



**ISPRA**  
Institute for Environmental  
Protection and Research

**ITALIAN ENVIRONMENTAL  
DATA YEARBOOK 2009**

# VADEMECUM



**ARPA** ENVIRONMENTAL  
PROTECTION  
AGENCIES OF REGIONS  
**APPA** AND AUTONOMOUS  
PROVINCES

ISPRA database has allowed the Institute to turn out a number of very different information products, all for the purpose of spreading environmental information among a wide-ranging public of users: from public decision-makers to researchers, from holders of economic interests, or stakeholders, to private citizens.

The 2009 edition comes in the form of five products:

- **Environmental Data Yearbook** – The **full version** contains the indicator fact-sheets populated during 2009 and organised by production sectors, environmental conditions and responses;
- **Key Topics** – A version containing supplementary information on priority environmental issues, subject to specific prevention and reclamation;
- **Vademecum** – A short version (pocket) of the assessments contained in the preceding volume;
- **Database** (<http://annuario.apat.it>)– A tool for on-line consultation of the indicator fact-sheets and the production of reports;
- **Multimedia** – A tool for communicating the Yearbook data and information in a quick and easily understandable way through film sequences and web applications.

The products are available on CD-ROM and at the websites [www.isprambiente.it](http://www.isprambiente.it) and <http://annuario.apat.it>

The information sources are listed in the database and in the full version of the Environmental Data Yearbook 2009

### **SOCIO ECONOMIC FRAMEWORK**

The characteristics of the country's territorial and socio-economic framework, and especially the demographic dynamics and the models of behaviour of economic subjects (families and businesses), are closely connected with the anthropogenic pressures that threaten the national environment (pollution of the air, water, soil and nature, waste generation, consumption and deterioration of natural resources).

Italian territory consists of hilly and mountainous zones (accounting for 41.6% and 35.2% of the total respectively), plus a lengthy coastline (8,353 km), ensuring a wide variety of landscapes. Due to its position, Italy is one of the countries at greatest risk for earthquakes and volcanoes in the Mediterranean area. The areas at greatest risk for earthquakes are the Friuli, the central-southern Apennine mountain chain, and especially the sectors of the intra-Apennine basin, as well as along the Tyrrhenian coast of Calabria and in southeast Sicily. Italy is one of the European countries with the richest supply of biodiversity, essentially on account of its favourable geographic position and as well as its extensive geo-morphological, micro-climatic and vegetative variety, plus the effect additional influence of factors of history and culture. Italy contains one half of all the plants species and a third of the animal species currently found in European territory.

The climate is generally temperate, with regional variations. In summer, the northern regions are hot, with occasional rain, the central regions are humid, and the south scorches under the dry heat. In winter the northern cities undergo cold temperatures, noteworthy humidity and fog, while temper-

atures in the south are more comfortable (10-20°C).

The last 60 years have been characterised by a sharp drop in the birth rate and a gradual ageing of the population, together with increased immigration.

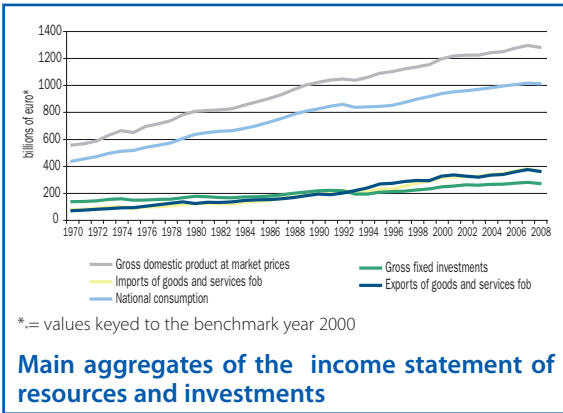
The years between 1958 and 1963 came to be known as "Italy's Economic Miracle", though the noteworthy economic development also generated significant regional differences, especially between the Centre-North and the South.

There have also been sizeable changes in the country's workforce from 1970 to the present. Italy's employment structure has been significantly modified, with, with the emphasis on farming and industry shifting in favour of the service industries.

As of 31 December 2008 Italy's resident population was 60,045,068 inhabitants, for an increase of 425,778 over the same date in 2007, determined exclusively by the arrival of immigrants from abroad. The Italian population is distributed over a surface area of 301,336 km<sup>2</sup>.

Within Europe as a whole, Italy is one of the most densely populated countries. The most densely populated Italian regions, at respective levels of 428 and 404 inhabitants per km<sup>2</sup>, are Campania and Lombardy. Consumption patterns also reflect demographic changes, with variations in family size having an especially noticeable effect on the allocation of available spending. In 2008 average monthly spending per family was equal, at current values, to 2,485 euro (2,480 euro in 2007). Veneto remained the region with the highest average level of family spending, at 2,975 euro, while Sicily, which registered 1,742 euro once again was the region with the lowest level.

Between 1970 and 2008, the main categories on the income statement for national resources and investments registered noteworthy growth, with the GDP, consumption and investments doubling their levels, while imports and exports rose no less than fourfold.



In the year 2008, however, the national GDP, calculated in values keyed to the reference year of 2000, fell by 1% compared to 2007, while the gap between Italy's northern and southern regions is not being reduced.

In all the countries of the European Union (EU25), more than 60% of the GDP (in Italy 70.4%) is generated by the services-industry sector (which includes banking activities, tourism, transport and insurance). Industry and agriculture, though they still play significant roles, have declined in economic importance in recent years. In Italy, the percentage of the incidence of the primary sector, in terms of value added for 2008 was only 2.5 percentage points, while the industrial sector (meaning industry in strict sense, plus construction) accounted for 26.9%.

As for Italy's production structure, the central regions show a greater propensity for service enterprises, while micro-firms are predominant in the South, and medium-size enterprises are the most widespread in the northeast regions. Large-scale industry plays the leading role in the Northwest.

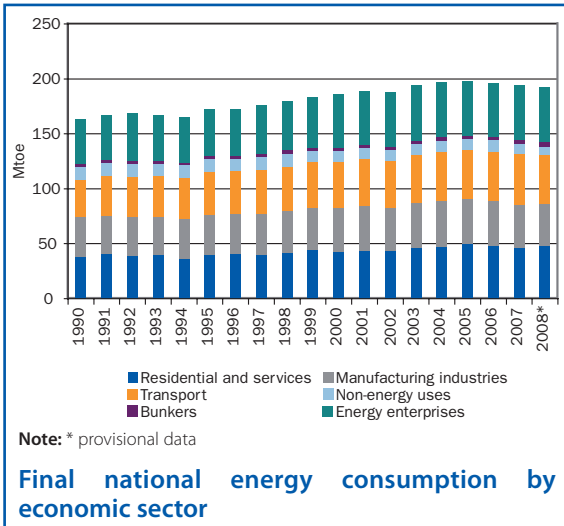
In 2007, there were 4.4 million Italian industrial and service enterprises, employing approximately 17 million workers (11.4 million salaried employees) and generating roughly 722 million euro of value added. Compared to Europe as a whole, Italian companies are more focussed on manufacturing activities, with the chief manufacturing sub-sectors being those referred to under the umbrella term "*Made in Italy*".

Looking at the energy sector, and specifically the ratio between final consumption and total consumption of energy, Italy outperforms the European average, showing greater overall efficiency in the conversion of primary energy sources.

In recent years there has been a series of changes in the sources of energy supplies, such as the growing role of natural gas compared to petroleum products, plus an increasing contribution from renewable sources and cogeneration, along with, from 2001 on, a revival in the consumption of solid fuels, whose contribution to total primary energy sources (including primary electric energy) went from 8.6% in 2001 to 11.5% in 2008.

But the modifications in the mix of primary sources have not lessened our country's high level of energy dependency, which went from 82.8% in 1990 to 85.5% in 2008. The objective of limiting the vulnerability of our economic system caused by

this energy supply structure has led the current government to present legislative measures to establish locations for new nuclear power plants. In 2008, the demand for primary energy stood at 192 Mtoe, for a decrease of approximately one percentage point compared to 2007.



The primary sectors responsible for the general trend show decreased consumption in recent years. In terms of the break-down in final energy consumption for 2008 (excluding non-energy uses and bunkering), the residential and services sector absorbed 34.4% of consumption, followed by the transport and industrial` sectors, at respective figures of 34.2% and 29%, while agriculture and fishing accounted for the remaining 2.4% of final consumption.

Between 1994 and 2008, the growth rate of electricity generation was significantly higher than the rate for overall energy consumption.

These results point to the growing role of electricity

as an energy carrier in the national energy system. In the specific case of electricity produced from renewable sources, the figure for 2008 was roughly 59.7 TWh, compared to total electricity production of 318.2 TWh. Nationwide, the production of electricity from renewable sources accounts for 18.8% of total electricity production. Agricultural activity generates pressures, though it, in turn, undergoes the effects of changes in ecosystems. In detail, agricultural areas are subject to the direct impact of other production sectors, as well as to the indirect impact of physical and chemical alterations in the atmosphere and of extreme meteorological, while, at the same time, agriculture ensures excellent production capacity for foodstuffs, wood and fibres. In 2007, Italy's Utilized Agricultural Area totalled 12,744,196 hectares, and there were a total of 1,677,766 agricultural enterprises.

Though the surface area utilised for, or being converted to, biological agriculture (1,002,414 hectares) fell by approximately 13% compared to the previous year, our country remains one of the main European practitioners of this production technique, in terms of both surface area and number of enterprises involved. At the end of 2008, there was a total of 49,654 operators.

Key agricultural practices include crop sequences and covering techniques. In 2007, 16.2% of the national seeded surface area was farmed on a single-crop basis, 40.8% under free alternation and, finally, 40.1% on a rotation basis.

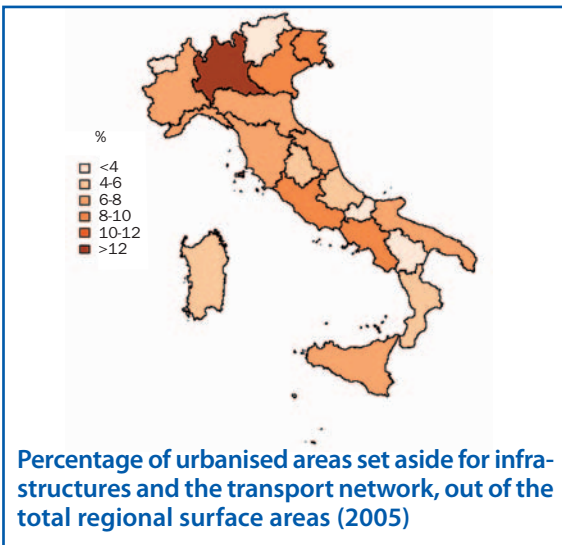
In 2007 approximately 150 thousand tons of plant care products were placed on the market.

Looking at all modes of transport in Italy, mobility of freight and passengers shows constant growth in recent years. In 2008, roadway transport once again proved to be the predominant mode for



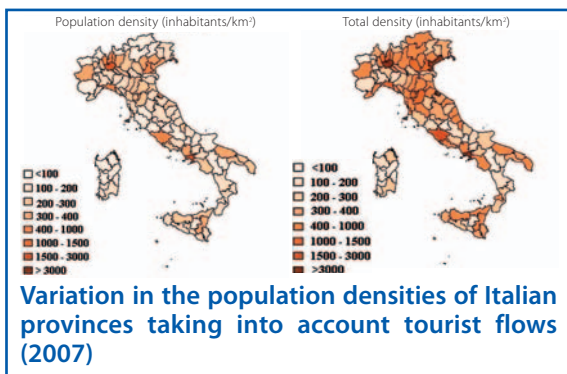
both freight and passenger transport, absorbing 62.3% of the km-tons of freight transported and 92.2% of the passenger-km.

A more detailed analysis of traffic, broken down by the different modes of transport, highlights a variety of situations. Commercial air travel grows by 11.8% between 2004 and 2008. Vehicle traffic registers a 60% increase in km travelled on Italian highways between 1990 and 2008. Between 2004 and 2007, passenger transport on the railway network rose by 5.6%, while freight transport shows a 1.2% increase. An overview of the urbanised surface area set aside for infrastructures and the transport network is provided by following figure, which illustrates the percentage break-down of the total surface area for each region. As can be seen, the region with the highest infrastructure density is Lombardy, with a percentage of more than 12.3%, followed by set of regions in the range of 8-10%: Veneto (9.7%), Campania (8.9%), Friuli Venezia Giulia (8.3%) and Lazio (8.2%).



There is a special tie between tourism and the environment, because tourist activities utilise environmental resources, in the broadest sense of the term, as an indispensable asset for their development, while, at the same time, the environment benefits from the resources brought into play by tourist activities, assuming such operations are compatible with the environment. Tourist arrivals and overnight stays in Italy fell by respective figures of -3.1% and -2.8%. The climate is one of the key driving factors behind the seasonal structure of tourist activity.

In fact, in 2008, 49% of the overnight stays again occurred in the third quarter. The mode of transport most frequently used by Italians to take trips is the automobile (63.6%). As for the modes of transport used by foreign tourists who come to Italy, the car continues to be favoured, registering an increase (+4.7%) between 2007 and 2008. In contrast, air travel as the mode of transport used by foreign tourist to reach Italy showed a decrease (-8.1%), on an annual basis, for the first time since 1996, primarily to the advantage of cruise ships, which registered a significant growth (+28.5%). Tourist flows radically modify population density, as in the case of the cities of Rimini and Florence, whose densities reach noteworthy levels with the addition of tourists.



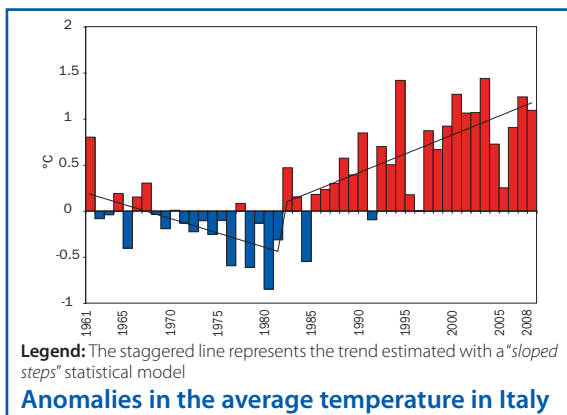
## CLIMATE CHANGE

Climate change is no longer merely a scientific question, but a priority global emergency and an issue of increasing importance on the policy agendas of national and international institutions. In 2009, the issue of climate change was a focal point of attention on the part of both the general public and national and international institutions, with growing expectations placed on the results of the 15<sup>th</sup> Conference of the Parties (COP-15 Copenhagen 2009), held with the objective of determining the elements of the new agreement meant to go into effect in the period following that (2008-2012) covered by the Kyoto Protocol.

The warming of the global climate system currently stands as an undisputed fact, as shown by the increases observed in the average global atmospheric and oceanic temperatures, as well as the melting of the polar ice caps (especially in the Arctic), the shrinking of glaciers in the middle latitudes (including the covering of snow) and the rise in the average level of the oceans.

Analyses worldwide confirm that the overall increase in average global temperature (the land-ocean system) as of 2008 was 0.7 °C compared to the pre-industrial level, while the rate of warming, equal to 0.1°C per decade during the last 100 years, has been 0.16°C per decade during the last 50 years.

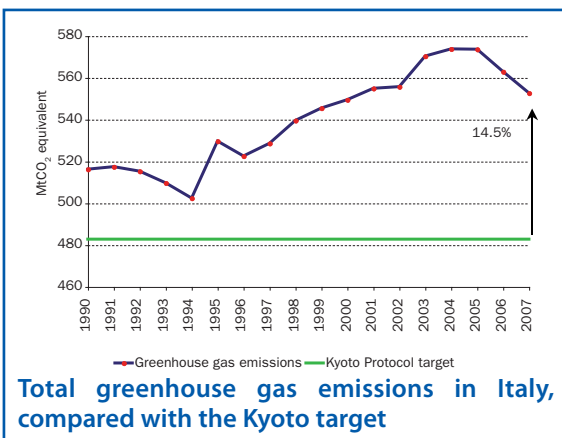
As for Italy, the most recent estimates obtained by ISPRA point to a decrease in the country's average temperature between 1961 and 1981, followed by an increase through 2008, for an overall increase of approximately 1 °C.



Observations made on dry land and on the oceans show – as is illustrated by the Fourth Assessment Report of the IPCC – that many natural systems have been affected by regional climate change, and especially by increases in temperature. The latest report of the European Environment Agency on the impacts of climate change shows that, in the rest of Europe as well, many natural systems, plus a large number of socio-economic sectors, have already undergone the consequences of climate change, namely loss of biodiversity, reduced quantities and quality of water resources, risks to human health, damage to farming and forestry activities, to tourism and to the energy and transport sectors .

A number of the effects of climate change observable both globally and in Europe can already be noted in Italy: erosion of coastal areas, desertification, melting of glaciers, scarcity of water, slope instability and risks to health are only some of the examples. Given its sensitivity to increased temperatures and its limited adaptive capacity, the Alpine environment proves to be one of the most vulnerable in our country, in keeping with what has been observed in the rest of Europe.

With regard the main greenhouse gas, the average global atmospheric concentration of carbon dioxide has risen from 280 ppm during the period 1000-1750 to 385 ppm in 2008, corresponding to a growth in carbon dioxide emissions from roughly zero to 31.2 billion tons, taking into account solely emissions from the use of fossil fuels in combustion processes and in cement production. The other greenhouse gases, such as methane, nitrogen dioxide and the fluorocarbons, have shown similar patterns of growth, with an even higher rate. Italy is not exempt from this growth trend of greenhouse gas emissions: the most recent figures for the national inventory of greenhouse gas emissions show that emissions in equivalent tons of CO<sub>2</sub> went from 516.32 million to 552.77 during the period 1990-2007, making for an increase of 7.06%, whereas, according to the Kyoto Protocol, Italy should have brought its emissions down, during the period 2008-2012, to levels 6.5% lower than emissions in 1990, meaning to 482.76 MtCO<sub>2</sub>eq. As a result, greenhouse gas emissions for 2007 exceeded the Kyoto objective by 70 Mt (+14.5%).



Based recent evaluations of the EEA, Italy will be able to reach the objectives set under the Kyoto Protocol only if, in addition to drawing on emission credits gained through LULUCF activities (*Land-Use, Land-Use Change and Forestry*) and acquiring quotas generated by the flexible mechanisms provided for under the Protocol, it implements additional measures to reduce emissions, above and beyond those already taken; such measures, however, must still be determined and enacted. In terms of the goal of reducing greenhouse gas emissions by at least 20% within 2020, compared to the levels of 1990, the EU is roughly halfway there, having registered, in the year 2007, a 9.3% reduction in emissions compared to 1990.

As concerns mitigation measures, it is important to note that the year 2009 saw publication in the Official Journal of the European Communities of all the legislative documents in the “Energy – Climate Change” package that was the subject of the historic agreement known as “20-20-20”, reached in the European Council on 18 December 2008; specifically:

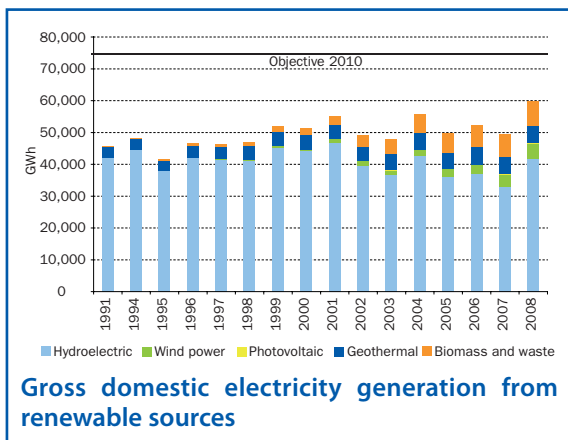
- Directive 2009/28/EC on the promotion of renewable energy, which sets the binding objective for the EU of bringing the percentage contribution of renewable sources as a percentage of total energy consumption to 20% by 2020, with the effort distributed among the Member States; Italy’s assigned objective is 17%;
- Decision 406/2009 on effort sharing, which sets the binding objective for the EU of reducing by 10% compared to the Community levels for 2005 greenhouse gas emissions in the sectors not regulated by 2003/87/EC; the burden of the effort is distributed among the Member States, with Italy assigned an objective of 13%;
- Directive 2009/29/EC on the revision and

strengthening of the European emissions trading system, setting for the EU the binding objective of reducing greenhouse gas emissions by 21% compared to the levels of 2005 for the sectors governed by Directive 2003/87/EC;

- Directive 2009/31/CE on carbon capture and storage.

Directive 2009/28/EC specifies what portion of final domestic energy consumption is to be produced from renewable energy sources by each country of the European Union as of 2020; these quotas include not only energy from renewable sources consumed for the production of electricity, but also renewable energy used for heating and transport. The Directive also makes possible the statistical transfer from one Member State to another of a certain quantity of energy from renewable sources, as well as cooperation between the countries, or with non-EU countries, in the production of energy from renewable sources. The renewable-energy consumption objective assigned to Italy is 17% of final domestic consumption, while, in 2007, total renewable energy as a percentage of final consumption was equal to 6.9%. In 2008, electricity generation from renewable sources stood at around 59.7 TWh, out of total electricity generation of 318.2 TWh, meaning that renewable sources account for 18.8% of total electricity generation.

Directive 2001/77/EC set a recommended objective of 22% as the portion of gross domestic consumption of electricity that should be generated from renewable sources (equal to approximately 75 TWh when gross domestic consumption stands at 340 TWh). Though this directive has since been rendered obsolete by Directive 2009/28/EC, it still represents the only benchmark for assessing the generation of electricity from renewable sources.



In the countries of the European Union, a central role in strategies of mitigation has been given to implementation of the European emissions trading system established under Directive 2003/87/EC. The initial period of implementation of the emissions trading system (ETS) began on 1 January 2005 and concluded on 31 December 2007. In Italy, the quotas for the first period were assigned under measure DEC/RAS/74/2006 of the Ministry of the Environment, Land and Sea. More recently, the National Committee for the Management and Implementation of Directive 2003/87/EC, consisting of representatives of the Ministry of the Environment, Land and Sea and of the Ministry of Economic Development, passed a ruling, on 20 February 2008, assigning the quotas for the second period (2008-2012).

Considering the sum total of the quotas assigned and issued in the three-year period 2005-2007, the differential for greenhouse gas emissions by plants participating in the ETS system was +5.7 Mt CO<sub>2</sub> above the maximum threshold. In the first year of the second period (2008-2012), on the other hand,



total emissions of CO<sub>2</sub> exceeded the assigned quotas by 9 Mt CO<sub>2</sub>.

On the subject of adaptation, in April 2009 the European Commission presented a White Paper entitled: *"Adapting to climate change: Towards a European framework for action"*, with the goal of making the EU less vulnerable to the impact of climate change.

## **BIODIVERSITY AND NATURAL, AGRICULTURAL AND FOREST AREAS**

The variety of bio-geographic, geo-morphological and climatic conditions that characterise continental Europe and the Mediterranean Basin make Italy a nation with an extraordinary concentration of species and habitats: a “hot spot” of biodiversity and a major resource for the entire planet.

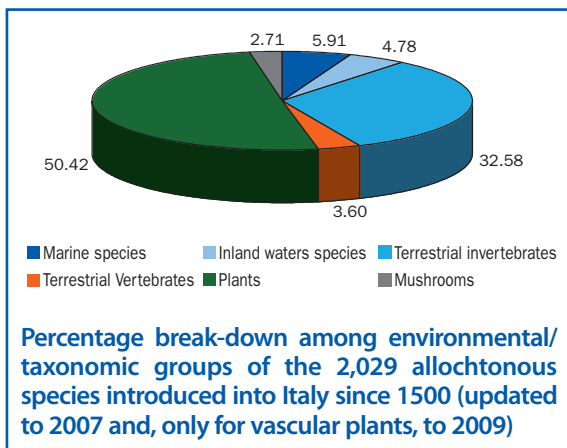
In addition to natural zones, agricultural areas also play an important role, seeing that approximately 21% of the UAA (Utilised Agricultural Area) presents characteristics of noteworthy naturalistic value in terms of biodiversity and the interconnection of natural spaces.

This wealth of biodiversity, however, is seriously threatened and risks being lost forever. For example, the percentage of Vertebrate species at risk fluctuates, depending on the author consulted, from 47.5 % to 68.4%.

The situation is especially critical for freshwater Fishes, Amphibians and Reptiles. Also at risk are 15% of the higher plants and 40% of the lower plants

The main threats to the natural heritage are tied to the impact of human activities and to the growing demand for natural resources and ecosystem services. For example, the transformation and modification of natural habitats constitutes an indirect threat for approximately 50% of the Vertebrate animal species, which major direct threats include poaching and illegal fishing.

The introduction of potentially invasive allochthonous species constitutes another threat to biodiversity. The number of alien animal and plant species in Italy currently stands at 2,029.

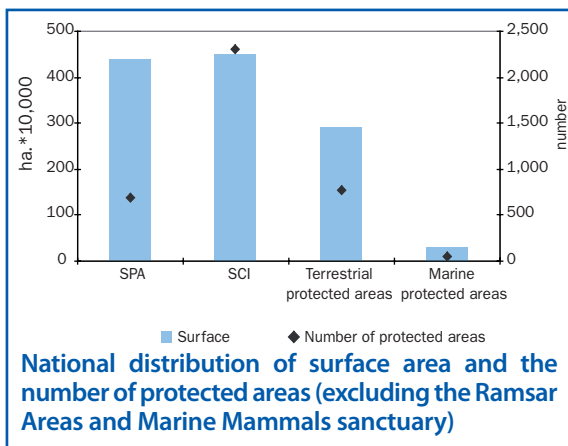


Climate change, confirmed by numerous studies and reports, also has an impact, influencing, for example, the geographic ranges of many species, as well as the vegetative seasons.

There is controversy over the role of activities tied to agriculture as causes of impact on the natural heritage. The specialisation and intensification of agriculture, as well as the globalisation of the agricultural economy, have resulted in a serious loss in biodiversity, even though set-aside policies have facilitated the restoration of habitats that had almost disappeared, such as wetlands, meadow areas alternating with shrubs and flooded meadows.

In attempting to alleviate these problems, Italy has endorsed numerous international conventions and agreements meant to safeguard biodiversity. At international level Italy has endorsed, among other conventions, that of Rio de Janeiro on biological diversity, in 1992, and the Ramsar Convention of 1971 on wetlands of international importance, in addition to signing, in 2009, the

“Siracusa Charter on Biodiversity”, which calls for a series of initiatives involving relations between biodiversity and the climate, the economy, ecosystem services, science, research and politics. Within the European Union, Italy has endorsed two fundamental directives for the conservation of biodiversity: the Bird Directive (79/409/EEC) on the protection of wild birds and the Habitat Directive (92/43/EEC) on the preservation of natural and semi-natural habitats, as well as wild flora and fauna. The specific objectives of Habitat Directive is the creation of a cohesive European ecological network named Nature 2000. At national level, a cornerstone measure for the preservation of biodiversity is Law no. 394 of 6 December 1991 on protected areas.



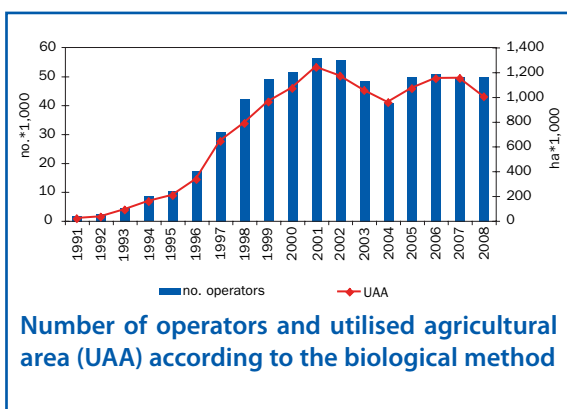
At present, 14.5% of the surface area of Italian territory holds SPAs, 15% holds SCIs (all established by the European Commission), and 9.7% contains protected terrestrial areas.

There are also 25 Marine Protected Areas and 51 Ramsar sites, plus the vast “Pelagos” international

protected ocean area for marine mammals.

The Common Fishing Policy (CFP) is the instrument used by the EU, and therefore its Member States, to manage all the different aspects of fishing and aquaculture: biological, environmental, economic and social.

As far as relations between agriculture and the environment are concerned, a topic deserving particular attention is biological agriculture. In Italy, the surface area utilised or being converted to biological agriculture amounted to 8% of the UAA in 2008.



What is more, starting with the medium-term reform of the Common Agricultural Policy (CAP) in 2003, and to an even greater extent with the Health Check of 2008, spending on rural development in Italy and other countries of the EU shifted from market measures towards forms of income support for farmers, with regard both to their production activities and, even more importantly, their role in preserving the countryside and the environment.

## AIR QUALITY

Air quality represents one of the environmental emergencies that, together with the closely related issue of climate change, is of concern to administrators of local and central governments and involves citizens on a daily basis.

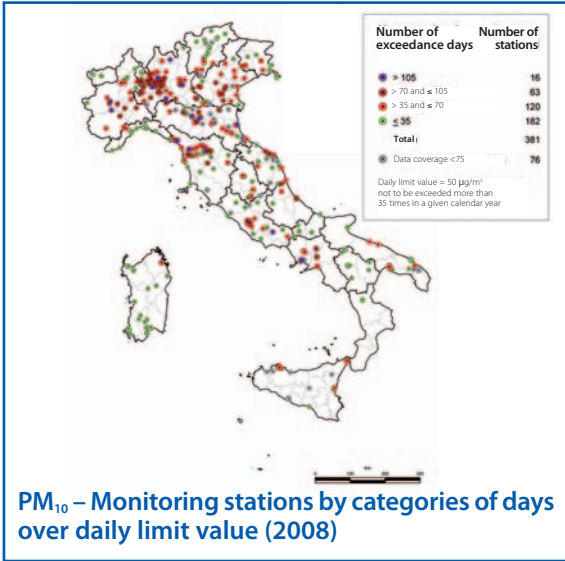
The reduction from the early 90's onward in emissions of primary particulate materials, meaning nitrogen oxides and other substances responsible for the pollution registered in Italy and in the rest of Europe, has led to an unquestioned improvement in the quality of the air, but it has not resolved the problems of particulate, nitrogen dioxide and ozone, whose levels in recent years have often exceeded regulatory levels, which, in the meantime, have become more stringent.

In Italy, the daily limit for PM<sub>10</sub> was exceeded by 52% of the monitoring stations in 2008; in the summer of 2009, 93% of the stations registered levels over the long-term objective for ozone.

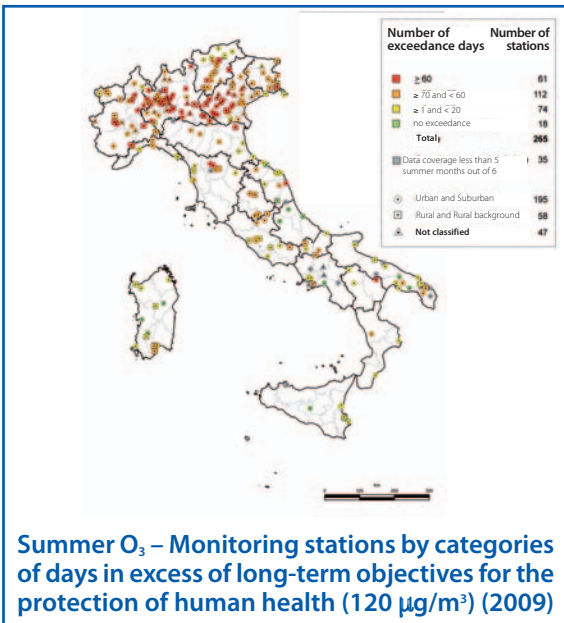
The most critical situations are found in the Po River valley and in large cities.

In Italy, 36% of PM<sub>10</sub> (solely the primary component), 68% of NO<sub>x</sub> and 38% of NMVOC emitted in 2007 were traceable to the transport sector, and especially roadway transport.

Levels of harmful gas emissions from roadway transport during the period 1990-2007 were the result of two contrasting trends: emissions tend to increase because of the continuous growth in the vehicle pool and the distances travelled, though, in reality, they decrease, thanks to the upgrading of the vehicle pool to meet increasingly stringent emissions standards whose effect, in terms of reducing emissions, has been even greater.

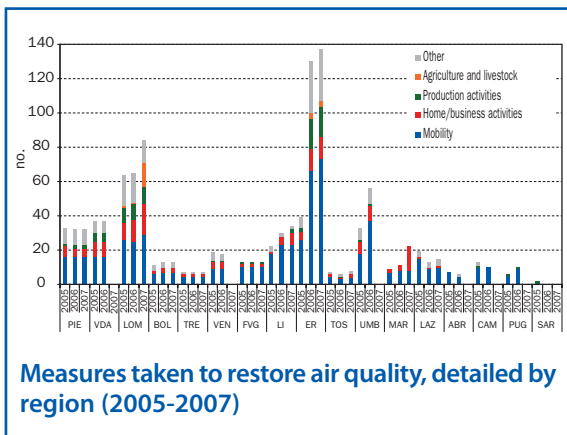


**PM<sub>10</sub> – Monitoring stations by categories of days over daily limit value (2008)**

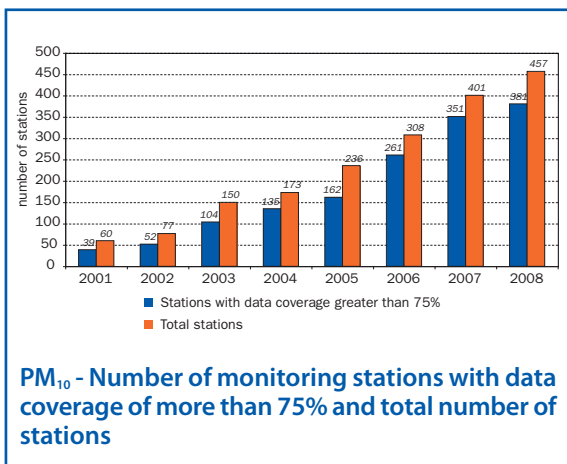


**Summer O<sub>3</sub> – Monitoring stations by categories of days in excess of long-term objectives for the protection of human health (120 µg/m<sup>3</sup>) (2009)**

As for efforts to improve air quality between 2005 and 2007, such initiatives increased considerably in the Emilia Romagna and Lombardia Regions.



The measures most frequently enacted in Italy's regions, in absolute terms, involved alternative mobility (18%) and public and private means of transport of low environmental impact (14% and 14% respectively).





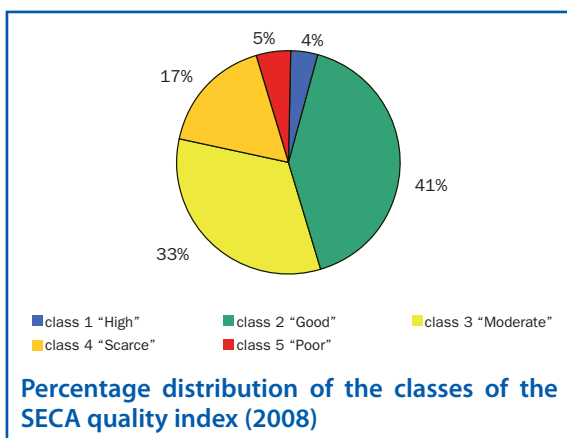
In terms of investigative activities, of key importance to managing air quality, mention should be made of the clear-cut improvements in monitoring and in the communication of information on the local and national levels.

## WATER QUALITY

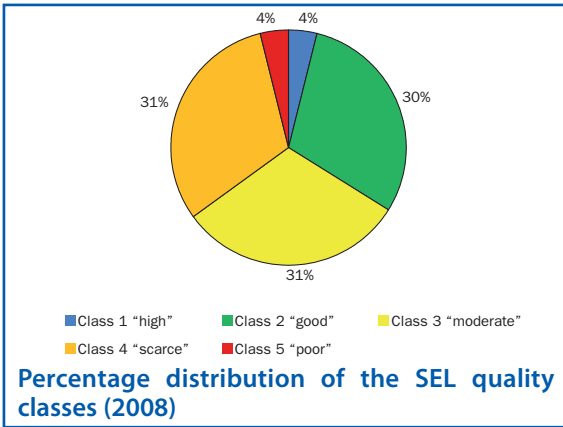
Directive 2000/60/EC, assimilated by Italian law under Legislative Decree 152/06, lays the groundwork for heightened cooperation among the Member States of the European Union in defending water environments, introducing the concept of “ecological status” for defining the quality of bodies of water and establishing that a “good status” of surface and underground waters must be reached by 2015.

The quality of water bodies is evaluated both with regard to their designated use (production of drinking water, swimming, mollusc growing etc.), and in terms of the specific objectives of environmental quality (SECA, SEL, SCAS).

Looking at the results for 2008 on the Ecological Status of Waterways (SECA), the situation observed (999 points monitored) was not especially critical, with 78% of the sites monitored falling under the SECA quality classes 1, 2 and 3, meaning an ecological status of “high”, “good” or “moderate”, while the remaining 22% were rated in quality classes 4 (scarce) and 5 (poor).



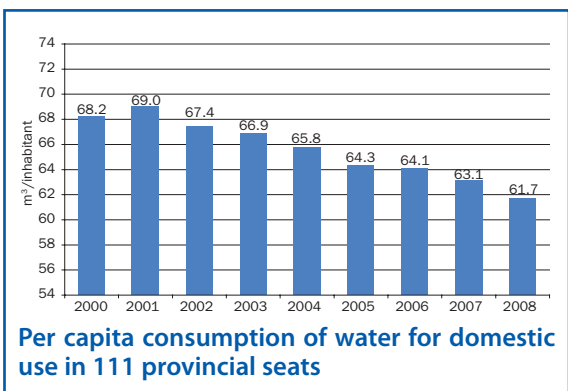
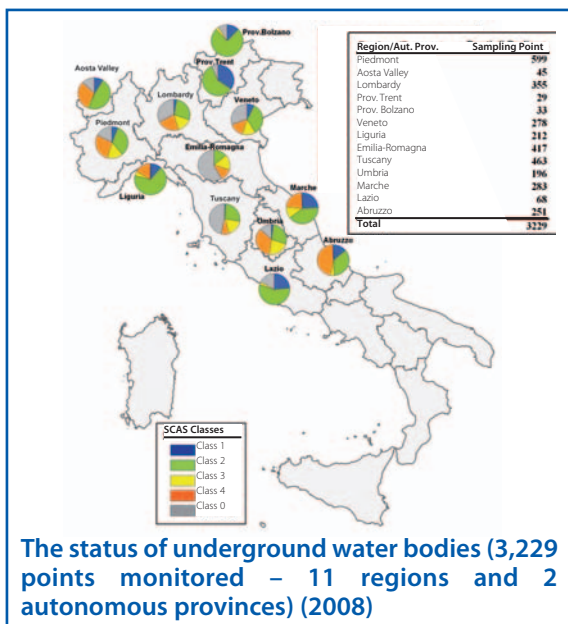
Lake quality (Ecological Status of Lakes - SEL), taken from a total of 134 stations in 13 regions (one less region than in 2007), falls within the classes of “moderate” to “high” 65% of the time, an incidence that marks an 8% decrease compared to 2007.



The quality of underground waters, defined in accordance with Legislative Decree 152/99, is represented by the Chemical Status of Underground Waters (SCAS), which highlights the zones containing critical environmental problems through a 5-class rating system (1-2-3-4-0), with the first three classes standing for levels of quality from good to sufficient, while the remaining two point to scarce quality, distinguishing between contaminants of anthropogenic origin (class 4) and those of organic origin (class 0).

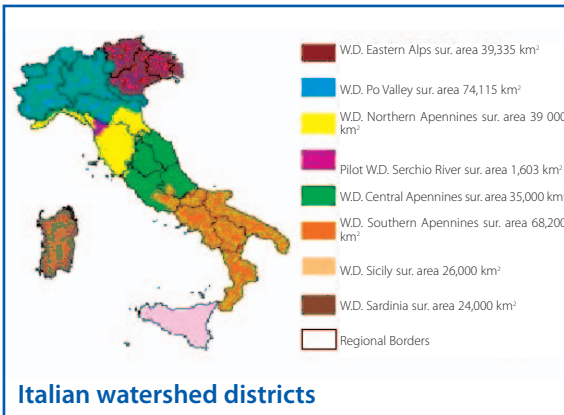
The figure shown below demonstrates that the number of points monitored in the different regions and autonomous provinces varied significantly (from 29 to 599). Trent and Bolzano, and the regions of Liguria, Lazio, Marche, Aosta Valley, Veneto, Piedmont, Abruzzo and Umbria presented, percentages of sampling points falling under classes 1 to 3 of between 93.1% e 52.6%. The highest percentages of points falling under class 4 were recorded in the

regions of Abruzzo and Umbria (respectively 45.8% and 34.2%), while the regions of Emilia Romagna and Tuscany showed respective levels of 58.3% and 46.7% of their points monitored falling under 0, or classified as poor for natural causes.



In quantitative terms, per capita consumption of water for domestic use in Italy's 111 provincial seats fell in 2008, compared to 2007 (-2.2 %), reaching a level of 61.7 m<sup>3</sup> per inhabitant.

Legislative Decree 152/2006, passed in implementation of the Directive, identified the watershed districts into which the entire national territory is divided, governing the Management Plans, with the requirement that one be enacted for each district.



Underlying the Management Plan is the Water Defence Plan (PTA), approved in eleven regions (Piedmont, Aosta Valley, Lombardy, the autonomous provinces of Trent and Bolzano, and the regions of Emilia Romagna, Tuscany, Lazio, Apulia, Sicily and Sardinia) and implemented in seven (Veneto, Liguria, Umbria, Marche, Campania, Basilicata and Calabria).

The massive anthropogenic development of the territory, combined with the dimensions of the production system, place heavy pressure on national water resources.

The quality of water resourced is influenced by widespread pollution from fertilisers and plant care products, as well as specific industrial dumping sites, plus shortcomings in the civic purification systems.

With regard to purification systems, Community Directive 91/271/EEC has set 31 December 2005 as the deadline for the creation and upgrading of sewage systems (in 2006 the level of compliance was 93%) and urban waste water treatment plants (in 2006 the level of compliance was 77%).

### EXPOSURE TO PHYSICAL AGENTS

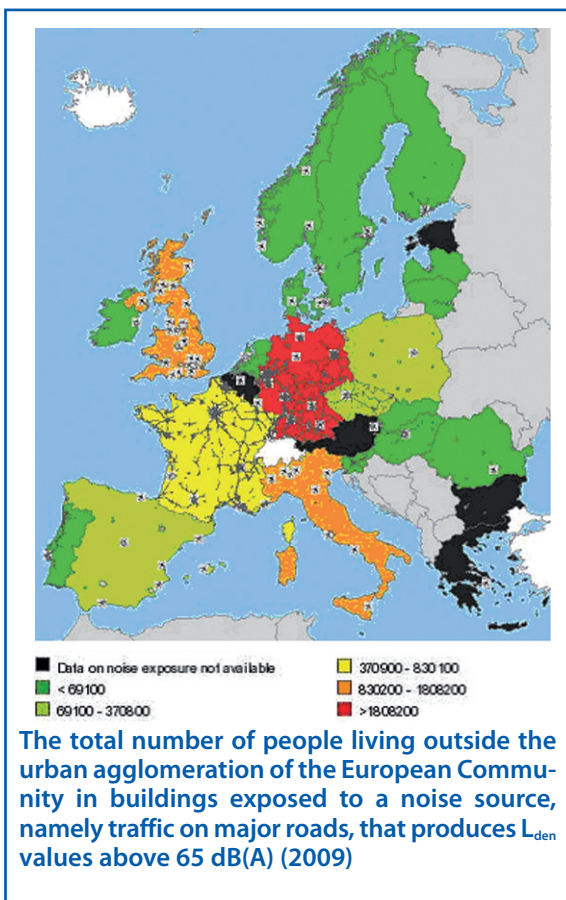
The term “Physical Agents” describes those environmental pollutants which, governed by the laws of physics, bring about a change in the environmental conditions of the context in which they are present. Physical Agents that effect the environment are electromagnetic fields, the levels of noise in a residential setting and in daily life, ionising radiation, vibrations, light pollution and ultraviolet (UV) radiation.

Noise pollution is considered one of the most significant causes in the deterioration of the quality of everyday life and it constitutes one of the most serious environmental problems. It is characterized by a wide spreading and a high impact. With regard to noise pollution, considered one of the main environmental problems today, the maintarget, at the European level, is the progressive reduction of the number of people exposed to noise levels deemed detrimental to people's quality of life or health.

It has been shown that around 41 million people in the European Community in urban agglomeration are exposed to environmental noise at  $L_{den}$  levels that exceed 55dB (A) caused by roadway infrastructures. Analysing the total number of people living outside the urban agglomeration of the European Community, in buildings exposed to a noise source, namely road traffic, that produces  $L_{den}$  values above 65 dB(A), it can be seen that in comparison to other member countries, a large percentage of the population of Italy is exposed. In many cases, the targets set out in Legislative Decree 194/2005, issued in compliance with END Directive no. 2002/49 EU, have not been met by the deadlines established.

Of the ten urban agglomeration in question, three have presented a strategic acoustic map but none

has drawn up an Action Plan. The situation regarding the road infrastructures however is better, as 12 of the 13 cities involved have presented an acoustic map.



The control activities carried out by the Agency System, primarily in response to reports presented by citizens, show that the types of sources held to be highly disturbing are business and service activ-



ities (43.2%), production activities (28%) and roadway infrastructures (22.9%).

The percentages regarding service and/or commercial activities and productive activities, fell by respective percentages of -5% and -7.4% compared to 2008, while roadway infrastructures were subjected to a greater number of controls than the 9.7% recorded in 2008 (+13.2%).

The main sources of noise, identified as road, rail and air traffic, have all registered a general increase in volume, with the distinctive characteristics of the rise linked to the individual source.

The increase in the above-mentioned pressure factors, combined with the shortcomings in the legislation and the lack of synergy and forms of dialogue between the principal players, is an obstacle to the determination of an organic and shared definition of the action to take.

Analysis of the data, in order to determine whether procedures prescribed by the laws governing the various sectors had been implemented, shows that, compared to previous years, up until 30<sup>th</sup> September 2009, the situation at the regional and local levels with regard to the fulfilment of the various obligations was stagnant, though, within the framework of transport infrastructures, some obligations had been met.

The equivalent of 41% of all of Italy's municipalities had approved acoustical classifications plan (+6% compared to 2007).

The most positive situations are found in Marche (94%), Tuscany (91%), Liguria (85%) and Piedmont (71%).

The prolonged exposure to *electromagnetic fields* is believed to be potentially dangerous to human health.

The sources of electromagnetic fields can be

divided into two main categories: low frequency fields (0-300 Hz) or ELF (*Extremely Low Frequency*) (electric power lines, substations, home appliances etc.); and high-frequency fields (100 kHz - 300 GHz), or RF fields (radio, TV, cell phones, radar).

Between 2007 and 2008 there was a recorded decrease in the violations of limits by RTV plants, and an increase of those incurred by RBS plants. Even though the density of RBS plants is roughly twice that of the RTV plants, and the density in terms of sites is 5 times higher, the most significant environmental pressure is exercised by RTV plants; in fact, the overall power of the RBS (1,175 kW) amounts to approximately 18% of that of the RTVs (6,442 kW).

In this context, another significant source of pressure is that created by high and extra-high voltage power lines, even though, between 2007 and 2008, there was a 15% decrease in the number of 200kV power lines, a 4% reduction in those between 40kV and 150kV (4%) and a 2% drop in those under 40 kV. There was however a slight increase (+2%) in the kilometres number of 380kV power lines.

In terms of both RTV and RBS radio frequencies, plus extremely low ELF frequencies, control activities are a fundamental part of the operations carried out by the responsible authorities (ARPA/APPA). An analysis of data gathered by the EMF Observatory shows that, between 2007 and 2008, there was a further decrease in the number of preliminary technical assessments regarding RBS (-17%) and RTV (-2%), as well as a drop in the number of controls for RBS (-1%) and RTV (-4%).

In terms of the clean-up initiatives undertaken to date regarding violations identified through control activities, what stands out is that, from 2007 to 2008, in those regions that have all the data pertaining to those two years, there was a 1.3%

increase as far as RTV plants were concerned and a 3.4% increase in RBS plants. It is interesting to note the differences between the two types of sources, RTV and RBS, with regard to the clean-up activities that have been completed and those still underway: for RBS plants, not only is the difference between the percentage of completed clean-up activities and those underway greater than that relating to RTV plants, but there are no longer any clean-up operations underway. This difference is due to the fact that, in the case of the RTV plants, clean-up activities are technically more complex. The records of regions that have provided a complete set of data for both 2007 and 2008 show that the number of cases of “clean-up efforts requested by regional and provincial agencies to safeguard the environment, and no clean-up activities”, has been reset at zero as far as RSB plants are concerned, while there has been an increase of approximately 10% for RTV plants. This means that these clean-up operations have not yet been scheduled by plant owners.

*Ultraviolet radiation* is the type found in the 100 to 400 nm (nanometres) range of the electromagnetic wavelength spectrum. Ultraviolet rays are conventionally subdivided into three spectrum bands: UV-C, UV-B and UV-A.

Ultraviolet radiation is of particular importance as it interacts with the Earth, and especially with the stratosphere (the “hole” in the ozone layer), the troposphere (photochemical pollution) and, ultimately, with the biosphere (effects on man, flora and fauna). This type of radiation can be produced by sources that can be either natural or artificial: the sun is the most important natural source, while a mercury steam lamp (a.k.a. a Wood’s lamp or germicidal lamp) is an example of an artificial source.

Exposure to solar radiation is an inevitable occurrence that has both beneficial and detrimental effects on man. To expose oneself to the sun generally produces an initial sensation of well-being (psychological wellbeing), in addition to playing a fundamental role in the production of Vitamin D3, which is responsible for the synthesis of calcium in the human body. On the other hand, countering the positive effects of prolonged exposure to the sun, which is usually what happens if someone is trying to acquire a suntan, are certain negative effects that have also been verified, including some of a serious nature, such as skin problems like erythema, photodermatitis, ageing and even tumours of the skin.

There is an optimum period of exposure that maximises the positive effects and minimises the negative effect, but this period is not the same for everyone.

It is commonly observed that light-skinned people tan and get sunburned far more easily than those with a dark skin. Information regarding ideal exposure time must, in fact, always keep skin type in mind and be modified accordingly. The UV index was established to increase the population's awareness of the risk of excessive exposure to the Sun, and to encourage the taking of protective measures.

Over the last two years, ISPRA in accordance with the agency system, has collected and collated all available data and information provided from across the nation.

Considering that, to date, Italy has only scarce experience on this issue, the limited data available obviously lacks uniformity and is extremely variable. Nevertheless, it does underline the country's commitment to this innovative subject.

Two of the ARPA (Aosta Valley and Piedmont)

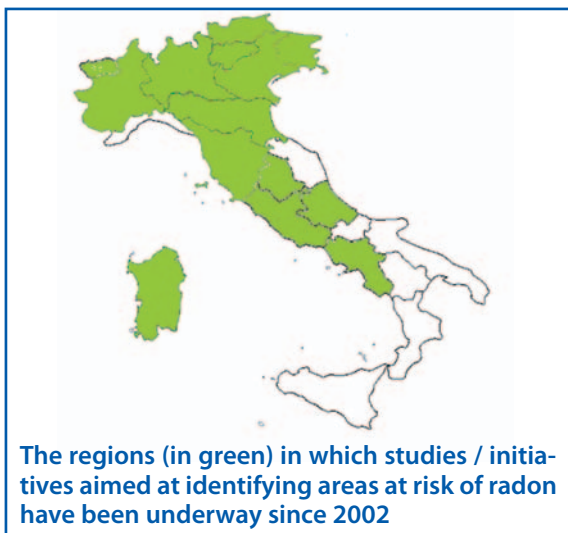
utilise criteria and procedures in line with European standards, and no fewer than 19 of 21 agencies carry out UV initiatives.

The control of environmental radioactivity in Italy is justified by the need to protect the general population and workers from exposure to ionising radiation.

Ionising radiation is almost always only associated with the production of nuclear energy, although, in fact, exposure to ionising radiation is also a medical, diagnostic or therapeutic procedure. In such instances, the risks involved are considered to be more than outweighed by the benefits incurred by those that undergo such treatments. The main source of exposure to ionising radiation occurs in a domestic setting and in other indoor situations. In fact, there is a natural gas present in the air in all these locations, called radon, which is the main source of the risks that everyone has to face. In some cases, it reaches such high levels of concentration that the associated risks are considered unacceptable and taking action to restore healthy conditions to the living environment is highly recommended or even obligatory.

A national overview of the situation with regard to radon exposure was obtained following an investigation carried out in the 80s and 90s, which, because of the characteristics of the phenomenon, is still valid. Noteworthy differences were found in the average concentrations of Radon (Rn-222) in the various regions of Italy. Especially high concentrations of radon (Rn-222) were noted in Lazio and Lombardy. The difference between these regions and the others is due to the high uranium content in the rocks and soils and their diverse permeability. As to the response to this investigation, the problem of protecting the workplace from radon

exposure was legally addressed with the enactment of Legislative Decree no. 241 in 2000, which modified and integrated an earlier decree, no. 230 of 1995. The Decree sets out the obligations of both those in charge of workplaces and of the regions. The latter in particular are charged to identify the areas most likely to suffer high concentrations of radon activity.



Pending the determination of the criteria to be used to identify the areas with high concentrations of radon, and the methods to be adopted in that process, some regions and some ARPA/APPA started studies and investigations that will allow to classify areas according to the likelihood of high concentrations of radon being present.

In conclusion, information on the decontamination efforts carried out in Italy in places where there is a high concentration of radon is still sketchy and erratic, whether with regard to domestic situations or the workplace.

### ENVIRONMENT AND HEALTH

The effects of climate variability and change will impact on the quality and availability of natural resources, biodiversity and territorial stability acting also as amplifiers of pre-existing environmental vulnerabilities. The impacts of climate change call for a proactive response that involves a reorganization of environmental and health prevention systems from a technological, operational and organizational point of view.

The observed data in the last decades show that also Italy is among Countries affected by meteorological change and variability.

In particular, in Italy an increase in the number of summer days ( $T > 25^{\circ}\text{C}$ ) has been observed over the last decades, while cold days have decreased by about 20% ( $T \leq 0^{\circ}\text{C}$ ).

Winters and autumns, therefore, are milder.

Even the number of rainy days seems to have suffered a statistically significant reduction throughout the national territory, while the intensity of rainfall in the Northern and Southern regions has increased.

The results of a first national screening of health risks caused by climate change highlight emerging risk conditions.

The changes in average temperature and humidity patterns facilitate the distribution of arthropods, potential vectors of viral, bacterial and parasitical diseases. In addition to meteorological factors, other vulnerabilities can influence the distribution of vectors such as habitat destruction, soil utilization, pesticide utilization and loss of natural predators.

The mapping of foci where insects (potential vectors of pathogenic agents) develop is therefore a prevention tool both during emergency stages

of events and in planning ad hoc measures.

Climate change can also pose a threat to food safety, affecting all the components of food systems. The changes in climate conditions can affect food security acting on all components of the food system at global, national and local level.

The most frequent and intense extreme events (such as droughts, increase in sea level and irregular seasonal rainfall patterns) are already showing impacts on: food production; food distribution infrastructures; the increase of food emergencies; resource availability for survival and health lives.

The causal chain through which weather variability and extreme events influence human nutrition is complex and involves different factors, such as: shortage of water; salinization of agricultural land; destruction of farm products due to floods; interruption of logistics due to disasters; increase in the incidence of plant infections and/or infestation.

For the moment we can only make forecasts on the basis of knowledge acquired on the key environmental conditions that favour the production of the main fungi and/or toxins.

The adaptation strategy must, on the one hand, revise environmental control and monitoring protocols and, on the other, promote specific action on different determinants, such as agricultural practices and the performance of water services, water treatment and sewage services.

Technological and management challenges are: guaranteeing the functioning of existing structures; eliminating management failures of inefficient ones; planning the safe use of new water sources in case of drought; preventing the unavailability of acceptable water quality during flood emergencies.

Climate change also influences the spread of aller-



gies, causing the Spring pollen season to occur earlier in the Northern hemisphere. It is therefore reasonable to believe that allergies from pollens, such as allergic rhinitis, have a concomitant seasonal variation. Different epidemiological studies (also conducted in Italy) show that the prevalence of allergic respiratory diseases has considerably increased all over the world in the past decades.

<b>Prevalence of pollinosis in Italy</b>			
Pollen	North	Centre	South, islands and Liguria
	% prevalence		
Graminaceae	75	60	40
Urticaceae (pellitory)	30	40	60
Compositae (artemisia)	25	15	10
Ambrosia	30	7	2
Chenopodiaceae	1	2	14
Plantaginaceae (plantago)	4	4	9
Birch	33	13	5
Alder	36	8	7
Hornbeam	34	26	4
Hazel	34	16	4
Cupressaceae	9	28	20
Olea	5	10	25
Fagaceae	7	15	10

In Italy, pollen allergy is estimated to represent about 40% of allergic but it diseases but it shows an high local variability. The different territorial distribution of plants that produce pollens can partially explain the marked differences in sensitivity in the different regions of Italy.

As described above, the importance of pollen allergies is related to the duration and intensity of pollen seasons, the frequency and concentration reached during peaks and the quantity of allergens. As a result, temperature variations and rainfall changes could alter the duration and the beginning of the growth season of pollinator plants.

It is necessary to strengthen local knowledge, implementing aerobiological monitoring of pollens and integrating it with a fungal spore monitoring system.

Health risks and climate change are a well known issue in scientific literature and are widely reported and documented in various national and international government report and assessments. The management of emerging risks related to new meteo-climatic scenarios can be faced by depicting specific responsibilities to the single sector that influence environmental determinants of health. But adaptation actions must, in any case, be integrated together, otherwise the adopted measures will be inefficient to control risks and adverse health effects not compatible with a healthy sustainable development.

## ENVIRONMENTAL RISK

### *Natural Risk*

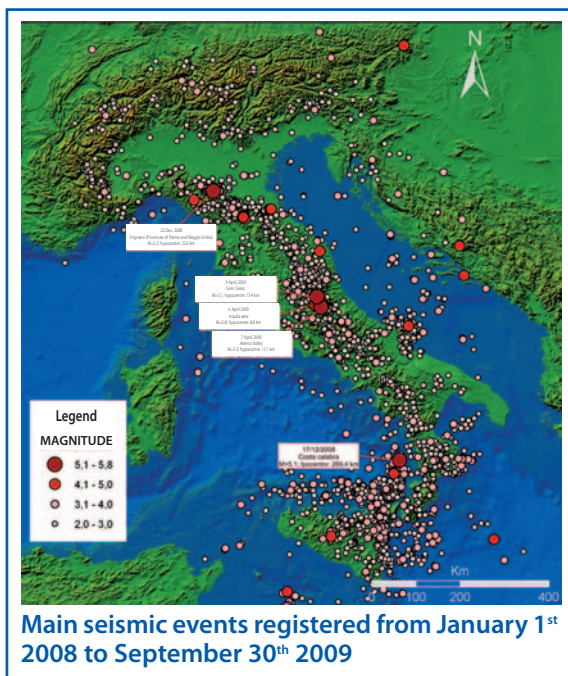
Natural events that are likely to give rise to conditions of risk can be subdivided into two main categories of underlying causes: events of endogenous origin (including for instance volcanic eruptions, earthquakes, etc.) set off by forces within the earth, and those of exogenous origin (including floods, landslides, avalanches, etc.), occurring on the terrestrial surface.

During the period 2008-2009 both seismic risk and geological-hydraulic risk occurred to an extraordinary extent.

The areas most subject to seismic risk are found in the Friuli zone, along the central-southern Apennine mountain range, especially in the intra-Apennine basin, near the Tyrrhenian shore of Calabria and in southeast Sicily.

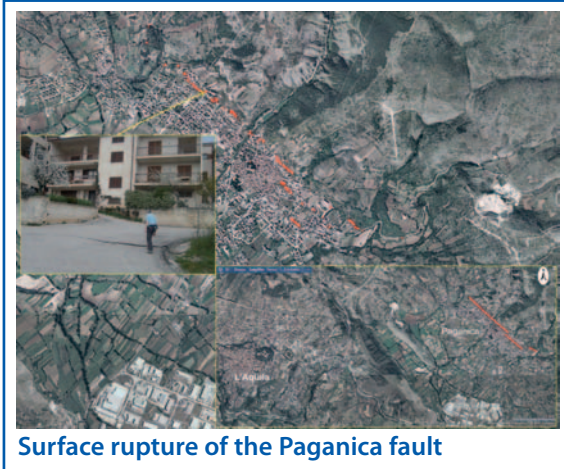
In 2008, three seismic events exceeded the threshold of a local magnitude of 5: the event along the coast of Calabria had a very deep epicentre and did not cause damage; those in the Frignano area damaged some bell towers and churches, causing cracking in a number of structures, plus the collapse of smokestacks and cornices. No damage to people was recorded.

The most noteworthy events of 2009 were those that occurred in the Aquila zone.



The most drastic event, which occurred in L'Aquila and the surrounding area on April 6<sup>th</sup>, with a local magnitude (MI) of 5.8 and a momentum magnitude (Mw) of 6.3, caused over 300 victims and serious damages to buildings and to the artistic and cultural heritage, involving an area of approximately 30 km<sup>2</sup>. The fault plane along which the earthquake occurred produced a surface rupture of the soil near Paganica. Such surface faulting, indicated by the red, can be easily detected for a length of 2.6 kilometres.

More than 50 municipalities in Abruzzo have suffered damages that have rendered part of the buildings unfit for habitation, with the consequence that the Civil Protection Agency has had to provide for 171 emergency camps.

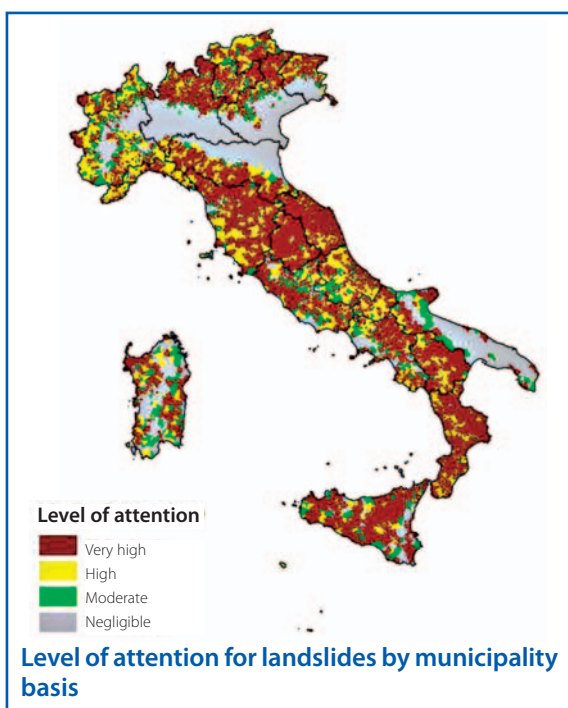


**Surface rupture of the Paganica fault**

The scenario of damaged buildings – as shown by the data collected by the Quick Earthquake Survey Team (QUEST) – immediately appeared to be irregular. The peak values seem to have been caused by local seismic vulnerability, in some cases combined with evident site effects (for example, Onna and other villages in the Aterno valley, located on recent non-consolidated alluvial sediments).

Italy presents an especially high risk on account of its morphological characteristics (75% of the national territory is mountainous-hilly). Landslides are the natural disasters that occur with the greatest frequency and, after earthquakes, cause the greatest number of victims and the most damage to urban areas, infrastructures and environmental, historical and cultural resources. In Italy, more than 485,000 landslides have been identified by ISPRA and by the regions and autonomous provinces, involving an area of over 20,700 km<sup>2</sup>, equal to 6.9% of the national territory (IFFI Project – Inventory of Landslides in Italy). Not all landslides present the same level of hazard, with those involving high-speed movement and note-

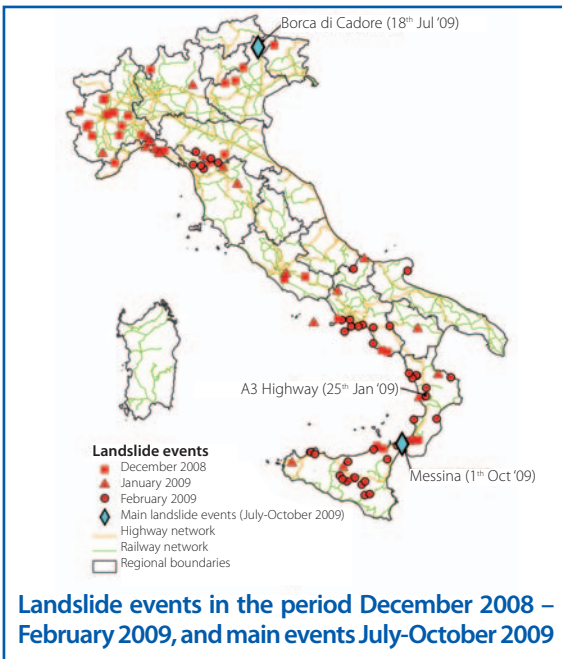
worthy volumes of rock or soil causing the greatest damage and number of victims. Italian municipalities affected by landslides currently number 5,708, or 70.5% of the total. A total of 2,940 municipalities have been classified at very high levels of attention, 1,732 municipalities call for high levels of attention, 1,036 municipalities rate a moderate level of attention, and 2,393 call for negligible levels of attention (municipalities in which no landslides have been registered).



In the period December 2008 - February 2009, exceptional precipitation in the whole national territory led to the occurrence of a series of landslide events that caused serious damage to urban areas, and particularly to transport infrastructures (for

example, the highways A3 Salerno-Reggio Calabria, A14 Vasto-Termini Imerese, A20 Messina-Palermo) and the railway lines Potenza-Battipaglia, Battipaglia-Sapri, Catania-Caltanissetta). On January 25<sup>th</sup> 2009 a landslide covered the roadway of the A3 highway for nearly 20 meters, between the exits at Rogliano and Altilia-Grimaldi, causing 2 victims and 5 injuries.

In 2009, two other dramatic natural events occurred: on 18<sup>th</sup> July, in the town of Borca di Cadore (BL), a rapid slide of rubble invaded a number of habitations in the Cancia district, causing two victims; on 1 October, following a violent rain storm (more than 200 mm of rainfall in 24 h), a number of rapid slides of mud and rubble occurred in the city of Messina (in the Giampileri, Molino and Altolia districts) and in the town of Scaletta Zanclea (ME), leaving 31 and 6 missing.



Slope instability is due to the interaction of several concomitant causes: natural events (precipitation, earthquakes) and anthropic activities. Anthropogenic factors play an increasingly important role (for example, roadway construction, excavation or overloads, negligent maintenance of defence works.).

In order to arrive at effective risk mitigation, therefore, it is indispensable that the emergency approach, based on after-the-fact responses, be replaced with initiatives combining forecasting and prevention.

Forecasting includes a research phase aimed at the census, collection and updating of information about landslide phenomena (IFFI Project, Inventory of Landslide Events in Italy), the monitoring of movements through telemasuring networks both from earth terminals and satellite, the identification of landslide-prone areas, and models for possible scenarios. The dissemination of information on hydro-geological instability (landslides, floods, avalanches) also plays a very important role in landslide risk prevention (i.e. the online cartography of the IFFI Project:

<http://www.sinanet.apat.it/progettoiffi>).

Heightening the awareness of citizens also provides them with increased knowledge of the risks involving their own territory, as well as of the forms of conduct to be followed before, during and after the event.

### ***Anthropogenic risk***

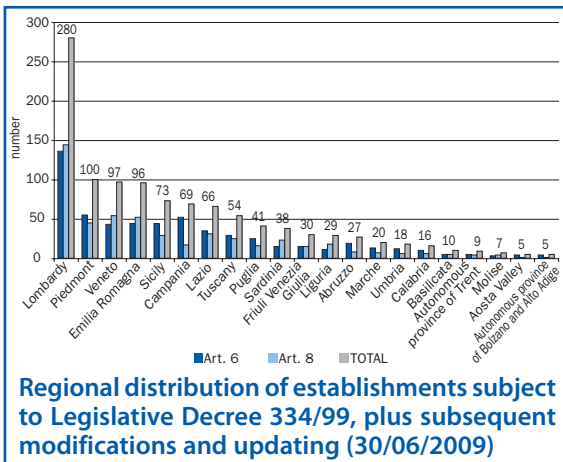
Anthropogenic risk is defined as the risk (direct or indirect) caused by human activities that are potentially dangerous for both the environment and human life. This broad definition encompasses so-called "industrial risk" arising from activities carried out in industrial establishments.

A "Major-Accident Hazard Establishment" (MAH



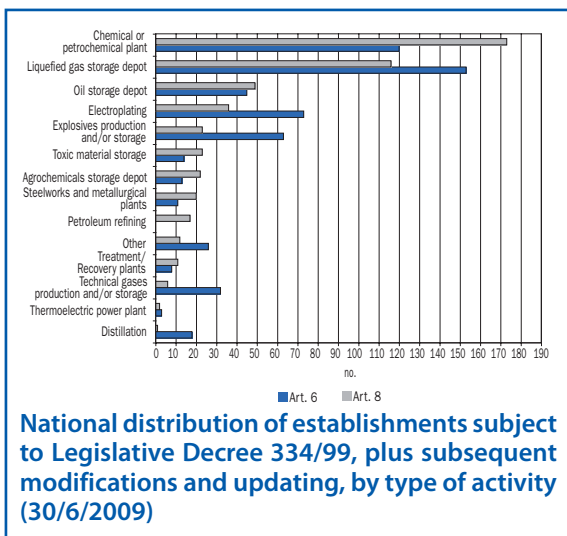
establishment) is defined as an establishment containing dangerous substances (used in the production cycle or simply stored) in quantities that exceed the thresholds established under the Seveso regulations (Directive 82/501/ EEC, plus subsequent modifications).

The Seveso Directive, plus subsequent modifications, aims at reducing major accident hazards, as well as their impact on man and the environment. The highest concentrations of MAH establishments are found in the regions of Lombardy, Piedmont, Veneto and Emilia Romagna. Municipalities with 4 or more establishments at risk of major accident include Venice and Ravenna.



When the activities of an establishment are known, then its potential risk can be foreseen, at least in general terms. An analysis of the different types of establishments, together with their distribution within the territory, makes it possible to determine the incidence of the different categories of industrial activities most common in establishments at risk of accidents. Such information – combined with

hypothetical hazard scenarios associated with areas of potential damage, makes it possible to produce risk maps to be used with a view of territorial planning, providing information, and ensuring adequate emergency management.



Noteworthy are the large petrochemical complexes that developed in the post-war years in the Po River plain (Ravenna, Ferrara) and in the Venice Lagoon, as well as in Southern Italy in the 60's and 70's (Brindisi, Priolo, Gela, Porto Torres, ecc.), while clusters of refineries can be found in Sicily and Lombardy.

One of the peculiarities of Italy is the impressive development of the network of LPG tank storage sites, supplying gas to the areas of the country that are not reached by the methane distribution network.

Another national characteristic is the presence of industrial districts, characterised by a concentration of small and medium-size industries with operations that are similar or belong to the same production chain.

## SOIL AND LAND

Soil is a complex, living body that continuously evolves. It carries out a series of functions making it essential for maintaining environmental balance. Soil plays a primary role in: protecting underground waters from pollution; controlling the quantity of atmospheric CO<sub>2</sub>; regulating surface water flows producing direct effects on floods and landslides; maintaining biodiversity; regulating nutritional element cycles, etc. Plant biomass depends on the soil's conditions with evident consequences on the whole food chain.

Incorrect agricultural practices, concentration of the population and economic activities in localised areas, climate change and land use/land cover change can limit or totally inhibit the soil's functions. The contamination of soil, due to excessive quantities of chemical substances, causes an alteration in the soil's characteristics and compromises not only its protective functions but also its productive and ecological functions. An example is contaminated sites, a common problem to all industrialized countries. In Italy there are currently 57 Contaminated Sites of National Interest, for which restoration efforts are being coordinated directly by the Ministry for the Environment, Land and Sea, while potentially contaminated sites, falling under the responsibility of regional authorities, number approximately 15,000, of which more than 4,000 need to be reclaimed. With regard to diffuse contamination, a national homogeneous overview is not yet available, even though the related problems are present in almost all Italian regions. Industrial and vehicle emissions cause the release into soils of acidifying contaminants (SO<sub>x</sub>, NO<sub>x</sub> and NH<sub>3</sub>), heavy metals (Pb, Hg, Cd, As, Cr, Cu, Ni, Se and Zn) and organic compounds (straight-

chain hydrocarbons, IPA, dioxins, furans, etc.). Intensive farming (which requires an abundant use of plant protection products, chemical fertilizers and animal dejection) can determine a surplus of nutritional elements (N, P and K), an accumulation of heavy metals and diffusion of biocide substances.

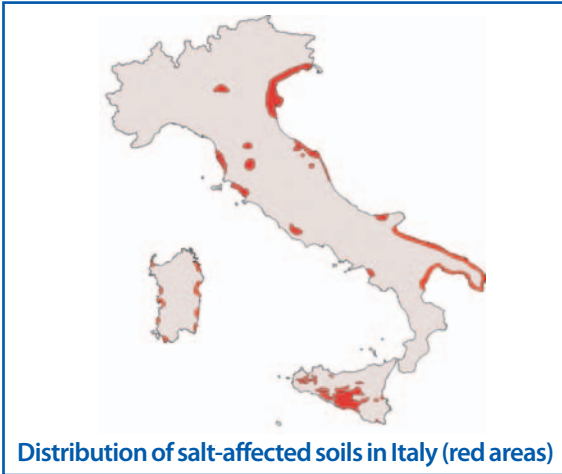
In particular, an excessive amount of nutritional elements can cause serious pollution of underground water and eutrophization of water ecosystems, since nitrates are highly soluble and therefore seldom retained in the soil.

The nitrate surplus trend is progressively reducing in almost all regions, due to measures adopted and regulations in force.

Another issue of great environmental and economic relevance is the phenomenon of soil erosion by water (i.e. the removal of topsoil, rich in organic matter, by surface waters).

The models designed to assess loss of soil, show that in about 30% of Italian soil the erosion risk is higher than the limit of tolerance; however these national-scale estimates are only based on approximate data.

A particularly common phenomenon, especially in coastal areas, is soil salinization. This refers to an excess of salts in soil, due to natural and human causes. It can reach levels that can compromise vegetation and farming activities, causing negative effects on the soil's biodiversity and on its resistance to erosion.



A first survey at national scale was recently carried out by the University of Palermo. It showed that salt-affected soils are mainly located in the lower Po River Plain, along extensive Tyrrhenian and Adriatic coastal strips and on the coasts of Apulia, Basilicata and Sardinia. Sicily is worth mentioning on its own, since the problem of salinization involves 10% of its regional land. Organic carbon content plays a positive role in many soil properties and its decline is one of the main factors in the deterioration of soil. It facilitates the aggregation and stability of soil particles reducing erosion and compaction; it bonds effectively with numerous substances, improving the fertility of the soil and its control capacity; it provides nutritional elements, such as nitrogen and phosphorus to plants. Most Italian soils have low levels of organic carbon content especially in farmland. However, preliminary data from a ongoing project (SIAS project) show an improved situation in some areas. Intensive agricultural areas can be subject to compaction (compression of soil particles into a

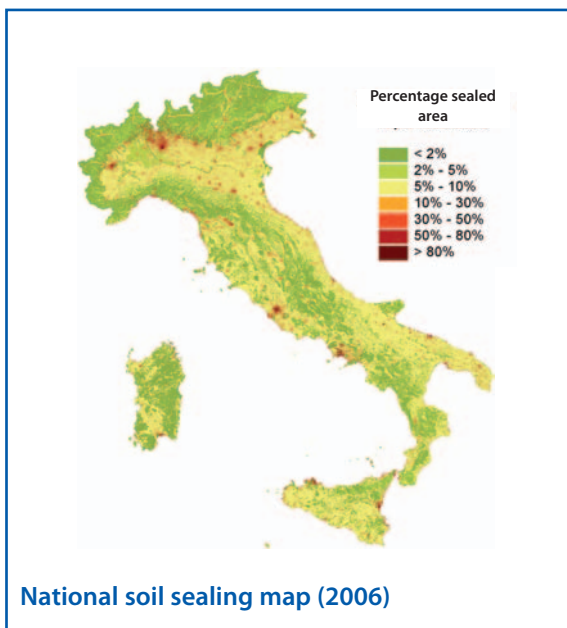
smaller volume following the reduction of air space between the particles themselves), mainly due to the use of agricultural machinery.

At the continental level, compaction is considered an important factor in the major floods that have affected Northern Europe in recent past.

The phenomenon of soil loss due to urbanization is a particularly serious one and a matter of concern since it strongly compromises large areas of land, which are often characterised by soils with a high agricultural value.

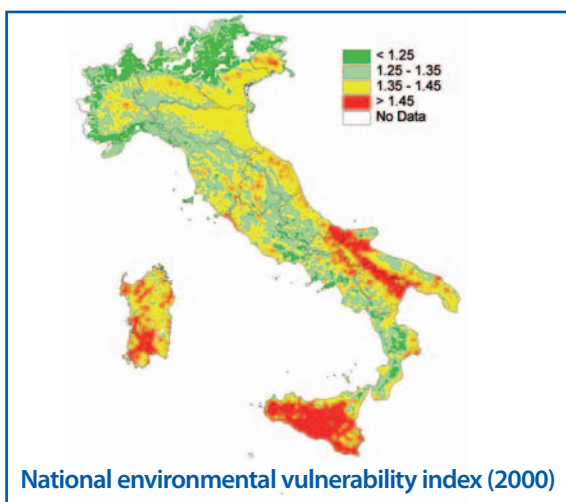
The trend in land use shows in Italy a progressive reduction of areas destined for agricultural use (-1.6%), a recovery of forest or semi-natural soils (+1.0%) and an increase of urbanized areas (+0.6%).

On the coast, urban areas have increased, especially in Sardinia and Calabria.



Soil sealing, is the result of covering the soil with impervious materials (built-up areas, industrial plants, commercial buildings, transport infrastructures, etc.), which partially or totally prevent it from performing its vital functions. Soil sealing limits/prevents water infiltration and the soil/subsoil's function of retaining the same, thus increasing the event of flash floods. The National map of sealed areas due to urbanization is based on data from CORINE Land Cover 2000, and shows that the highest values of this problem are found in Lombardy, Apulia, Veneto and Campania regions, with higher concentrations near urban areas and along the main road axes. In particular, the problem is assuming worrying proportions in the large plain areas, where urbanization is coupled with intensive farming. Progressive loss of soil biodiversity is related to all the above mentioned factors. Soil-dwelling organisms play an essential role in the formation of the soil and in its capacity to fix nitrogen and carbon, to retain water and nutrients, to act as a biological filter against contaminants etc. Areas subject to soil biodiversity loss in Italy mainly correspond to the areas that are affected by previously described threats. Overexploitation, unsustainable management of soil resources and climate conditions contribute to increasing the environment's vulnerability to desertification. The Research Unit for Climatology and Meteorology applied to Agriculture (CRA-CMA) has recently published a national map assessing land degradation and desertification processes. The map of the ESAI (Environmentally Sensitive Areas Index), obtained by applying the MEDALUS method, shows a medium-high degree of environmental vulnerability in Sicily, (around 70% of the regional area) followed by Molise (58%), Apulia (57%) and Basilicata (55%). Six regions

(Sardinia, Marche, Emilia Romagna, Umbria, Abruzzo and Campania) have a vulnerability percentage between 30% and 50%. Other seven regions (Calabria, Tuscany, Friuli Venezia Giulia, Lazio, Lombardy, Veneto and Piedmont) have a land vulnerability value between 10% and 25%, while three regions (Liguria, Aosta Valley and Trentino Alto Adige) show very low values (between 2% and 6%).



Mining activities, spread nationwide according to a growing trend up to the middle of the last century, is now reduced and mainly related to the extraction of marlstone for cement, ceramic minerals and minerals for industrial use. However, the serious ecological, health, static and structural problems relating to the hundreds of abandoned mines have not yet been solved. As regards quarries, data collected from relevant regional offices show that there are currently about 5,400 quarries operating in the country. Again, many problems involving unused or illegal quarries need to be solved. The



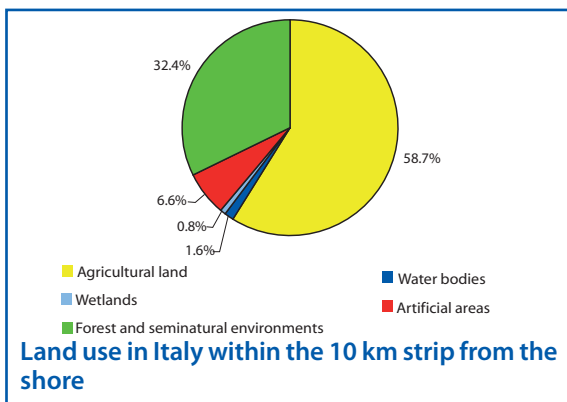
most important energy resource deposits are located in: Basilicata, which produces 75% of oil and 12% of natural gas in Italy; Sicily, which produces 10% of oil and 4% of gas; the Adriatic off-shore zone, where there is the highest production of natural gas. Recoverable reserves are estimated to be about  $130 \cdot 10^6$  t of oil and  $100 \cdot 10^6$  Sm<sup>3</sup> of natural gas, but the production is constantly decreasing. Despite the great geothermal potential of the Italian territory only two areas are being exploited, both located in Southern Tuscany (Larderello-Travale/Radicondoli and Monte Amiata). The production of energy from geothermal sources is, in any case, constantly increasing. Geosites are those geological and geomorphological areas presenting rare and unique characteristics. They are an important component of our geological heritage and provide essential information for our knowledge of the Earth. Actually, about 4,000 geosites have been counted in Italy.

At European level, the growing awareness of the environmental importance of soil and the need to contrast its progressive degradation and function loss, limit the increase of desertification processes, mitigate hydrogeological instability and reduce human pressure on land has led to a substantial review of the legal framework. The 6<sup>th</sup> Environment Action Programme, the new Common Agricultural Policy (CAP; Reg. EU 1782/03 and 1783/03) and the directive proposal for soil conservation (COM (2006) 232) acknowledge the environmental function of soil and lay the foundations for the protection and conservation of this resource. The current national legislation (Law 152/06) is focussed on mitigating hydrogeological risk and protecting the soil from pollution, with the involvement of a number of different institutional bodies, though there is still no all-encompassing act able to address the other issues as well.

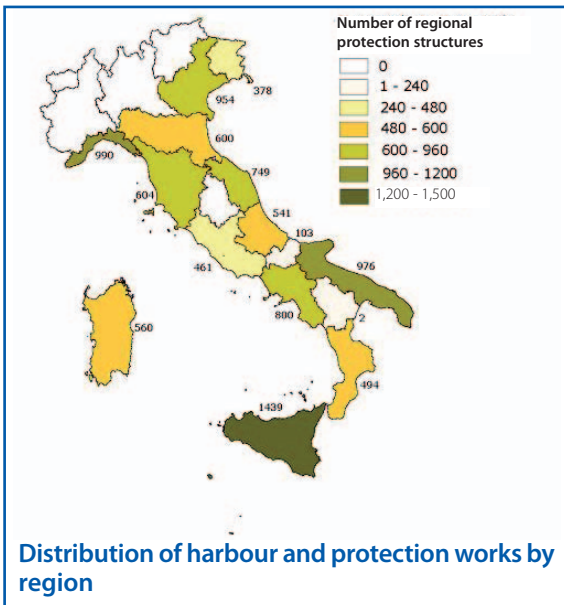
## COASTAL AREAS

The coast is a continually evolving area. Its changes are more clearly visible near low and sandy shores, where there are new adjustments of the seashore and land surfaces that emerge and are submerged by the sea. Coastline dynamics mainly depend on the sea's action, but they are also influenced by all those direct and indirect natural and human activities that intervene on the coastal balance, changing its morphological characteristics. The Italian coast has a length of 8,353 km, of which 4,863 km are low sandy or delta coastlines, areas that, from a physical point of view, are more vulnerable to sea action and subject to intense geomorphological dynamics. Due to their accessibility, low coastal areas are more densely occupied by residential settlements and intense business activities (even for tourism) as well as by roads and sea transport infrastructures. Indeed, in Italy more than 300 km of coasts host commercial and leisure port facilities.

Two thirds of Italian territory (over 65%) found within 10km of the shore is used for human activities and is moulded even by invasive and irreversible human action on the environment.



Italy is among the countries with the highest risk of coastal erosion. Out of the 4,863 km of low and delta coasts in Italy, 1,170 km are definitely eroding. In other words, over the last 50 years 24% of sandy coasts suffered an average erosion of over 25m. The regions most affected are: Sicily (with as many as 313 km of eroding coast); Calabria (208 km), Apulia (127 km), Sardinia (107 km), Lazio (63 km) and Tuscany (60 km). Interventions have taken place over the years to protect eroding shoreline. Hard structures, such as beams and barriers, have been installed on long sections of coastline, but without resolving the erosion problem, especially in the medium and long term. In many cases they even contributed to increasing the process of artificialization and marine/coastal habitat degradation.



An alternative technique to recover eroding coastlines is beach nourishment, which consists of

reconstructing the eroded beach by replacing the sand lost by erosion with nourishment material (usually sand). In the last few years, the search for new sources of material to be used for the nourishment of eroding coastlines has focused on the study of seabottoms. Indeed, deposits of relict sand (generally referable paleo-beaches) that can be used for beach nourishment are found on the continental shelf. Using relict sand deposits has some advantages with respect to using land quarries, such as: availability of large quantities of sediment (millions of m<sup>3</sup>); potentially similar composition to the sand on our coastlines; limited effects on the environment and lower costs (for beach nourishments requiring large volumes of sediment).

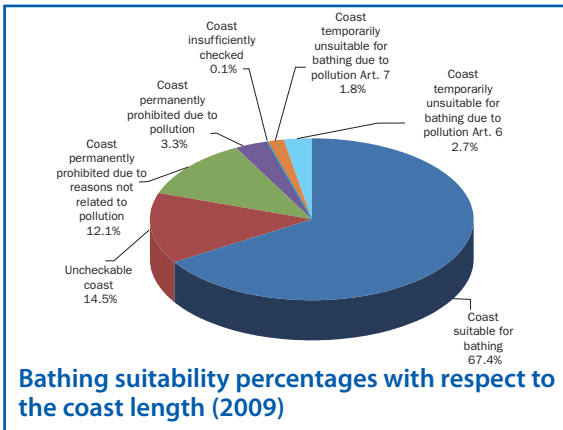
Although beach nourishment contributes to resolving coastal erosion on a local scale in the short term, it would be appropriate to plan a series of activities aimed at the preservation of the coastal system's resilience capacity, particularly with reference to natural elements that ensure the stability of coastal dynamics, such as dune environments.

Coastal dunes not only have a high landscape value but they also play an essential role in protecting the coastal zone increasing its resilience. In particular, they are able to annul the erosion risk, contrast the inland flooding risk and prevent saline intrusions in freshwater aquifers. Furthermore, coastal dunes host specific and characteristic ecological niches and are therefore extremely important both for plant communities and for the animal species associated with them. For some species they are actually essential ecological corridors for the coastal environment. It should not be forgotten that the preservation of dunes and beaches natural conditions are closely

related to those of other equally important ecosystems, such as humid retrodunal environments, coastal lagoons and lakes, *Posidonia oceanica* meadows and other marine phanerogams.

Distributed along almost all of Italy's coastline are the 10 habitats found to contain coastal dunes, three of which are included in the list of priority habitats in Annex I to Directive 92/43/EC, falling under two different macrocategories of reference: "Sea dunes of the Atlantic, North Sea and Baltic coasts" and "Sea dunes of the Mediterranean Coast".

Along the Italian coast there are 4,615 sites where recreational and bathing activities can be practiced. This places Italy at the top of the list of European countries with the highest number of marine waters used for this purpose. In 2009, 5,175 km of Italian coastline was checked, with 4,969 km found suitable for bathing. This value represents 33.8% of bathing coast in Europe and 55.2% of bathing coast in the Mediterranean area.



A widespread and very current phenomenon that involves large sections of the Italian coast is the

stranding of seabed vegetation and its compatible management. This is what occurs with the marine phanerogam *Posidonia oceanica*. The meadows are one of the fundamental components of the coastal environment's balance and richness, and are acknowledged as a priority habitat and thus protected by the Habitat Directive (92/43/EC). Coastal erosion phenomena can have a serious impact on the loss of biodiversity, of landscape and environmental heritage (coastal pine woods, dunes, beaches, etc.) and of areas where very valuable economic activities can be developed.

In the Mediterranean and in Italy, coastal areas are among the most vulnerable and seriously threatened natural ecosystems of today, even though they are largely protected by specific tools, both at the national and community levels. The increasing focus placed on protecting the seashore environment, plus the growing attention to improving management of coastal zones, have led to the passage of specific European regulations, national strategies, regional reclamation plans etc.

At the European Community level, between 1996 and 1999, the Commission carried out a demonstrative programme on Integrated Coastal Zone Management. Then, in 2002, on the basis of the Programme's experience and results, the European Council and Parliament adopted the ICZM Recommendation (2002/413/EC). On the international level, Italy is one of the signatory countries of the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its related protocols. 21 States of the Mediterranean basin and the European Community have endorsed the Convention. In accordance with Article 4 of the Convention,

Protocol VII on Integrated Coastal Zone Management (ICZM) of the Mediterranean was implemented. Protocol VII is the first binding legal tool in the definition of a national strategy for the integrated management of coastal zones and governance of marine and coastal zones. The formulation of plans for the management of coastal zones is based on systematic monitoring and analysis of vulnerable areas, in order to determine the measures best suited to defending the more sensitive areas and those subject to intensive exploitation. Out of 15 coastal regions, 11 of them are endowed with planning tools extending to the entire regional territory. Among these, 6 regions have a specific coastal protection plan and only Emilia Romagna and Marche have an approved integrated management plan for the coastal area.

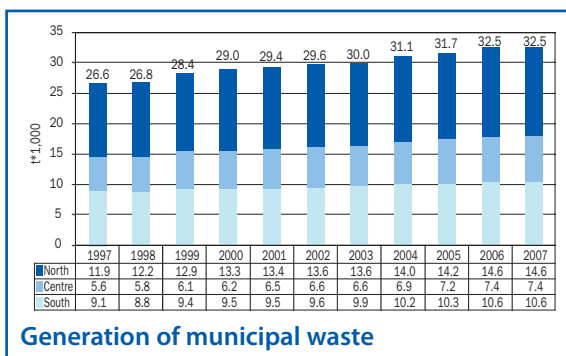
The remaining regions mainly have coast protection and Regional Action Plans (RAPs) that merely define a list of protective works to be realized in short sections of the coast.

Indeed, the current coastal planning framework in Italy does not yet reflect the wider scope introduced by the Integrated Coastal Zone Management. However, it should be underlined that, since the ratification of Protocol VII on ICZM, the Ministry of the Environment, Land and Sea started a series of studies and projects to prepare Italy's National Strategy.

## THE WASTE CYCLE

Total municipal waste generation between 2006 and 2007 was marked by substantial stability, with growth of about 0.1%.

In the period 2003-2007, the total generation of municipal waste increased by about 8.4% with more substantial increases between 2003 and 2004 (+3.7%) and between 2005 and 2006 (+2.7%). A more controlled growth was recorded between 2004 and 2005 and in the last year (+1.6%).



The analysis of per capita data is necessary to extract the individual generation level from that of the resident population. In this regard, a reduction of data for 2007 was observed with respect to 2006. Indeed, over the last year, national per capita generation was about 546 kg/inhabitant per year, compared to the 550 kg/ inhabitant per year of 2006.

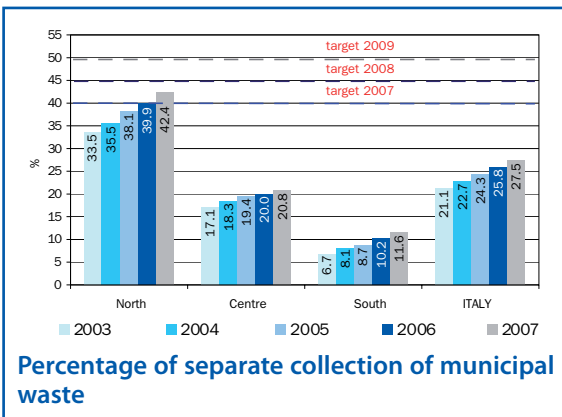
In particular, it should be noted that the per capita generation is substantially influenced by the increase in the official resident population, which grew by 488,003 units (+0,8%) between the December 31<sup>st</sup> 2006 and the December 31<sup>st</sup> 2007,



and therefore it is larger with respect to the recorded municipal waste data.

Despite the substantial stability of the total generation of municipal waste, it can be observed that, between 2006 and 2007, separate collection at national level increased by almost 590,000 tons (+7%). This growth brings the amount of separately collected waste to about 9 million tons, representing 27.5% of the total municipal waste generation. However, the collection is still below the 35% target by Article 205 of Legislative Decree no. 152/2006 to be reached by December 31<sup>st</sup> 2006, the 40% target introduced by Law no. 296 of December 27<sup>th</sup> 2006, to be reached by December 31<sup>st</sup> 2007.

An analysis of geographical macroareas highlights an extremely diversified scenario, while the North (with a collection of 42.4%) is clearly beyond the 2007 target, which was actually almost reached in 2006 (39.9%), the Centre and South (with respectively 20.8% and 11.6%) are still very far from achieving the target.



In 2007, the regions with the highest percentages

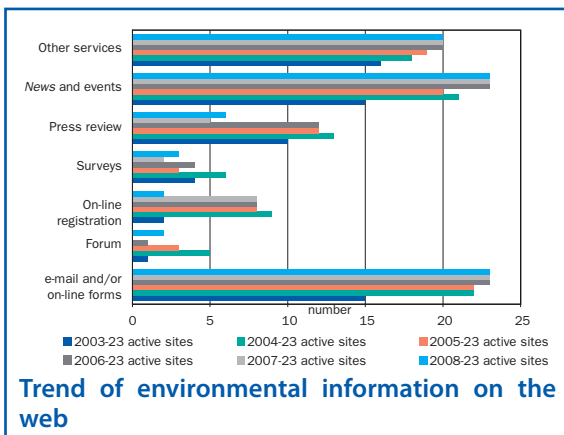
of separate collection are Trentino Alto Adige (53.4%) and Veneto (51.4%). Piedmont and Lombardy almost reach 45%, with final respective figures of 44.8% and 44.5%.

Data on the generation and separate collection of waste are collected and processed by ISPRA for each single city. An analysis of data at the municipal level, conducted in 2007, shows that 4.1% of municipalities have separate collection rates higher than 70%, while over half (about 52.5%) have collection rates below 30%. By dividing the municipalities into classes, according to the resident population, it can be noted that 70% have less than 5,000 inhabitants. The analysis of the data also shows that municipalities with a higher separate collection rate decrease in number as the population grows in dimension.

In the class of municipalities with less than 5,000 inhabitants, about 34% of municipalities have a SC rate higher than 40%. In centres with a population between 5,001 and 15,000 inhabitants, the number of municipalities with the highest SC rate is roughly 42%. In the case of larger populations centres, on the other hand, the percentage of municipalities with separate collection rates greater than 40% is more limited. In municipalities with populations of between 50,001 and 150,000, for example, the percentage is roughly 19%.

## INSTRUMENTS FOR ENVIRONMENTAL KNOWLEDGE AND AWARENESS AND INTERFACE WITH THE MARKET

Reporting activities and their products, telematic tools for access to environmental data/information, library services, environmental education and training initiatives, plus the European EMAS and ECOLABEL regulations, are some of the instruments society can draw on in formulating a strategy for responding to environmental problems. Legislative Decree no. 195/05, in addition to granting citizens the right to obtain access to information, to take part in decision-making processes and to obtain justice in environmental matters, also requires public authorities to establish and update specific catalogues of environmental information, distributing them by means of, wherever possible, It communications and electronic technology. In recent years the spread of environmental information has been significantly reinforced, thanks in large part to technological innovation, which has improved its effectiveness.



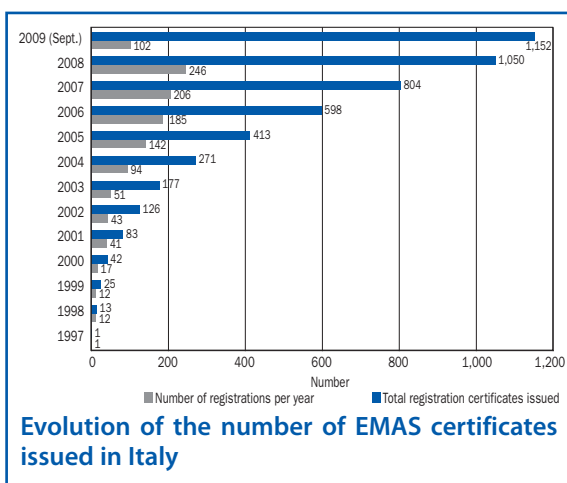
Non-structured information, meaning news and data communicated through the mass media, also contribute to environmental awareness. A study carried out by ISPRA on the words used in titles showed that the topic of “waste” was that most frequently dealt with by Italy’s daily papers and periodicals in the first six months of 2009. Reports on the state of the environment, yearbooks, manuals, guidelines and thematic reports were again found to be the reporting products most widely used by the Agency System. With their yearbooks and reports, the agencies contributing to distributing the data to the territories involved, furthering the growth of the national system of environmental knowledge as a whole.

In addition, the national system has further reinforced its position in the print, radio and television media. The supply of environmental information offered over the web remains constant: documents for downloading and periodic bulletins can be found on the sites of environmental agencies, with the most widely used modes of communication being e-mail and on-line forms. The ISPRA web portal provides information and services that meet the prerequisites of accessibility and effectiveness contemplated under the law, while the network of libraries and documentation centres specialised in environmental topics, combined with other instruments, ensures distribution of the information. The ISPRA library has expanded the range of the topics and areas of research offered to users.

In Italy, the array of initiatives to heighten awareness and provide instruction, for the purpose of promoting sustainability, is very extensive, with the Agency System constituting only a portion, though a significant one in terms of effectiveness and numbers. In 2008, the Agency System

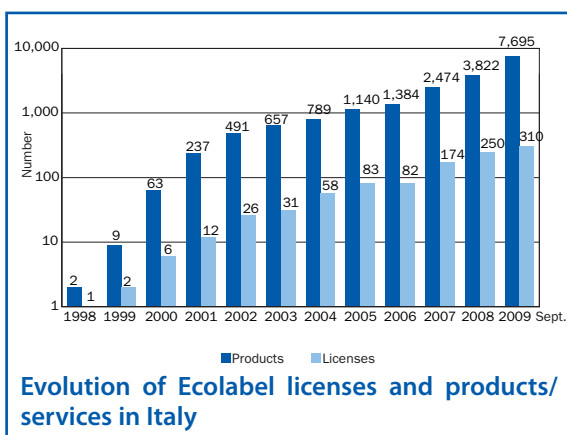
promoted 492 initiatives of environmental education, while the face-to-face training sessions, in which approximately 6,500 environmental experts took part, numbered 352. There were 737 internships and apprenticeships, of which 52% were carried out by recent university graduates.

As for the penetration of the European EMAS and ECOLABEL regulations, it has grown continuously since 1997, showing noteworthy annual increases.



Only in 2009 there was a slight drop in the increase of requests for EMAS certification for reasons that require further investigation but can probably be attributed to the economic crisis. As of September 2009, the number of EMAS certificates issued was 1,152. Among the European countries, Italy ranks third for EMAS, after Germany and Spain, while it is the leader for the ECOLABEL, followed by France and Denmark. The regions with the best results in terms of EMAS registered organisations are: Emilia Romagna, Tuscany, Lombardy and Veneto, while Apulia holds fifth place. Between 1998 and 2009

(September) 310 ECOLABEL licenses were issued, for a total of 7,695 labelled products/services. The largest number of ECOLABEL licenses was registered in Trentino Alto Adige, followed by Emilia Romagna, Tuscany, Lombardy and Piedmont. Still, the general public's awareness of both the ECOLABEL mark and the EMAS logo remain below the levels able to move the market towards a "green market".



---

## **LEGAL INFORMATION**

Neither the Institute for Environmental Protection and Research (ISPRA) nor the individuals who act on its behalf may be held responsible for the uses made of the information contained in this Report.

Law 133/2008, which converted, following modification, Legislative Decree no. 112 of 25 June 2008, established the ISPRA –Institute for Environmental Protection and Research. The ISPRA carries out the functions that were the responsibility of the Environmental Protection and Technical Services Agency (formerly APAT), of the National Institute for Wildlife (formerly INFS) and of the Central Institute for Scientific and Technological Research Applied to the Sea (formerly ICRAM).

**ISPRA** – Institute for Environmental Protection and Research  
State of Environment and Environmental Metrology Department  
Environmental Statistics and Yearbook Project Service  
Via Vitaliano Brancati, 48 - 00144 ROME  
[www.isprambiente.it](http://www.isprambiente.it)

ISBN 978-88-448-0424-4

Reproduction authorised when the source is cited

*Graphic treatment:* ISPRA

*Cover graphics:* Franco Iozzoli, ISPRA

*Cover photo:* Paolo Orlandi, ISPRA

*Typographic coordination:* ISPRA - Publishing Department

*Administration:* Olimpia Girolamo, ISPRA - Publishing Department

*Distribution:* Michelina Porcarelli, ISPRA – Communication Service

Finished print in the month of July 2010  
by Typolithography CSR - Via di Pietralata, 157 - 00158 Rome (Italy)  
Phone 064182113 (r.a.) - Fax 064506671



ISBN 978-88-448-0424-4



9 788844 804244