €
Average price	77 €	94 €	34 €
2006/07			
TEE traded	46,444	30,422	0
Max price	65 €	91 €	-
Min price	33 €	60 €	-
Average price	48 €	84 €	-
2007/08			
TEE traded	243,646	58,986	2,300
Max price	69 €	90 €	38 €
Min price	29 €	60 €	5 €
Average price	45 €	77 €	22 €

Source: AEEG elaborations on GME data, Yearly Reports on energy efficiency securities mechanisms, www.autorita.energia.it

Table

2

White certificates - Price of the TEE in bilateral exchanges

	Type I	Type II	Type III
April 2008			
Exchanges volumes (TEE)	216,812	35,384	0
Weighted average prices (€/toe)	62	77	-
May 2008			
Exchanges volumes (TEE)	31,629	21,450	1,446
Weighted average prices (€/toe)	85	79	30
February 2009			
Exchanges volumes (TEE)	52,204	6,890	310
Weighted average prices (€/toe)	55	35	35

Source: GME data, www.mercatoelettrico.org/It/Esiti/TEE/TEE.aspx, 2009



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By 31 May 2008, 215 operators had enrolled in the Register for Energy Efficiency Securities (46 distributors, 160 ESCO, and 9 traders) with an increase by 23% compared to the previous year. 175 are also recognized as market operators (37 distributors, 131 ESCO, and 7 traders) and can act on the GSE platform. With decree (21 December 2007), yearly energy efficiency targets have been increased and, at the same time, targets for the period 2010-12 have been defined (table 3).

Table

3

Yearly savings objectives for electricity and gas distributors

Anno	Sector		(Mtoe)
	Electric	Gas	
2008	1,2	1,0	
2009	1,8	1,4	
2010	2,4	1,9	
2011	3,1	2,2	
2012	3,4	2,5	

Source: decree 21 December 2007

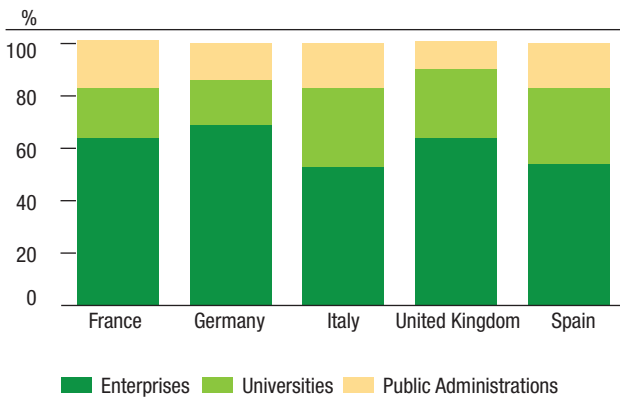
Eco-innovation and environmental research

Figure

1

Composition of the expenditure in R&D by institutional sectors in selected European countries % values, 2005

Source: COTEC – Foundation for technological innovation, 2008



penditure for scientific research amounts to about 8,970 million euros and constitutes approximately 0.57% of the GDP. The distribution of the funds according to socio-economic objectives, identified following the main target expressed either by the institutional mission or in the management plans of research related items of the budget, shows that 40,2% is allocated to university research (promotion of basic knowledge), 12,2% to health research (protection and promotion of human health), and 3,6% to the control and protection of the environment (table 1).

Law n. 296/06 (2007 financial law) has performed a significant rationalisation of traditional instruments in support of research, allocating in the budget of the Ministry of University and Research the fund for the investments in scientific and technological research (FIRST). The FIRST merged the resources of the Fund for aid to research (FAR), the Fund for the basic research investments (FIRB), the part of the Fund for under utilised areas within the competence of the Ministry of University and Research, and the annual resources for the national interest research projects of the university (PRIN). Other directives in support of research and innovation of enterprises contained in law n. 296/06 concern: the allowance of a tax credit of 10% for the investments and the costs of research and innovation businesses (with the possibility to rise to 15% if the costs of research and development are deferred to contracts which are stipulated with public universities and research bodies); the valorisation of the research and development programmes performed by newly constituted innovative businesses; the financing (among others) of projects for industrial technological innovation (PII); the de-

velopment of specific products and services with a high innovation content within the scope of the five technological areas considered as strategic for the re-launching of the competitiveness of Italian business (namely, energy efficiency, sustainable mobility, new health technologies, support to “made in Italy” products and innovative technologies for cultural and tourist activities). The PIIs are foreseen within the Program for industrial innovation of the five technological areas considered for economic development (known as “Industry 2015”).

Subsequently, law 244/07 (2008 financial law) introduced fiscal incentives for investments in research and development activities and for basic research projects. Law 133/08 established incentives to the growth of investments in research and development in the energy sector and to the promotion of fourth generation nuclear plants or fusion research.

Research plays a fundamental role for the introduction of innovative solutions for the mitigation of greenhouse gases and the reduction of energy consumption from fossil fuels. Between 2002 and 2006, through the Fund for investment in basic research (FIRB), 286 projects have been financed in the sectors of climate change, environment, energy, natural resources conservation, transport, and public health, of a total value of 395 million euros, with a public contribution of 291 million euros.

In 2004, the Special Integrative Fund for Research (FIRS), instrument for the integration of research activities not connected to specific and immediate industrial or commercial objectives (co-financed by the Ministry of Education, University and Research, the Ministry of Economy and Finance and by the Ministry for the Environment, Land and Sea), has promoted the creation of the “Euro-Mediterranean Centre for Climate Change” (CMCC) with a contribution of 27 million euros. The CMCC is an organisation for scientific research with the aim to deepen the knowledge in the field of climatic variability, its causes and its consequences. In the same channel two programmes of strategic relevance have been identified (“New systems of production and management of energy” and “Sustainable development and climate change”) and fourteen projects have been co-financed in the areas of “hydrogen vector” and “combustion cells”.

As far as research for the valorisation of solar energy is concerned, two significant projects have been initiated: the building at Porto Gargallo (Siracusa, Sicilia) of the first pilot installation for the production and accumulation of heat at high temperatures through the capture of solar energy (known as “Archimedes Project”) and the construction of the plant at Lonate Pozzolo (Varese, Lombardia) for the pre-industrial cycle production of photo voltaic cells of thin films of cadmium tellurium and cadmium sulphide through an innovative process developed by the University of Parma. In the field of research and development in the hydrogen sector the Ministry for the Environment, Land and Sea has co-financed, as part of the agreement of March 2005 with the Veneto Region, the setting up at Marghera (Venezia) of a hydrogen technological district. In 2007, as part of a project with

Eco-innovation and environmental research

the University La Sapienza of Rome, a research line started on hydrogen for the study of three classes of materials in a solid state for the accumulation of an alternative energy vector. In regard to scientific and technological knowledge on climate change, the existing agreement of co-operation signed between Italy and the United States was renewed in 2006 with a three year duration, co-ordinated by the CMCC and in collaboration with other public and private institutions and research centres. Building upon the strengthened cooperation in the first phase of the agreement, the project aims at developing the knowledge on climate change at a regional scale, with special emphasis on the Mediterranean region.

In December 2008 the Ministry for the Environment, Land and Sea issued a public call of 10 million euros for the financing of projects for energy efficiency and the use of renewable energy in urban areas, characterised by strong replication potential and know how transfer to industries.

Research in the sector of sustainable development has an important role also in the National Research Programme (PNR) 2005-2007⁵. The private sector, universities and public research institutions have adhered to the invitation of the Ministry of Education, University and Research for the presentation of project ideas, in twelve strategic programmes highlighted in the PNR for the re-launch of competitiveness of Italy; projects are financed with a non refunding loan and with special or normal credit. In

the programmes “Reinforcement and Development of the Motor Industry including two wheel vehicles with low consumption motors and low environmental impact” and “Energy saving and micro-generation distribution” nine projects for a total eligible cost of 80 million euros, and six projects for a total eligible cost of 36 million euros have been financed so far, respectively.

The PNR 2005-2007 has also foreseen the realisation of, and the support to the “Technological Districts”. These agreements represent a new pattern of support to development, which involves the business and the scientific sectors, as well as the private financial operators and local authorities. On this line, an agreement has been made with the Basilicata Region for the realisation of specific preparatory actions for the technological district in the sector of innovative technologies for the protection from hydrologic, seismic and climatic risk, with public funding of 6 million euros, devoted to the financing of specific industrial research projects.

The promotion of eco-innovation and the creation of new jobs in small and medium enterprise (SMEs) operating in the green economy are important priorities also in the European policy for the less developed regions and areas. In the 2000-2006 Structural Funds cycle, support has been promoted for the research carried out by enterprises in the environmental field, with projects included in the National Operational Programme (PON) “Scientific research, high level training and technological devel-

Table

1

Sums allotted by Central Administrations for research, 2008

Socio-economic objectives	Million euros	% of total	% of GDP
Exploration and utilisation of the territory	262.8	2.9	0.02
Control and protection of the environment	326.7	3.6	0.02
Exploration and use of space	655.0	7.3	0.04
Transport systems, telecommunications and other infrastructures	105.2	1.2	0.01
Production, distribution and efficient use of energy	529.5	5.9	0.03
Production and industrial technologies	775.0	8.6	0.05
Protection and promotion of human health	1,092.5	12.2	0.07
Agriculture	304.7	3.4	0.02
Education	235.3	2.6	0.02
Culture, recreation, religion and communication mass media	95.7	1.1	0.01
Systems structures, and social and political processes	797.5	8.9	0.05
Promotion of basic knowledge – research financed by FFO (1)	3,055.9	34.1	0.19
Promotion of basic knowledge – research not financed by FFO (1)	553.3	6.2	0.04
Defence	123.9	1.4	0.01
Transfers to the Regions	56.6	0.6	0.00
Total	8,969.5	100.0	0.57

Note (1): Ordinary fund for universities Source: Ministry of Education, University and Research, 2009

— 5 Issued by the Ministry of Education, University and Research, in compliance with legislative decree. 204/1998, art.1, par 2



Eco-innovation and environmental research

opment 2000-2006". In particular, direct actions have been included to the measure 1.3 of the Programme (Research and Technological Development in Strategic Sectors of Southern Italy) which support research projects in different environmental branches (water and soil protection, atmospheric emissions, waste reduction, re-utilisation and recycling), also within specific areas (e.g. protected areas). Twenty-six projects have been financed, with total investments about 136 million euros, with the participation of a considerable number of private enterprises (38) and of public research centres and universities (43).

The Regions have also financed interventions in the field of environment innovation that mostly consist of incentives to develop procedures for the qualification and environmental audit and certification of the business network. The need has arisen to coordinate the programming of structural funds with the 6th Research Framework Programme (RFP), which has envisaged important interventions for sustainable development. In particular, the advantages for the business network of southern Italy has been highlighted in terms of growth and competitiveness, where the opportunities offered could be seized by an effective integration between the systems of national and European research.

The national programme of EU structural funds for research and innovation 2007-2013 continues to support research activity on environment, and sustainable development represents one of the horizontal principles of the process. The National Strategic Reference Framework (QSN) allows for actions in the production of comprehension systems (university and research bodies) and that of intermediaries who have the task, within different territorial contexts, to transfer knowledge to enterprises in order to transform knowledge in new or better qualified products and services. Actions in the business system are also considered. In particular, research projects considered of strategic value, on the basis of possible follow-up in collective well-being and in promoting sustainable development can be financed, with strong links of collaboration between the research system and the production system. Also investments in research and innovation finalized at reaching the objectives of sustainability of the environment through the reduction, reconversion and requalification of production inputs are promoted.

The structural funds, and more generally the regional policy of the European Union in its different contexts, can support the participation of the performers of the system of research and innovation in the initiatives of the 7th RFP, also in regards to the environment. Actions are foreseen to reinforce (in the areas of infrastructure and human capital) the actors involved in the system of research and innovation so that, in time, they can become accomplished in all the areas of activity of the programme. In particular, the structural funds may ease forms of inter-regional collaboration in research and development, activating methods and attitudes that can be reinforced by the "ter-

ritorial cooperation" programmes and allow for the performers themselves to take part in public calls of the seventh RFP.

An innovative component of both the 6th and 7th RFPs is represented by European Research Activities Network (ERANET). It consists of a series of projects with the priority objective to strengthen the efficiency and the capacity of European research, reducing the fragmentation of human and financial resources. Each project is dedicated to a specific area of scientific and technological research and approximately one quarter of the projects regards energy and the environment directly, but many other relevant environmental aspects are also considered. Presently the Ministry for the Environment, Land and Sea is partner in three projects:

- SKEP project (Scientific Knowledge for Environmental Protection);
 - CIRCLE project (Climate Impact Research Coordination for a Larger Europe): duration 4 years, started in November 2005, dedicated to the adaptation to climate change;
 - EUWI-SPLASH project (European Water Initiative): duration 4 years, started in February 2007, dedicated to water resources, with specific attention to programmes for developing countries.
- The ERANET projects have the objective to ease the coordination of the environment research of the member States, both to harmonise the various programs of national research, and to intensify the synergy between the institutions responsible for the elaboration of environment policy and regulations, and the scientific community.

Among the activities which have been generated by these projects there is the creation of comprehension and analysis instruments of environmental research implemented in the various member States (database), to better identify possible synergies, gaps in knowledge, as well as overlapping, in order to rationalise the organisation of the research; also guidelines and good practices have been developed for the organisation, evaluation and divulgation of the research. A trans-national research initiative, led by objective criteria, based on the analysis of the existing knowledge gaps and on the need to support the development of national and European environmental regulations, is promoted by setting up mechanisms of combined financing, granted by the partners of the ERANET project.



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Environmental Education

The reference framework

Since the 1972 Stockholm Conference on the Human Environment, and later through all the most important international meetings (the Rio Conference on Environment and Development in 1992, the Special Session of the General Assembly of the United Nations - UNGASS Rio+5 in 1997, the Johannesburg WSSD in 2002), environmental education and education for sustainable development have been considered a fundamental tool for increasing knowledge on environmental issues, to improve awareness and capacities necessary for adopting a social model based on sustainable development, and to promote behavioural changes in individuals and communities necessary for adopting sustainable lifestyles.

In December 2002, upon finalizing the recommendation contained in the Johannesburg Plan of Implementation, the General Assembly of the United Nations approved a resolution establishing the UNESCO Decade of Education for Sustainable Development (DESD) 2005-2014.

During the 5th UN-ECE (United Nations Economic Commission for Europe) Ministerial Conference “Environment for Europe”, the Ministers of the Environment focused on the promotion of the Decade for ESD and to contribute, at a regional level, to the implementation of the UN-ECE Strategy for education for sustainable development, adopted at Vilnius (Lithuania) in March 2005 and signed by Italy. The UN-ECE Strategy calls Governments to promote its implementation through a strong policy commitment aimed at integrating the objectives of sustainability into educational, training and information policies, at all levels – formal, informal and non-formal, finalized to the creation of a National Plan for implementation.

Furthermore, the Ministerial Declaration signed during the latest UN-ECE “Environment for Europe” Conference (Belgrade, 2007) underscored the renewed commitment of the international community to promote education as a fundamental tool for promoting a new society based on democratic principles and sustainability values.

Environmental education in Italy

Environmental education in Italy is built on a long and concrete experience. At national level, the law that provided the estab-

lishment of the Ministry of the Environment (law 349/86) gave it the institutional function of coordinating and promoting activities on environmental education, information and training, while acknowledging at the same time an important role for the cooperation with the Ministry of Education.

The Ministry of the Environment, Land and Sea has, over the years, implemented a strategy aimed mainly at integrating environmental education with other sectoral policies, as a support tool for creating consensus, promoting participation, disseminating information and awareness, and promoting changes for responsible behaviour and lifestyles.

Following the 1st National Conference on Environmental Education held in Genova in April 2000, Italy was provided with the policy orientation document “Guidelines for a new planning process between State and Regions and the Autonomous Provinces on environmental information, training and education (INFEA)”, adopted by the State-Regions Permanent Conference in November 2000.

The guidelines, through the definition of roles, responsibilities and areas of action of both the State and Regions, and the implementation of interventions and past experiences in this sector, represented the basis for defining the INFEA National System as the integration of the regional scale systems, based on a model of sharing strategies between central and local governments, and supported by the proactive and fundamental contribution from all stakeholders (students, teachers, environmental NGOs, protected areas institutions, local governments, etc.).

The INFEA Agreement, stipulated between State and Regions and Autonomous Provinces, also identifies a formal body, the INFEA Technical Board, as the permanent seat for the comparison and concert of actions aimed at increasing environmental awareness through educational processes, and through means inspired by principles of subsidiarity and competitiveness. The Ministry of Education, University and Research is also a member of the Technical Board.

The INFEA National Programme 2002-2005

The first INFEA National Programme, completed in June 2005 and for which 11.6 million euros were allocated, was implemented through 19 Agreements with the Regions and Autonomous Provinces (table 1). Through these agreements, the INFEA regional networks were extended, and environmental education, training, and information programmes were started

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that aimed at different targets, such as schools, citizens, self-employed professionals, craftsmen, public administrators, category associations, etc.

The INFEA National System represents, even at the EU level, an original example of harmonized policy implementation, which considers both the State and Regions directly involved in the planning and financing of the measures.

Shifting from environmental education to education for sustainable development

Education for sustainable development has become today a priority target to face the challenges set in the context of global changes that invest both the community and individu-

als, and for which it is necessary to give concrete answers that can no longer be postponed. The National Forum for Education for Environment and Sustainability, organized by the Ministry for the Environment, Land and Sea in cooperation with the Piemonte Region, which was held in Torino in June 2007, had the objective of singling out new inputs on education as a cross-cutting tool compared to other sectoral policies, shared with institutional representatives from State and Regions, academic and scientific bodies, environmental NGOs, and from all the stakeholders involved in different way in educational processes.

The National Forum represented the first important step of a process to reorient education policy, and produced as an initial result the establishment of the second INFEA National Programme, with the adoption of the guideline document for

Table

1

Resources allocated in the 19 Agreements of the INFEA Program approved in 2002-2003

Regional programs	Regional co-financing	Ministerial co-financing	Other co-financing	Total
Piemonte	1,988,360	609,911	0	2,598,271
Lombardia	2,390,089	609,911	0	3,000,000
Trento (aut. prov.)	1,587,128	413,150	308,564	2,308,842
Veneto	1,735,089	609,911	0	2,345,000
Friuli - Venezia Giulia	702,555	609,911	0	1,312,466
Liguria	3,165,000	600,000	0	3,765,000
Emilia - Romagna	962,888	609,911	0	1,572,799
Toscana	659,776	609,911	0	1,269,687
Marche	1,027,445	609,911	600,000	2,237,356
Umbria	960,610	609,911	164,852	1,735,373
Lazio	414,118	609,911	0	1,024,029
Abruzzo	1,223,038	609,911	0	1,832,949
Molise	2,000	487,900	0	489,900
Campania	95,958	609,911	94,131	800,000
Basilicata	890,000	600,000	440,099	1,930,099
Puglia	3,490,000	600,000	0	4,090,000
Calabria	826,270	609,500	127,500	1,563,270
Sicilia	605,000	609,900	960,100	2,175,000
Sardegna	966,000	609,911	0	1,575,911
Total	23,691,323	11,239,382	2,695,246	37,625,951
Interregional Programs				
Umbria - Training Program		196,746		196,746
Toscana - Quality Indicator System		118,048		118,048
Sicilia - Publishing Program		78,698		78,698
Total		393,492		393,492
TOTAL	23,691,323	11,632,874	2,695,246	38,019,443

Source: Ministry for the Environment, Land and Sea, 2009



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State, Regions and Autonomous Provinces planning “Orientation and objectives for the new planning framework for education for environment and sustainable development” (adopted on 15 March, 2007). The document includes objectives and perspectives aimed at strengthening the cooperation between central and local institutions to open the new INFEA System to a broader participation, aimed at sharing and defining roles and responsibilities of each and everyone in directing the formal, informal and non formal education processes, in a long-life-learning approach.

The approval by the State-Regions Conference of the “New State-Regions planning framework on education for sustainable development”, agreed in August 2007, represents the formal element of continuity with the preceding INFEA National Programme. This broad political agreement, which directly involved the Ministry of Education, University and Research, is aimed at proposing a model of integration of the principles of sustainability such as equity, social inclusion and environmental protection with cultural and formative aspects, which can orient the choices of individuals and communities, and at supporting the effectiveness of sectoral policies for sustainability.

The new planning framework is implemented by the State, the Regions and the Autonomous Provinces to support and strengthen the regional systems, and is open to cooperation among different institutional bodies. The document is focused on priority actions divided in three levels (national, interregional and regional), including the three educational sectors – formal, informal and non-formal, respectively, and defining specific actions for each sector. The objectives respond to the need to strengthen the national education system and to adapt it to the new global context; in particular, as recommended by the Regions, the need to develop a legal framework for the professional skills for education for environment and sustainability is stressed. Financial resources for the implementation of the new planning framework have been allocated by the Financial Law 296 of 26 December, 2006 (2007 Financial Law), within a “Sustainable Development Fund” of 25 million euros for each year 2007, 2008 and 2009, which is intended, among other objectives, for the creation of information, training and education for environment and sustainable development.

International activities

The UN Decade on education for sustainable development (DESS)

The UN Decade on education for sustainable development (DESD-2005-2014) represents a major framework to lead everyone to reflect on the opportunities in sharing information and objectives towards a common growth. The United Na-

tions declared the 2005-2014 period the “Decade of Education for Sustainable Development”, asking governments of all countries to develop specific policies aimed at integrating the principles of sustainability at all levels of educational systems as a fundamental key to change.

Specifically, in the implementation document of the Decade, issued by UNESCO, education represents a long life learning process focused not only on formal education received at schools and universities, but also on informal education whose contents cross, especially, through media, advertising, and information and communication instruments, by which we are all stimulated as opportunities for continuous learning.

The UNESCO World Conference on Education for Sustainable Development, held in Bonn this year, represented an opportunity for taking stock of results achieved and criticalities encountered so far, and for re-launching the second implementation phase of the Decade.

In Italy, the Decade implementation process is coordinated by the UNESCO Italian National Commission, which established a National Committee to implement a programme of activity for increasing awareness, promoting research and stimulate the debate on education for sustainability.

The UN-ECE Strategy on Education for Sustainable Development

Italy is actively involved in the implementation process of the UN-ECE Strategy for Education for Sustainable Development through the participation in the Steering Committee and through the development of activities at national level, aimed at integrating objectives of sustainability into educational policies at the formal, informal and non formal level. During the last UN-ECE “Environment for Europe” Conference (Belgrade 2007) a joint Statement of the Ministries of the Environment and of Education was adopted, strongly supported by Italy. The Statement recalls governments to strengthen the existing policies in implementing the UN-ECE Strategy and to promote education as a fundamental tool for the growth of a society based on democratic and sustainable values.

The international Task Force on education for sustainable consumption

Among the activities planned at international level for implementing the Johannesburg Plan of Implementation, the “Marrakech Process” on Sustainable Consumption and Production (SCP) coordinated by UNEP (United Nations Environment Programme) aims to develop a ten year framework of programmes in support of international and regional initiatives to accelerate the change towards sustainable consumption and production patterns.

Within this framework, Italy launched in May 2006 an inter-



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national Task Force on Education for Sustainable Consumption. For this purpose, in cooperation with UNEP and UNESCO, the Task Force drafted a document of policy recommendations and guidelines for the introduction of education for sustainable consumption in the formal educational curricula, “Here and Now. Education for Sustainable Consumption”. The document was officially presented at the UNESCO International Conference on Education for Sustainable Development (Bordeaux, October 2008) during which UNEP, in collaboration with the Task Force, organized a work session on this issue. The Task Force is also providing relevant contributions to the promotion of education for sustainable consumption in view of the next future international sessions of the UN Commission for Sustainable Development planned for the 2010-2011 biennium.

Information

The right of citizens to receive accurate and reliable information on the state of the environment and natural resources has progressively taken on an ever-increasing role in the national legal context, as well as in relation to the reform process of public administration and administrative proceedings, following transparency and participation criteria. In particular, the right to access to environmental information is recommended internationally by the Aarhus Convention¹, which in articles 4 and 5, explicitly guarantees to citizens the right to information in environmental matters, distinguishing between the right of citizens to have access to such information and the obligation of public authorities to disseminate it.

In Italy, in recent years, information on environmental matters, which for a long time was limited to provide information during the frequent environmental emergencies (landslides and floods, particularly serious episodes of industrial pollution, atmospheric pollution and waste), has assumed a more independent and structured role, mostly through television which has, for some time now, been dedicating specific TV-programmes on the environment and through the press, in which news on environment matters are more and more frequent.

The objective of the information on environmental issues, proposed in a clear and exhaustive manner, is to obtain the positive effect of giving citizens greater awareness, promoting changes in their everyday behaviour, as well as better and more precise knowledge for the solutions that technology and innovation can give in integrating the needs for economic and social development with the objective of maintaining the use of natural resources within the limits of sustainability.

For this purpose, the Ministry for the Environment, Land and Sea has developed tools for reaching the objectives of information mainly through its web site, the Report on the State of the Environment and the National Environment Library.

The Ministry’s web site contains press releases, contests, calls for projects, and the main legislations in the matter of environment subdivided by sector.

Law 349/86, which established the Ministry for the Environment, envisages that, every 2 years, the Ministry presents a Report on the State of the Environment (SoE) to the Parliament containing a complete profile of the state of the environment, identification of sensitive elements and most significant pressures, and periodic monitoring of the environment. The last SoE report was issued in 2006. The information contained in the SoE is all available on the web site of the Ministry.

The National Environment Library has a collection of around 3,000 publications (volumes, magazines and documents).

In support of the activities of the Ministry for the Environment, the main role of gathering, processing and disseminating environmental data and information is carried out by the Institute for Environmental Protection and Research (ISPRA) which publishes yearly the Environmental Data Year Book and thematic reports such as the Report on Quality of Urban Environment, the Waste Report (in collaboration with the National Waste Observatory – ONR).

The ISPRA web portal, available also in English, French and Spanish, provides to citizens data, rules and regulations, and reports subdivided by specific themes (air, water, protected areas, environmental emergencies, energy, etc.). ISPRA also manages and publishes specific environmental databases such as those on local management for environmental sustainability (GELSO), national database on air quality (BRACE), inventories of atmospheric emissions (CORINAIR-IPCC) and those on the registry and transfer of pollutants (INES).

Environmental data and information are gathered at the local territorial level by the network of regional and provincial Environment Protection Agencies (ARPA-APPA).

In addition, ISPRA is responsible for the general coordination and connections with the EIONET network, which gather environmental bodies and institutions operating in member States of the European Union and that is used by the European Environment Agency to carry out its mandate of observation and information on environmental matters.

This stream of information, structured and regular, is supported by a communication strategy that aims at reaching specific targets of the public opinion. To this purpose, over the last few years the Ministry for the Environment promoted some communication campaigns pursuing the objective of increasing citizens awareness, in particular young people, on environmental themes.

In cooperation with the Ministry of Youth and Sport Activities, the Region Emilia-Romagna, the environmental NGO Legambiente, and MTV television, a permanent communication campaign was launched in 2007 on the importance of water saving and was aimed at young people. Its objective was to raise awareness of young people on a responsible consump-

— 1 The Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters was signed in Aarhus in 1998 by 39 UN-ECE member States. The Convention was ratified by Italy with law 108/2001



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tion of water resources and to promote greater knowledge about the problem.

The campaign “Youth do not make water” (double meaning in Italian with “youth do not fail”) showed, through radio spots, video and internet, “good daily practices” that address young people to save more, to not litter, to not pollute and, mostly, to not waste water, through the presentation of a true Decalogue of advice. “Makes your own forest” is an initiative launched in 2007 aimed at contributing to the improvement of green areas and to the development of the National System of Protected Areas, promoted by the airline company Air One in cooperation with the Ministry for the Environment. Through the purchase of an electronic ticket for one of the destinations reached by Air One, 20 euros cents were donated automatically for the purchase of trees ready for creating new wooded areas. The educational campaign “CircOLLamo” (“We circulate”) promoted

by the public Consortium of spent oils (COOU) with patronage of the Ministry, started in 2007, is aimed at informing citizens on the appropriate disposal of used lubricating oil. Priority attention is reserved to high school students especially by informing them on the damage that can arise from the improper disposal of this hazardous waste and on the advantages that can, instead, be obtained through its reuse. In 2008, after the waste emergency in Naples and in other areas of Region Campania, a national information campaign was presented on the RAI national television networks to educate citizens on separate waste collection, promoted by the Ministry for the Environment. Lastly, the first phase of the campaign “Time that is needed” is presently on-going, planned by the Ministry for the Environment for increasing the awareness of citizens on the importance of environmentally correct behaviours.

Box

1

Implementation of the UN Decade on Education for Sustainable Development 2005-2014 in Italy

Since 2005, the UNESCO Italian National Commission has been actively dedicated to the implementation in Italy of the UN Decade of Education for Sustainable Development 2005-2014 (DESD), declared by the General Assembly of the United Nations in the wake of the Johannesburg WSSD in 2002 and on the understanding that sectoral policies for sustainability can show efficacy only if accompanied by adequate educational actions.

The leadership of the campaign of “cultural” renovation was entrusted by UNESCO, the Agency of the United Nations created in 1945 with the task of spreading peace and well-being by utilizing the tools Education, Science and Culture.

In promoting the DESD, UNESCO operates in the member countries through National Commissions, which have the task of transferring at the national level the inputs coming from the UN and that, while being placed in the administrative structure of the reference country (the Italian Commission, for instance, is managed by the Ministry of Foreign Affairs), represent the cross point between the institutions, on one hand, and the civil, cultural and scientific society, on the other.

Under the auspices of the UNESCO Italian National Commission, the DESD campaign in Italy benefits from the active and enthusiastic collaboration of a number of partners: ministries, regions, representatives of social and economic organizations, associations, research and development institutions, the school system, environmental agencies, NGOs.

All these stakeholders subscribed the “Common Commitment of persons and organizations for DESD”, drawn up by the Commission and other bodies involved in the education sector, thus becoming part of the “DESD National Committee”, which meets periodically to discuss initiatives to be promoted, to examine on-going working activities and to submit proposals.

The DESD campaign in Italy is celebrated each year, in the first half of November, with a “Thematic Week” (The Week of Education for Sustainable Development), full of various appointments spread on the entire national territory: meetings, laboratories, entertainments, exhibitions, excursions, games.

The thematic week is dedicated each year to a different theme, selected by the DESD National Committee on the proposal of the UNESCO Italian National Commission; in 2006, the theme on sustainable energy was selected, in 2007 the focus was on the fight against climate change, and in 2008 the theme was waste reduction.

The Ministry for the Environment, Land and Sea is the leading supporter of the activities promoted by the UNESCO Italian National Commission.



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Main results of the 2008 DESD Week dedicated to Waste Reduction

Participants and initiatives carried out

- 380 participants
- 7 major clusters of activities;
- more than 500 initiatives, half of which extended during the full week;
- 200 laboratories;
- 150 conferences, roundtables, workshops, and lessons;
- 40 exhibitions;
- 30 movie/documentary shows on specific themes;
- 30 visits to facilities (composting sites, waste disposal sites, paper mills and natural areas);
- 30 theater/music shows;
- 20 contests on particular themes;
- more than other 100 initiatives integrated into broader projects.

Level of participation

- Regions: all regions participated both as organizers and promoters of events as well as collaborators (especially in the context of the INFEA System, through laboratories and centers of environmental education, and through the Regional Environment Protection Agencies - ARPA);
- Schools (pre-school, primary, and secondary, with the involvement of students, teachers, parents) have been the most active participants: some 105 schools participated as organizers and around 85 schools participated as collaborators;
- 52 Provinces and 78 Municipalities worked as organizers or collaborators;
- 67 Associations and 40 Cooperatives/Consortia;
- 6 UNESCO Centers and Clubs (organizers/collaborators);
- 14 Foundations (organizers/collaborators);
- 25 Universities/Research Centers (organizers/collaborators);
- 50 Private companies.

Box

2

The Nimby Forum® Project

Nimby Forum® is a research project on phenomena of environmental protests started in 2004. It is promoted by the Italian no-profit association ARIS – Society and Information Research Agency and is aimed at contributing to the development of the culture of communication. In this regard, dialogue is an essential tool in the management and possible weakening of situations of environmental territorial conflict.

The Nimby Forum project obtained the sponsorship from the Office of the Prime Minister, the Ministry for the Environment Land and Sea, the Ministry of Infrastructures and Transport, and the Ministry of Economic Development. Moreover, the activities carried out by the Forum are guaranteed by a Scientific Committee which works alongside the organization in an important advisory role, identifying guidelines for the pursuing of the project objectives. The Committee includes prominent members from academia, research, European and national institutions, NGOs and the media.

In order to carry out a review on the progress of the Nimby (Not In My Back Yard) syndrome at national level, the Nimby Forum established a permanent Technical Board, which includes the representatives of the most important national organizations involved in the phenomenon (State and local institutions, enterprises, NGOs), and created the Permanent Media Observatory, which surveys and analyzes plants and infrastructures disputed in Italy through daily monitoring of a thematic press review.

Numerous initiatives for in depth studies and dissemination come out from the results of the Observatory for stake-



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holders and the media, with technical reports, interviews, ad hoc research programs, meetings and workshops. The activities promoted involve many aspects of the phenomenon: from information and communication processes to the issue of citizens' participation; from local governments' policies to the national planning strategies. The objective is to involve a growing number of organizations operating in the areas, and to contribute to spreading a participatory culture on the subject themes of the Forum. The following table highlights a synthesis of data collected during the different surveys carried out by the Permanent Media Observatory.

Aris – Nimby Forum® - Comparison of the four editions

	Edition I	Edition II	Edition III	Edition IV
Total press articles included in the survey	2,760	4,020	4,116	4,874
Articles per month (average)	251	309	343	406
Articles per day (average)	8	10	11	13
Maximum number of articles per day	45	66	46	66
Total plants/infrastructures contested	190	171	193	264

