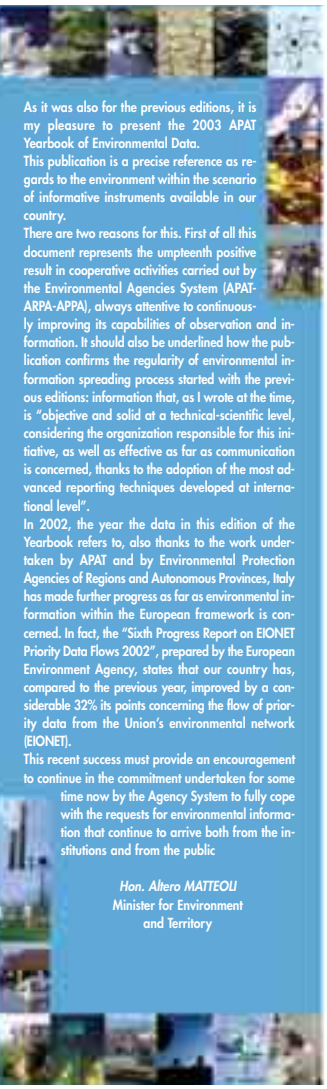


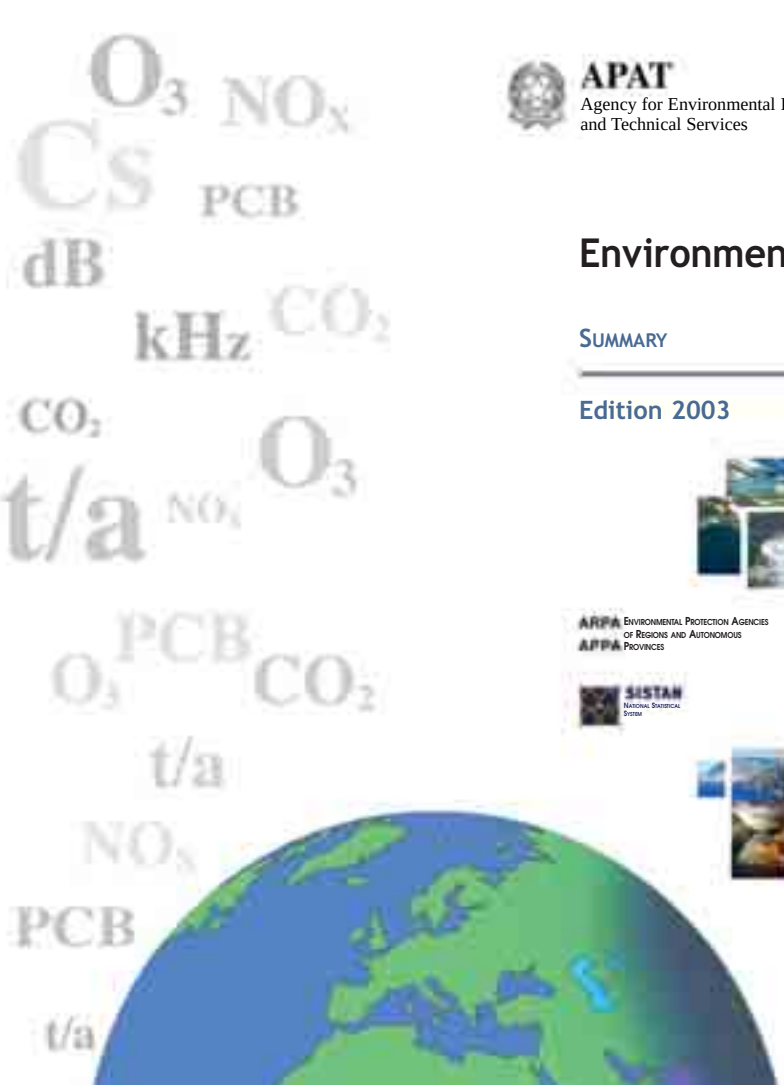
As it was also for the previous editions, it is my pleasure to present the 2003 APAT Yearbook of Environmental Data.
This publication is a precise reference as regards to the environment within the scenario of informative instruments available in our country.
There are two reasons for this. First of all this document represents the umpteenth positive result in cooperative activities carried out by the Environmental Agencies System (APAT-ARPA-APPA), always attentive to continuously improving its capabilities of observation and information. It should also be underlined how the publication confirms the regularity of environmental information spreading process started with the previous editions: information that, as I wrote at the time, is "objective and solid at a technical-scientific level, considering the organization responsible for this initiative, as well as effective as far as communication is concerned, thanks to the adoption of the most advanced reporting techniques developed at international level".
In 2002, the year the data in this edition of the Yearbook refers to, also thanks to the work undertaken by APAT and by Environmental Protection Agencies of Regions and Autonomous Provinces, Italy has made further progress as far as environmental information within the European framework is concerned. In fact, the "Sixth Progress Report on EIONET Priority Data Flows 2002", prepared by the European Environment Agency, states that our country has, compared to the previous year, improved by a considerable 32% its points concerning the flow of priority data from the Union's environmental network (EIONET).
This recent success must provide an encouragement to continue in the commitment undertaken for some time now by the Agency System to fully cope with the requests for environmental information that continue to arrive both from the institutions and from the public

*Hon. Altero MATTEOLI*
Minister for Environment
and Territory










**APAT**
Agency for Environmental Protection
and Technical Services

# Environmental Data Yearbook

## SUMMARY

## Edition 2003

ARPA ENVIRONMENTAL PROTECTION AGENCIES
APPA OF REGIONS AND AUTONOMOUS PROVINCES

SISTAN
NATIONAL STATISTICAL SYSTEM

YEARBOOK 2003

**APAT**
Agency for Environmental Protection
and Technical Services

# Environmental Data Yearbook

## SUMMARY

EDITION 2003

ENVIRONMENTAL PROTECTION AGENCIES OF REGIONS
AND AUTONOMOUS PROVINCES (ARPAS AND APPAS)

SISTAN NATIONAL STATISTICAL SYSTEM





**APAT - Agenzia per la protezione dell'ambiente e per servizi tecnici**
Via Vitaliano Brancati, 48 - 00144 ROMA
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*2003 has been declared by the UN*
*'International Year of Water'.*
*The cover is dedicated to this event.*

*Quas ob res ubi viderimus nil posse creari*
*De nihilo, tum quod sequimur iam rectius inde*
*Perspiciemus, et unde queat res quaeque creari*
*Et quo quaeque modo fiant opera sine divom*

**T. Lucretius** - ***De rerum natura***
***(I,155-158)***

ENVIRONMENTAL DATA YEARBOOK - SUMMARY



# Presentation

As it was also for the previous editions, it is my pleasure to present the 2003 APAT Yearbook of Environmental Data.
This publication is a precise reference as regards to the environment within the scenario of informative instruments available in our country.
There are two reasons for this. First of all this document represents the umpteenth positive result in cooperative activities carried out by the Environmental Agencies System (APAT-ARPA-APPA), always attentive to continuously improving its capabilities of observation and information. It should also be underlined how the publication confirms the regularity of environmental information spreading process started with the previous editions: information that, as I wrote at the time, is "objective and solid at a technical-scientific level, considering the organization responsible for this initiative, as well as effective as far as communication is concerned, thanks to the adoption of the most advanced reporting techniques developed at international level".
In 2002, the year the data in this edition of the Yearbook refers to, also thanks to the work undertaken by APAT and by the Regional and Provincial Environmental Protection Agencies, Italy has made further progress as far as environmental information within the European framework is concerned. In fact, the "Sixth Progress Report on EIONET Priority Data Flows 2002", prepared by the European Environment Agency, states that our country has, compared to the previous year, improved by a considerable 32% its points concerning the flow of priority data from the Union's environmental network (EIONET).
This recent success must provide an encouragement to continue in the commitment undertaken for some time now by the Agency System to fully cope with the requests for environmental information that continue to arrive both from the institutions and from the public

*Hon. Altero MATTEOLI*
Minister for the Environment
and Territory

ENVIRONMENTAL DATA YEARBOOK - SUMMARY



# Introduction to the 2003 edition of the Yearbook of environmental data

The Yearbook on Environmental Data – 2003 edition – confirms the availability of information concerning environmental conditions in Italy, now well on its way to qualification as being regular and organic.
The present publication is also the result of a complex process involving the identification of instruments for acquiring data and reporting mechanisms, promoted by APAT and implemented with the fundamental contribution of the Environmental Agencies System, especially within the framework of the National Topic Centres (CTN) project, as well as with cooperation from numerous technical-scientific institutions (Main Reference Institutions) working as partners with the CTNs.
Compared to the 2002 edition, this Yearbook has improved both in content and in form.
Environmental issues have been confirmed, while the *productive sectors* have been improved, with the addition of a chapter on *industry*. The chapter dedicated to *environmental controls*, although not yet sufficiently developed, is however more consolidated compared to previous editions. A chapter has also been added on *information, capacity building* and *environmental education*, extending also to this field the section about the answer factors needed to compare environmental impact.
Significant improvement of the meta-data (characterization of the indicators) has been obtained with the introduction, for each indicator, of a *state* and *trend* section. It contains both the motivations for the attribution of the specific "Chernoff's icons", and commented by improvements or deteriorations found, the possible reasons for the trend of the indicators or of the phenomenon, any links to provisions adopted on the territory and the phenomenon trend compared to the objectives stated in the provision.
All in all about 180 indicators, compared to the nearly 160 in the previous edition, have been listed and represented, in many cases accompanied both by territorial articulation and time-series. This shows the evolution of the consolidating process of the set of indicators selected for the yearbook, and it is hoped these will be completed in the next editions.
APAT provided a considerable contribution to the new indicators, which were supplied by the former Technical Services Department.
Significant innovation have been also applied to the overall format of the Yearbook.
First of all yet another effort has been made to improve the level of harmonisation and communicative effectiveness of the tools (graphs, tables, thematic charts) used to represent the indicators.
For this edition too, to encourage widespread information, it was considered appropriate to prepare three different versions of the document.
A complete Italian version, containing all the indicators selected for the 2003 edition with the objective of providing a "photograph", as exhaustive as possible, of the environment's objective and trend conditions, both in terms of quality or *state*, and *pressures*, *determinants, impacts* and *Responses*, according to the DPSIR[1] framework.
It is therefore a real and proper Yearbook of environmental data, which will be produced in the

[1] For details of the *DPSIR* see *"Structure of the Yearbook summary"*.



printed version in a limited number of copies, and however made available as a text (.pdf) and hypertext on the Internet website http://www.sinanet.apat.it. To make the document easier to read, the publication consists in two volumes, in a case edition, in which the first volume includes the introductive elements (Section A), the productive sectors (Section B) and the responses (Section C); the second includes environmental conditions (Section D).
Following the considerable success of the synthesised version prepared for the previous edition, the current one also presents this smaller form. Once again there are two volumes, quite small ones, one in Italian and the other in English. Both volumes present a specific selection of the Yearbook's 180 indicators, with the objective of providing an overall summary, as accurate and as effective as possible, of environmental conditions in Italy, with the advantage of faster communication. In selecting the indicators presented here, great care has been taken to privilege those that are more immediately understandable also for those who are not specialists in this field. Hence, where possible, we have selected indicators for which there exists a well-defined "target value", such as for example the *per capita* production of waste or limitations to the emission of climate change gases to achieve within a given period of time.
The Italian version will be published in 20,000 copies, for capillary distribution starting with the central and peripheral administrations.
The English version (hence widely distributed abroad) is addressed at a public beyond our national borders, to confirm regular communication concerning our environmental conditions, successfully started with the 2002 edition, at super-national level. This edition is once again accompanied by a multi-media version of the Yearbook, to encourage its wider diffusion and better understanding of the information contained in it, available on the Agency's website at http://www.sinanet.apat.it, and on a CD produced in 15,000 copies.

*Giorgio CESARI*
Director General APAT



# Contributors

The preparation of the Yearbook belongs to the activities planned – in the sector of data publishing and information on objective environmental conditions and trends – by the Agency for the Environmental Protection and Technical Services (APAT).
As for previous editions, the publication is the result of a complex activity of analysis carried out by a great number of Technical Units of the Agency more directly involved in the activity of environment reporting (Departments: Land Resources and Soil Protection; Marine and Inland Waters Protection; State of Environment and Environmental Metrology; Nuclear, Technological and Industrial Risk; Nature Protection; Library, Documentation and Information. Interdepartmental Services: Environmental Emergencies; Guidance, Co-ordination and Control of Inspection Activities; Environmental Certification), and with the contribution of the ARPA/APPA agencies, especially through the network of the National Topic Centers (CTN) and of the Main Reference Institutions, which collaborate to the CTN's.
Co-ordination, planning and implementation: Interdepartmental Service for Environmental Information (IAM).

Many contributions have also been provided, not only by the single sectoral specialist, but by central and peripheral administration, as well as by the technical and scientific structures.

In particular, as far as the former are concerned, mention must be made of all the Departments of the Ministry for the Environment and Territory, the Ministry for Production Activities, the Ministry for Cultural Assets and Activities, the Ministry for Infrastructure & Transport, the Ministry for Agricultural and & Forestry Policies, the Ministry for Health, the Carabinieri Division for Environmental Protection, the State Corps of Foresters, The Manager of the National Transmission Network, the Marine Environment Division of the Corps of the Harbour Police, the National Fire-brigade, the Regions, the Provinces, the PMP, Local Authorities; for public and Private technical and scientific institutions and organizations, ICRAM, ISTAT, the Health Institute, the Basin Authorities, the Water Magistrates, the National Research Council (IAA, IRSA, ICT, IMAA, III), ACI, ENEA, the Italian Glaciological Committee, ENEL, the European Soil Bureau of the Common Research Centre of the European Union at Ispra, EUROSTAT, Agecontrol S.p.A., Biobank, the ITHACA Database, the National Register of Organizations EMAS, ODYSEE, TELEATLAS.

Contributors are specifically detailed in the integral version of the "Environmental Data Yearbook – Edition 2003".

Thanks are due to all those, single specialists or organizations and institutions, who have made it possible to achieve this work and are helping to consolidate initiatives for a more organic and effective diffusion of environmental information in our country.

We hope all those that have contributed to this Yearbook are explicitly mentioned in the list of thanks, although a few names may have been missed in such an enormous quantity of data.

Lastly, we wish to express the hope that all our readers will feel free to send their comments and any suggestions for change, so that, with the help of everyone, the information produced may attain even higher levels.



# Index

ENVIRONMENTAL DATA YEARBOOK - SUMMARY



## Structure of the Yearbook Summary

As in the integral version, this Summary represents the complex picture of information on the environment in eighteen chapters and an appendix.
In particular, the first five chapters (agriculture, energy, transport, tourism and industry) contain the indicators describing production sectors especially in terms of their inter-relation with the environment, according to *Driving Forces* (**D**) of environment pressures, as direct factors of environment *Pressures* (**P**) and lastly, in relation to their environmental *Responses* (**R**).
The three following chapters (6-8) contain, although in this edition only in a preliminary form, the indicators on main institutional and non institutional initiatives, for the prevention, monitoring and recovery of situations of environmental degradation, thus mainly belonging to the *Responses* category.
The first chapter covers the environment quality of organizations, enterprises and products.
The second contains, in a very basic form, information on environment *monitoring* and inspections. The third chapter, also in development, and contrary to the other chapters, does not contain indicators, but in this first edition, is limited to providing information and data as example, on information, and environmental education and training.
The last chapters contain indicators on *environment conditions*, described mainly through the qualitative and quantitative objective and *State* of environment resources (**S**), *Pressures* which tend to alter such state, and the consequent *Impacts* (**I**) on man life and the ecosystem. These chapters cover the topics of *atmosphere, biosphere, hydrosphere, geosphere, waste, ionising radiation, non ionising radiation, noise, natural risk and anthropogenic risk*.
Each thematic area provides a brief description of the main environmental issues, which are in turn represented through certain themes. For each of these, a reduced number of significant indicators has been selected from the overall *set* given in the Yearbook. In the case of the atmosphere theme area, for example, attention is focused on two main topics: emissions as the main *pressure* factor, and air quality as the macro-indicator of objective environmental *state* and trend referring to that component.
In selecting the indicators to be included in this *Summary*, the following basic criteria have been adopted:

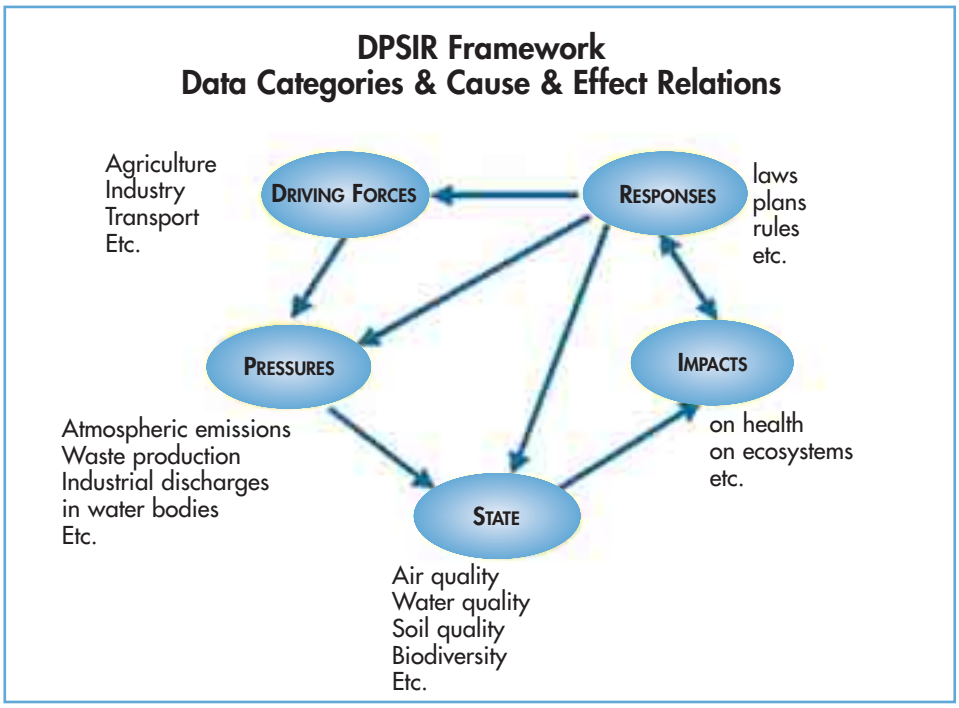
- high information quality and availability;
- availability of well-defined and objective references for a more effective reading of trends. For example, for the atmosphere, the selection includes climate-change gas emissions, for which a target must be achieved between 2008 and 2012;
- high communication impact, meaning that preference is given to indicators relating to phenomena (global climate) or basic problems (water purification), on which public expectations for information are highest.

To represent the indicators, always with the aim of providing more immediate and effective information, graphs and theme sheets have mainly been used, tables only being given in a few cases.

The appendix provides the complete picture of the indicators included in the integral version of the Yearbook.
In particular, the picture is organized according to theme areas end topics. Indicators are pro-



vided for each topic, together with descriptive information. This includes the name, aim, position on the *DPSIR* framework, level of spatial and time coverage. The indicators selected for the *Summary* are highlighted.
The *DPSIR*, developed by the European Environment Agency on the basis of an earlier framework (PSR) prepared by the OECD (Organization for Economic Co-operation and Development), has been adopted by APAT to build the environmental data system. As shown in the following figure, the *DPSIR* framework organizes related environmental data and information in five categories showing the relations of cause and effect.




The priority aim is the *state*, i.e. the set of physical, chemical and biological qualities of environmental resources (air, water, soil, etc.). The state is altered by *pressure*, comprising whatever tends to degrade environmental state (emissions to the atmosphere, waste production, industrial discharge, etc.) mostly caused by human activities (*driving forces*) – industry, agriculture, transport, etc., as well as natural ones. This alteration produces effects (*impacts*) on the health of human beings and animals, on ecosystems, economic damage, etc. To deal with impacts, *responses* are prepared, i.e. countermeasures (such as laws, intervention plans, direc-



tives, etc.), in order to:

- act on the infrastructures, as the *driving forces* of environmental degradation, by modifying – for example – freight transport procedures;
- reduce *pressures* by – for example – using new technologies to abate emissions;
- act on state through safeguarding and/or remediation interventions;
- limit *impacts* through compensating interventions, such as – for example – barriers to abate the noise produced by vehicles.

This model, in the integral version (section A), has been applied to the four thematic areas by the Sixth Community Environment Action Programme indicated as areas in which it is of priority importance to obtain sought-for results: climate change, nature and biodiversity, environment, health and quality of life, natural resources and waste. This in order to simplify the assessment which may be developed starting from the basic information contained in the Yearbook.

# 1. Agriculture

## Introduction

The relationships between environment and agriculture are extremely complex. On the one hand, agriculture is affected by the negative impact of the environment and by other production sectors. This happens, for example, through the alteration of atmospheric chemistry, climate change, the occurrence of related extreme climatic events (floods, hurricanes, drought) and the competition for land-use by other sectors (industry, infrastructures, etc.). On the other hand, agriculture is indicated as one of the main causes of water pollution, soil erosion, soil pollution and acidification, of the greenhouse gas effect, of the loss of habitats and biological diversity, of the simplification of the landscape and of poor conditions in animal well being. This is due to forms of intensification, concentration and specialisation which have occurred in recent decades.

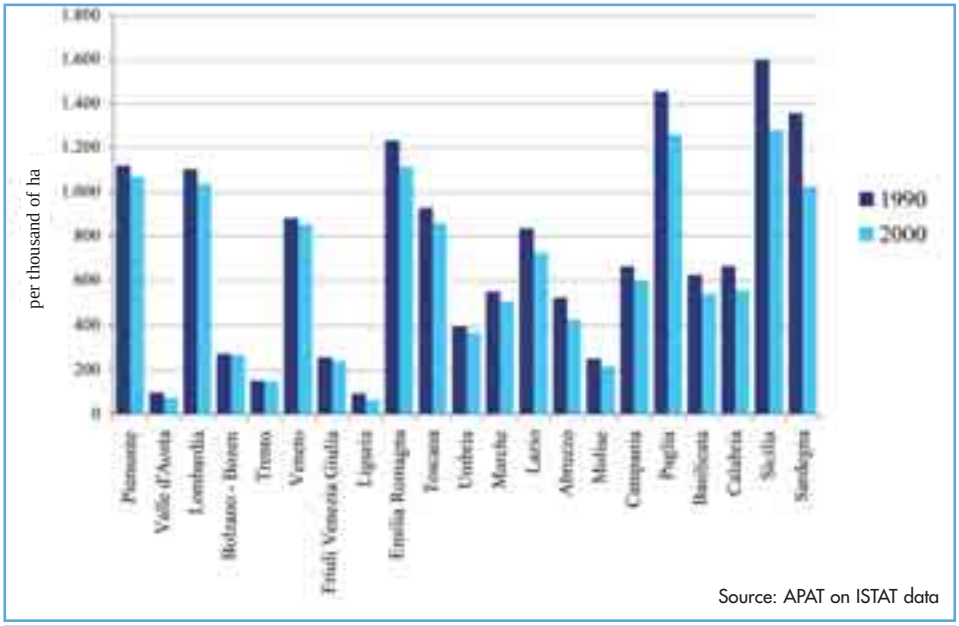
However, we should also point out that agriculture can play a positive role and have a high potential in producing opposite processes, in that it can reduce pollution, reduce the greenhouse effect and environmental decline, and provide environmental services, as well as maintaining a sufficient capacity of production and providing safe and good quality food.

One negative aspect to point out is a considerable reduction (-12.2%) of the Utilized Agricultural Areas (UAA), from over 15 million hectares in 1990 to 13.2 million hectares in 2000. There is also a reduction in the number of farming enterprises, falling in the same period from 3,023,344 to 2,593,090 (-14.2%). There are also other negative results due to use of fertilizers and pesticides, with an increasing consumption per unit of land, although the total amounts have fallen.

A positive aspect regards the number of farms shifting from conventional to biological production, which either excludes or reduces the use of synthetic chemical products (both fertilizers and pesticides). Italy is the EU country with the highest number of enterprises and the greatest area dedicated to organic farming, with one of the highest growth rates. With respect to one of the most controversial topics, the growing of genetically modified plants (GMP), up to now Italy has authorized exclusively planting for experimental purposes. According to official data on these plants, the total area involved in the entire country is less than 2 hectares.

In order to describe the relationships between agriculture and environment, four indicators have been provided. One of these combines in aggregate indices some of the indicators discussed in detail in the Yearbook.

***INDICATOR:*** Farms and utilized agricultural areas

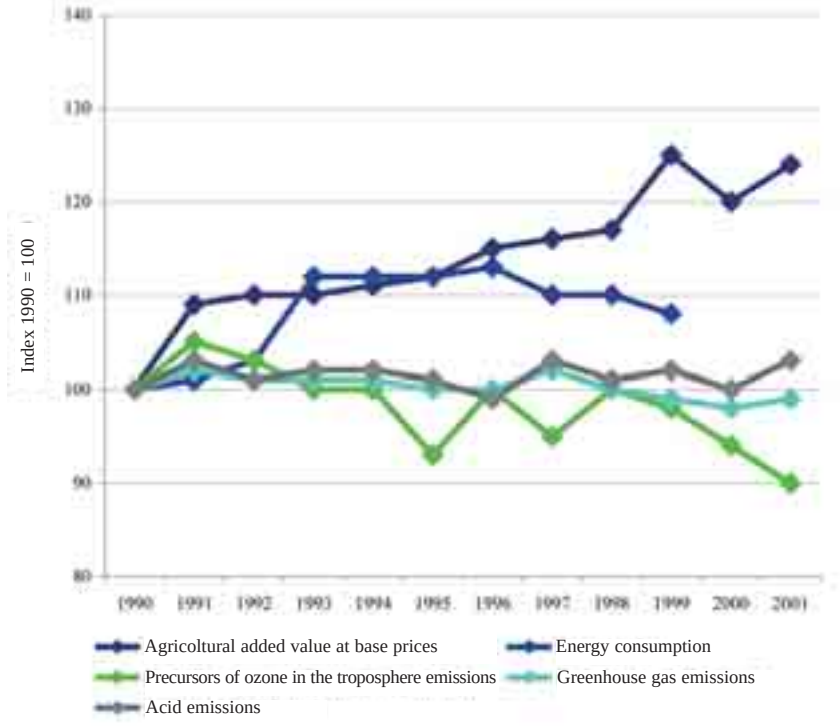



Source: APAT on ISTAT data

**Figure 1.1: Utilised Agricultural Areas in Italy - Years 1990 and 2000**

From 1990 to 2000, the number of agricultural enterprises fell from just over 3 million to less than 2.6 million (-14.2%), while the Utilized Agricultural Areas (UAA), including fields for sowing, permanent meadows, grazing land and woodland for agricultural use, family orchards and chestnut groves, fell from over 15 million hectares to 13.2 million hectares (-12.2%). The decrease of the UAA was lower in the northern regions (-7%) and greater in the central (-9%) and southern regions (-13%) and in the islands (-22%). From the environmental point of view, this item can be interpreted in a negative way, since a major amount of national territory has been deprived of farm production, thus reducing the capacity of the sector to provide farm products for future generations. A proportion of this land has been irreversibly converted to other land-uses (infrastructures, buildings). Another part has, on the other hand, undergone a process of colonization by natural vegetation, above all permanent meadows and grazing land, mainly located in hill and mountain areas. This process can be assessed in two ways. On the one hand, it increases the natural character of the agricultural ecosystems and improves the landscape; on the other, it introduces risks of instability and more frequent fires.
For 2000, Puglia was the region with the highest UAA/ST ratio (65%). There follow, with rates higher than 50%, Basilicata, Marche and Emilia Romagna. The Province of Trento (23.7%) and the Valle d'Aosta (21.8%) and Liguria (11.6%) regions show the lowest values.

***INDICATOR***: Eco-efficiency in agriculture

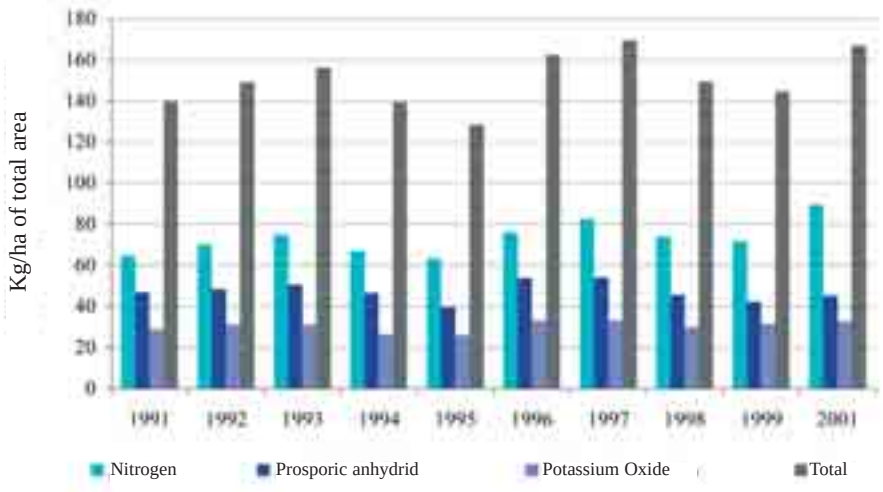



Source: APAT/CTN_TES on APAT, EUROSTAT, ISTAT data

**Figure 1.2: Eco-efficiency in agriculture in ITALY - Years 1990-2001. Added value to the basic prices, type of use and emissions of pollutants (index 1990 = 100)**

The emissions of greenhouse gases due to agricultural sector (methane and nitrogen oxides) represent less than 10% of the national total and these trends, unlike the other sectors which have shown increases, have been almost constant since 1990.
Among the substances contributing to acidification, the only significant one for the agricultural sector is the production of ammonia, accounting for between 20% and 30% of total national acid emissions. The contribution of the agricultural sector to total production of Non-Methane Volatile Organic Compounds (NMVOC) and nitrogen oxides, considered to be among precursors of ozone in the troposphere, is very low with respect to the national total (less than 0.5%), with a decrease taking place over time.
Energy consumption, which rose considerably in the early 1990s, subsequently stabilized with a slight tendency to decrease.

***INDICATOR***: Distribution of fertilizers for agricultural use



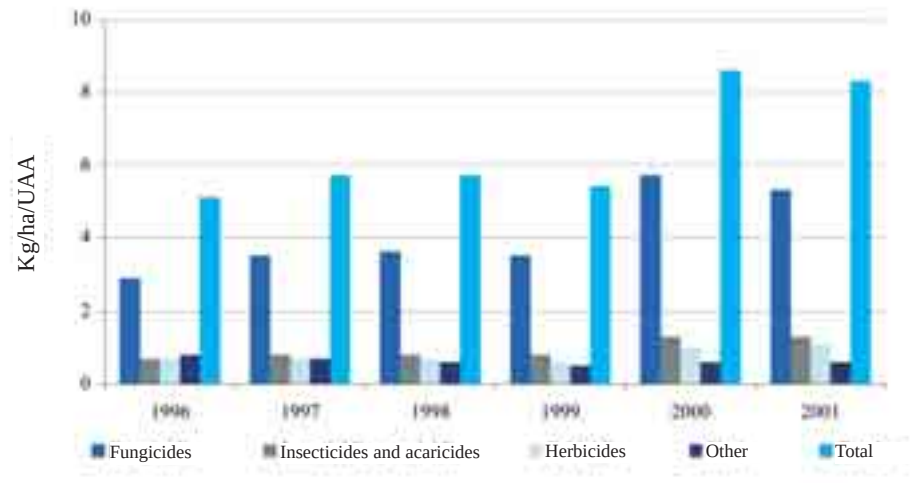

Source: APAT/CTN_TES on ISTAT data

**Figure 1.3: Amounts of fertilizers distributed for agricultural use – Years 1991-2001**

In 2001 over 4.9 million tons of fertilizers for agricultural purposes were distributed throughout Italy. Of these, 3.5 million tons are accounted for by mineral fertilizers, of which almost half are nitrates. Then there are approximately 0.3 million tons of organic fertilizers, 0.4 million tons of organic-mineral fertilizers and 0.7 million tons of amendments and correctives. The analysis at regional level, for 2001, shows that Lombardia (705,463 t) and Veneto (692,984 t) are the regions with the highest amount of fertilizers distributed, while Friuli Venezia Giulia is the region with the highest amount of fertilizers per hectare (193 kg/ha of nitrogen, 85 kg/ha of phosphoric anhydride and 131 kg/ha of potassium oxide).

Figure 1.3 shows the development over time in the amounts of the main types of chemical fertilizers put on the market for agricultural purposes, i.e. nitrate, phosphate and potassium compounds, expressed in units of nitrogen (N), phosphoric anhydride ($P_2O_5$), potassium oxide ($K_2O$), per hectare of area available to be fertilized. The total area is the result of the sum of the area for planting (excluding fallow land), woodland for agricultural use (excluding chestnut groves), permanent fields for fodder (excluding grazing land) and family orchards. Furthermore on average approximately 89.4 kg/ha of N, 45.1 kg/ha of $P_2O_5$ and 32.5 kg/ha of $K_2O$ have been distributed. The estimated trend of fertilizers per unit of land area shows a slight and constant increase; this occurred since a decrease took place in the area available to be fertilized, despite the lower amounts of fertilizers distributed.

***INDICATOR:*** Distribution of pesticides for agricultural use




Source: APAT on ISTAT data

**Figure 1.4: Amount of active principles contained in pesticides distributed for agricultural use, by category in kg/ha of area available for treatment**

This indicator provides information about the distribution of pesticides, assuming that all the amounts issued for consumption are employed in agriculture. Pesticides are considered as those products used to defend crops from pests (above all insects and acarids) and pathogens (bacteria, virus, fungi), to control the growth and physiology of plants and fruits and to ensure high quality standard in agricultural products. They are classified as fungicides, insecticides, herbicides and miscellaneous.

The data analysis on the amount of active principles per hectare of area available for treatment (kg/ha), divided by region and referring to the year 2001, shows that the regions with the highest values are Trentino Alto Adige, Liguria, Piemonte and Veneto in the North and Campania in the South. The analysis of data at national level shows a trend towards the reduction in the amount of pesticides distributed for sale over the past six years: from 84.8 millions kg in 1997 to 76.3 millions kg in 2001. Nevertheless, it should be pointed out that, similar to what has been said for fertilizers, due to the reduction of the UAA recorded in the same period, the rate of distribution per hectare rose from 5.7 kg/ha in 1997 to 8.3 kg/ha in 2001.



# 2. Energy

## Introduction

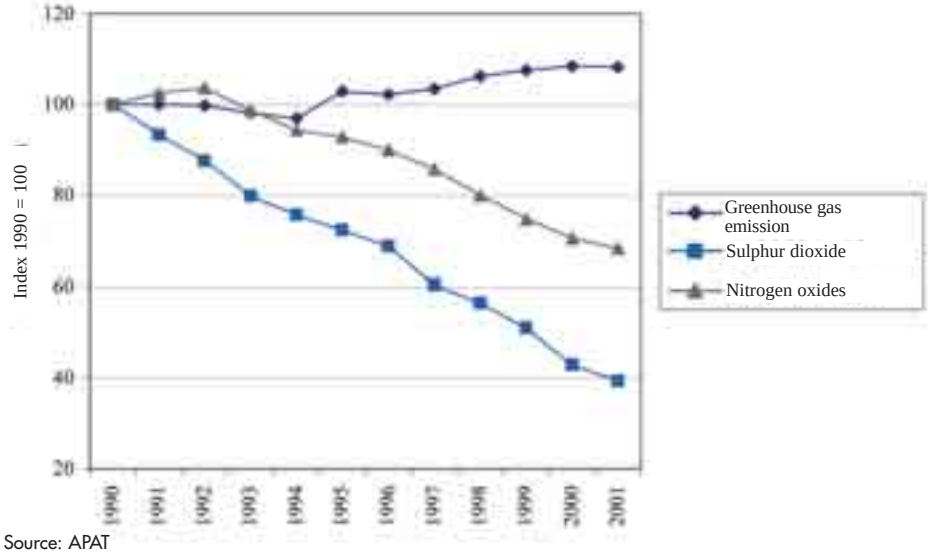
Recent data about energetic processes, related to a set of indicators selected from the "Energy and Environment in the European Community" report core set, highlight several changes in the energy supplies, just like the growth for natural gas in loss of oil products, the growth of renewable fonts, co-generation and, from 2001, a reprise in fossil combustible consumption. These trends are influenced, in addition to the international market flows, by the evolution of laws and regulations, the liberalization of energy markets and the introduction of new forms of incentives for energy production from renewable fonts by a minimum 2% share of renewable fonts for each electricity energy producer.

In 2001, energy processes accounted for 83.5% of overall greenhouse gas emissions ($CO_2$, $CH_4$, $N_2O$, HFC, PFC, $SF_6$), for 91.8% of sulphur dioxide ($SO_2$) emissions and for 98.6% of nitrogen oxides ($NO_x$) emissions. It plays a key role for the compliance with the main obligations undertaken by Italy at the international level for the environment protection, in particular of the atmosphere.

Greenhouse gas emissions from energy processes have constantly increased since 1995 (+8.2% in 2001 with respect to 1990). If this trend is confirmed in coming years, Italy will unlikely to be able to respect the target of reduction set by the Kyoto Protocol and by burden-sharing within the European Union employing solely domestic measures. According to these agreements, on the aggregate level, overall national emissions should fall in Italy by 6.5% by 2008-2012, with reference to the levels of 1990. This is why the Third National Communication presented by Italy to the United Nations Framework Convention on Climate Change (UNFCC) and the Deliberation entitled "*Revision of the guidelines for national policies and measures of reduction of greenhouse gas emissions*", approved by the Inter-Ministry Committee for Economic Planning on 20 December 2002, on the basis of Law 120/2002 ratifying the Kyoto Protocol, provide for the use of credits deriving from international co-operation mechanisms and from measures in the agricultural and forestry sector, according to the procedures defined at the Marrakech Conference.

Trends in greenhouse gas emissions deriving from energy processes vary differently for the various economic sectors, with a very high growth for transport (+22.4%), a slightly lower one for energy industries (+9.6), a limited growth for the residential sector and services including agriculture (+3.6) and a significant fall for manufacturing industries (-7.8%).

***INDICATOR***: Total emissions of greenhouse gases

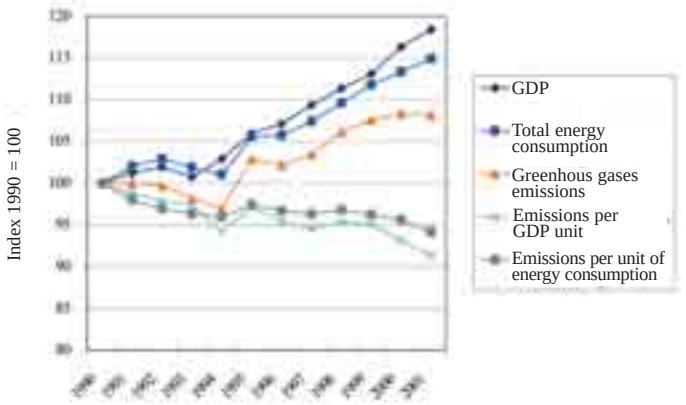



Source: APAT

**Figure 2.1: Trends of energy related greenhouse gases, sulphur dioxide and nitrogen oxides emissions - Years 1990-2001**

Trends in emissions of sulphur dioxide (-59.7% in 2001 with respect to 1990) from energy processes, falling due to the use of cleaner fuels, have so far guaranteed the respect of the international protocols on acidification. On the aggregate level, these required Italy to undertake a 30% reduction of overall national emissions in 1993 with respect to the levels of 1980 (Helsinki Protocol), 65% in 2000 and 73% in 2005 with respect to the levels of 1980 (Oslo Protocol) and 70% in 2010 with respect to the levels of 1990 (Göteborg Protocol). Up to now, the objectives of both the Helsinki Protocol and the Oslo Protocol for 2000 have been met.

Trend in energy related emissions of nitrogen oxides (-31.7% in 2001 with respect to 1990), decreasing due to the use of emission abatement devices in power plants and above all in vehicles, has enabled Italy to comply with the objectives of the international Protocols on acidification, eutrophication and reduction of tropospheric ozone. On an aggregate level, these protocols required Italy to achieve in 1994 the stabilization of overall national emissions with respect to the levels of 1987 (Sofia Protocol), and for 2010, a reduction of 48% with respect to the levels of 1990 (Göteborg Protocol). Up to now, Italy has complied with the objective set by the Sofia Protocol (but not the ones stated in the declaration by which Italy, together with other countries, agreed on a reduction of 30%) and is in line with the objective stated in the Göteborg Protocol for 2010.

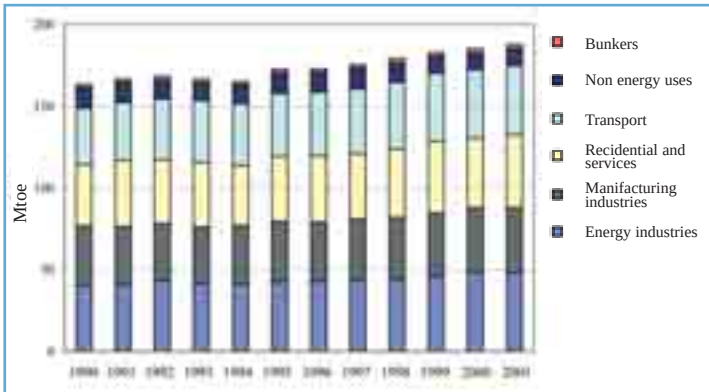



Source: APAT on APAT, ISTAT, ENEA data

**Figure 2.2: Economic and energy indicators and greenhouse gas emissions - Years 1990 - 2001**

When comparing trends in greenhouse gas emissions with those of the main economic and energy indicators, we can observe that decoupling between total energy consumption and greenhouse gas emissions started already in the 1990s, but strengthened in recent years, mainly due to the replacement of fuels with high carbon content with natural gas in the production of electricity and in industry.

***INDICATOR***: Total energy consumption by economic sector

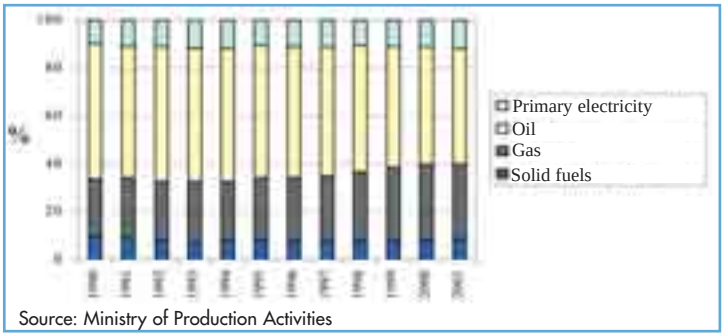



Source: ENEA

**Figure 2.3: Total energy consumption by economic sector Years 1990 - 2001**

Trends in total energy consumption were quite stable between 1990 and 1993, at approximately 166.7 Mtoe, and subsequently show significant growth, reaching approximately 187.8 Mtoe in 2001 (+14.9% with respect to 1990). With regard to the distribution of final energy consumption by sector (excluding non-energy uses and bunkers), we should highlight the growth in transport (from 23.1% to 24.3%) and the slightly lower one in energy industries (from 27.0% to 27.5%), the basically stationary rate in the residential and services sector (from 25.3% to 25.4%) and the fall in manufacturing industries (from 24.5% to 22.7%).

***INDICATOR***: Total energy consumption by primary sources

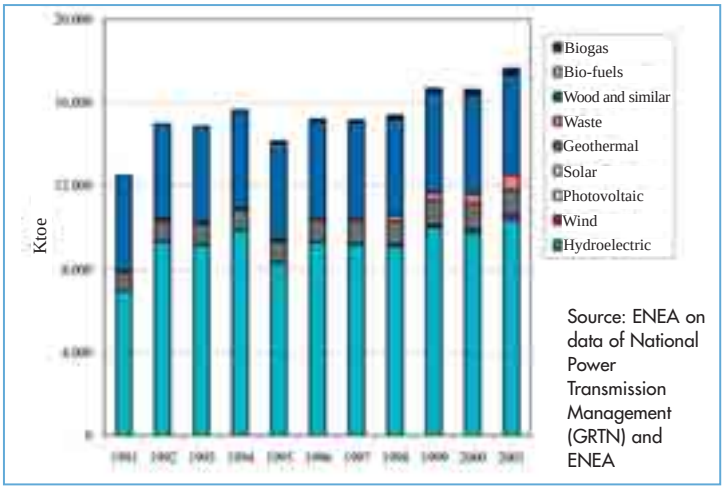



Source: Ministry of Production Activities

**Figure 2.4: Total energy consumption by primary sources (percentage values) - Years 1990 - 2001**

The market share of natural gas with respect to the total energy consumption rose from 23.9% in 1990 to 31.2% in 2001; solid fuels fell from 9.7% to 8.5% (but with an increase from 7.7% to 8.5% in the last two years); oil products fell from 56.6% to 48.5%, while primary electricity (imports + production from renewable sources) rose from 9.8% to 11.8%.

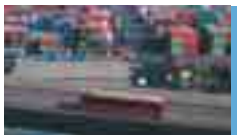
***INDICATOR***: Gross energy production from renewable sources expressed in equivalent fossil fuel




Source: ENEA on data of National Power Transmission Management (GRTN) and ENEA

**Figure 2.5: Gross energy production from renewable sources expressed in equivalent fossil fuel - Years 1991 - 2001**

The production of energy from renewable sources still has a relatively limited value (9.4% with respect to the total), but the tendency is towards a net growth (+ 41.4% between 1991 and 2001) – especially if we exclude oscillations in the data due to the availability of hydroelectric energy – due to the effect of the increase in the production of power generated by wind (from 26 ktoe in 1997 to 259 ktoe in 2001), waste (from 144 ktoe in 1997 to 721 ktoe in 2001) and biomass (from 4734 ktoe in 1997 to 5,137 ktoe in 2001, including wood and similar, bio-fuels and biogas).





# 3. Transport

## Introduction

In the current situation the main trends in the transport sector, i.e. the growth in the demand for mobility and the increase of modal imbalance, involve direct and indirect impact on the environment: the energy consumption from non-renewable sources, global warming, air, acoustic, water and soil pollution, the consumption and the fragmentation of the land, visual intrusion, damage to the historical and artistic heritage. The improvements achieved in the reduction of the environmental impact of vehicles and infrastructures are often out weighted by the significant growth in the demand for transport. The situation shows improvements with regard to overall emissions of some harmful substances, such as sulphur and nitrogen oxides, benzene, dust and the recycling of materials. With regard to energy consumption, greenhouse gases, noise and impact on the environment as a whole, the indicators show an increase.

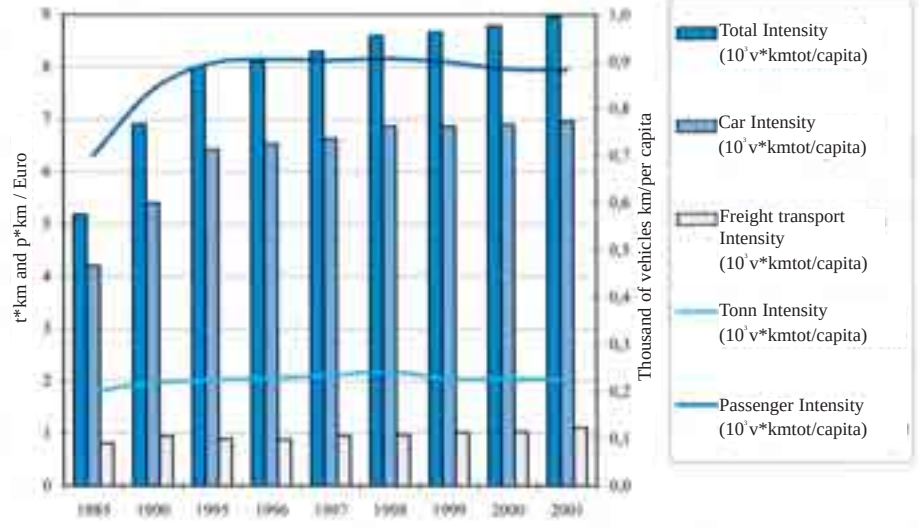
In recent decades the Italian situation of mobility has been characterized by two basic trends. On the one hand the constant increasing demand for transport, both for passengers and goods, at a rate often higher than the increase in Gross Domestic Product (see figure 3.1). On the other hand, there is a great modal imbalance in the national transport system favouring road transport, with heavy consequences from the viewpoint of the environmental, social and economic sustainability of the system itself. Another important critical factor of the national transport sector is the non-homogeneity of services in various part of the country, with congestion occurring mainly in the central and northern regions, while low levels of accessibility, caused by the insufficient quality of transport services and infrastructures, are to be found in the South.

In the period 1990-2001, the demand for mobility of people rose from 728 to approximately 907 billion passengers*km, (+24.6%). This demand was increasingly met by private road transport, now accounting for 82%. In 1990-2001, there was also a sharp increase in the demand for freight transport over 50 km (+ 21.6%), rising from 190 to 231 million tons*km; however, the non-homogeneity of freight transport data for the period considered calls for caution in comparisons. Due to the fragmentation of physical flows, the outsourcing of logistic services and the greater demand for a quality service, this demand too is met above all by road transport, accounting for +64% of the total freight traffic over 50 km. Considering this growth, there have been slight falls in rail transport (-10.7%) and pipelines (-4%), with an increase in combined and maritime transport.

A survey on energy sources employed shows the almost total dependence of transport on the consumption of oil products, mainly oil and diesel fuel, causing emissions into the atmosphere of numerous pollutants and of greenhouse gases. The technological innovations to vehicles taken alone do not seem able to solve the energy problem (and greenhouse gas emissions), since the higher efficiency of single vehicles has not been able to compensate for the continuous growth of traffic and average vehicle size. Consequently, despite the increasing reduction of unit consumption, total energy consumption attributable to the trans-

port sector continues to grow (see figure 3.2). The diffusion of fuels with lower environmental impact such as natural gas, liquid oil gas and bio diesel, is satisfactory with respect to the other european countries but wholly insufficient to compensate the growth of emissions. Since 2000 the transport sector, including international bunker fuels, has absorbed the highest amount of final consumption of energy, approximately 35% of the total.
The emissions of harmful substances in this sector are mainly connected with the mode of combustion of energy sources. The use of appropriate technologies considerably reduces emissions. Nevertheless trends in recent years show contrasts, emissions are rising due to the growth of the vehicle fleet and length of journeys, and are falling as the fleet is renewed. In particular, nitrogen oxides and volatile organic compounds show significant rates of reduction in the period after 1995 (see figure 3.3).

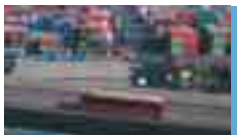
***INDICATOR:*** Passengers*km by mode, passengers*km per capita and by GDP, vehicles*km; tons*km by mode, tons*km per capita and by GDP, vehicles*km




Source: APAT on Ministry for Infrastructures and Transport and ISTAT data

**Figure 3.1: Travel and intensity, total and by mode - Years 1985 - 2001**

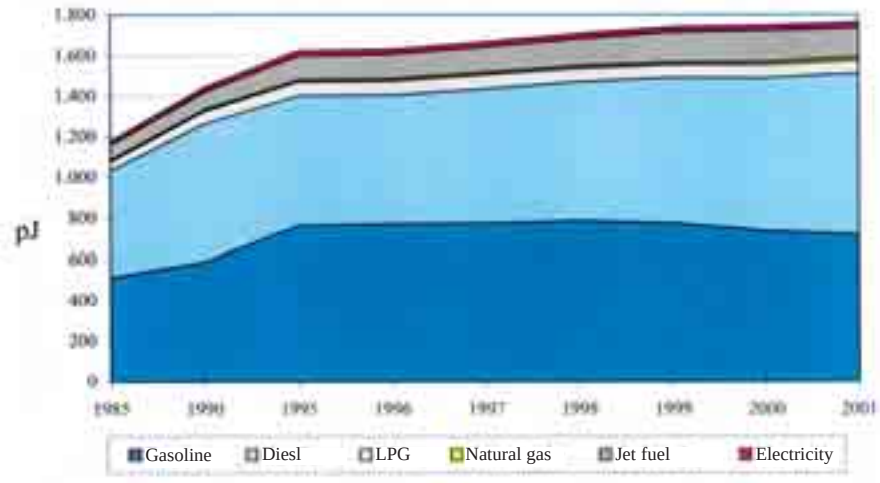
In recent years there has been an increase in transport intensity of, in particular of goods, per unit of income. In the period 1990-2001 it roses from 0.839 to 0.880 passengers * km per 1000 Euro of GDP, and from 0.219 to 0.213 tons * km per 1000 Euro of GDP (in constant currency of 1995). The ratio between the mobility of persons and national income was character-





ized by a significant growth during the 1980s and early 1990s, while after 1995 it stabilized, and the growth of travel started follow trends in income. Trends in the ratio between the mobility of goods and income were, however, characterized by a slight growth up to 1990, after which growth has continued despite fluctuations.

***INDICATOR:*** Final and primary energy consumption in transport, share of the total by mode and type of fuel. Percentage of unleaded oil and alternative fuels (natural gas and LPG)



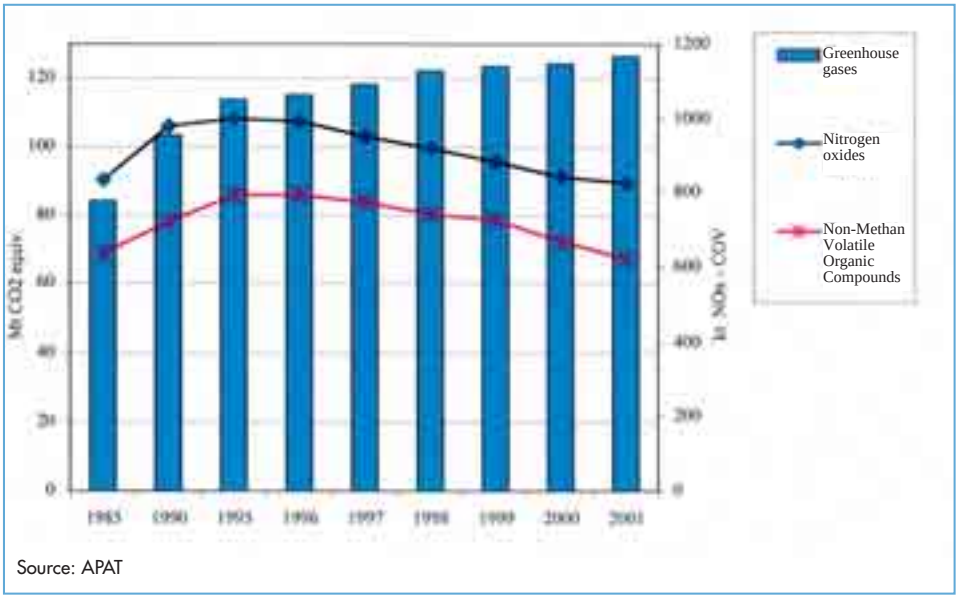

Source: APAT on Ministry of Production Activity data

**Figure 3.2: Total fuel consumption in transport (pJ) - Years 1985 - 2001**

In Italy the transport sector, including reserves, absorbs the highest percentage of final energy consumption; 84.9% of this consumption is accounted for by road transport. An examination of the used energy sources shows the almost total dependence of transport from the oil products, mainly oil and diesel fuel. As already mentioned, the technological innovations to vehicles, taken alone, do not seem able to definitively solve the problems, since the increased efficiency of single vehicles has not balanced the constant growth in traffic and, for motor cars, the average increase in engine size. Therefore, despite a gradual reduction of unit consumption, the total share in energy consumption due to the transport sector continues to grow.

***INDICATOR:*** Greenhouse gas emissions ($CO_2$, $CH_4$ and $N_2O$)

***INDICATOR:*** Emissions of main air pollutants ($NO_x$, COVNM)




Source: APAT

**Figure 3.3: Total emissions of greenhouse gases (Mt) and of the precursors of acid rain, NOx and COV (kt) - Years 1985 - 2001**

In Italy, in line with a trend occurring in the 1990s in most of the industrialized countries, atmospheric emissions of harmful gases are falling, while those of greenhouse gases are rising. With reference to harmful gases, the decrease is the result of two contrasting trends: emissions are rising due to the growth of the vehicle fleet and travel, and are falling as the fleet is renewed. In particular, nitrogen oxides and volatile organic compounds show significant rates of reduction in the period after 1995. On the opposite, greenhouse gas emissions, directly connected with the fuels consumption, are continuously increasing; in particular from 1990 to 2001 they rose by approximately 23%.

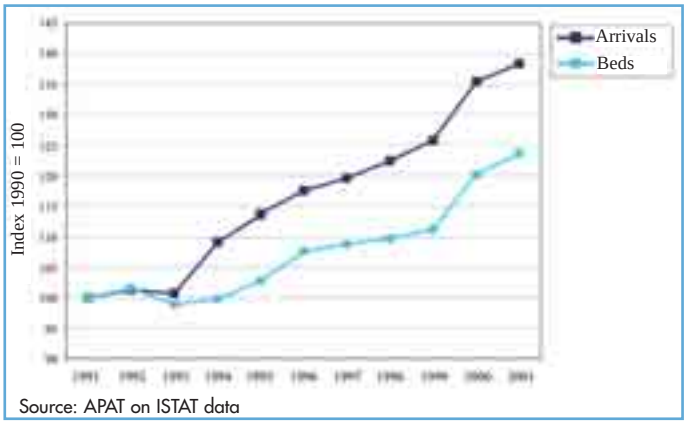


# 4. Tourism

## Introduction

The environment is a basic component for tourist industry, and the sector is therefore increasingly concerned with preserving its quality. Tourism, as an economic activity, induces heavy pressure on natural resources and the environment; if not properly controlled, this may adversely affect the tourist area involved, thus reducing the expected benefits. At the same time, the development of tourism can represent a strong point for the conservation of the environment, thanks to the availability of resources favouring environmental protection.
In Italy, the tourist flow in 2001, in hotels and related facilities, showed a lower growth with respect to the previous year, with 2.2% in terms of the number of arrivals and 3.4% in the number of presences.
People travel more often and for shorter periods, with mainly domestic destinations and more often by car.
Tourist flows analysis highlights the seasonal character of tourism and its concentration in particular areas. The impact generated is the result of the intensive use of water and soil resources, of the changes in the landscape caused by the building of infrastructures and services, air pollution and the production of waste, the destruction of vegetation, the disturbance to fauna and to the local population.
It should also be pointed out that tourism is becoming an increasingly important component of household expenditure.
In order to provide a summary for the driving forces of the tourism sector, the "tourism intensity" and "tourist flows by mode of transport" indicators have been chosen.

***INDICATOR***: Tourism intensity




Source: APAT on ISTAT data

**Figure 4.1: Change in tourism intensity in terms of arrivals and accommodation places (indexing to 1991)**

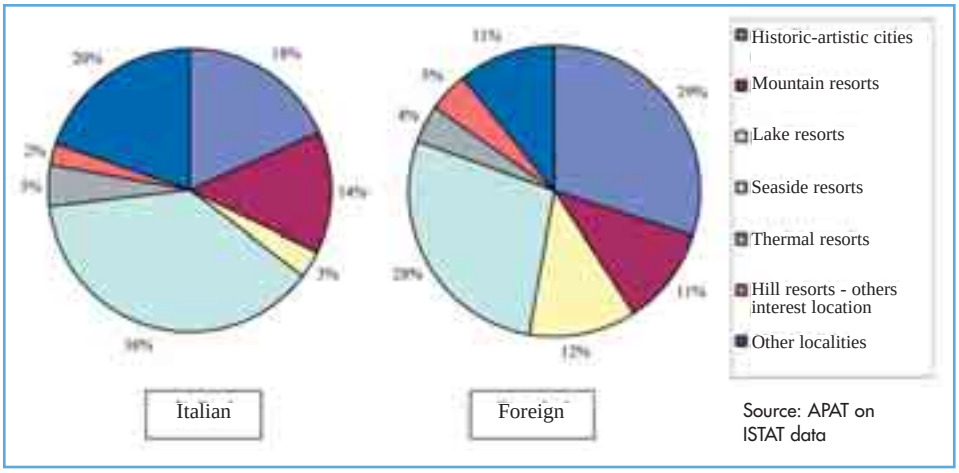



**Figure 4.2: Presences of Italian and foreign clients in accommodation by type of resort - Year 2001**

Between 1991 and 2001, tourism intensity, in terms of accommodation places, rose by 23.6%, while arrivals rose by 38.4%. The year 2001, with respect to 2000, shows a rise of 2.9% and 2.2% in arrivals.
The highest tourism intensity is recorded in Valle d'Aosta, Trentino Alto Adige, Veneto and Marche. In particular the arrival/resident population ratio shows peak levels in Trentino Alto Adige, with 7.42 tourists per inhabitant (the autonomous Provinces of Bolzano and Trento, with respectively 9.30 and 5.59 arrivals/inhabitants), followed by Valle d'Aosta (6.54 arrivals/inhabitants). Data likewise highlights the seasonal aspect, especially significant in the spring-summer period, and the concentration of tourists seaside resorts and historic cities, factors that can have adverse effects on the environment.

***INDICATOR***: Tourist flows by type of transport

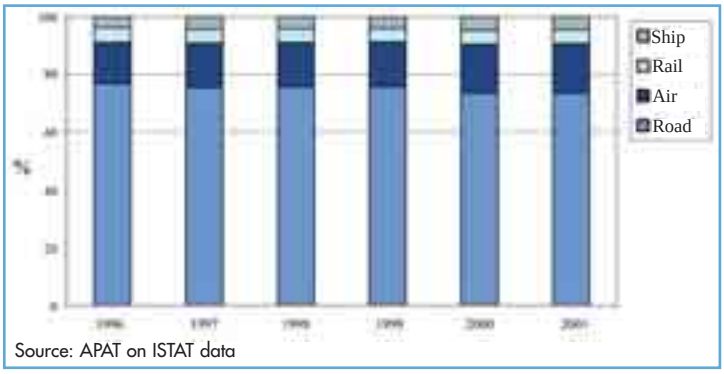



**Figure 4.3: Distribution of the percentage of foreign visitors in Italy, according to the means of transport chosen Years – 1996 - 2001**



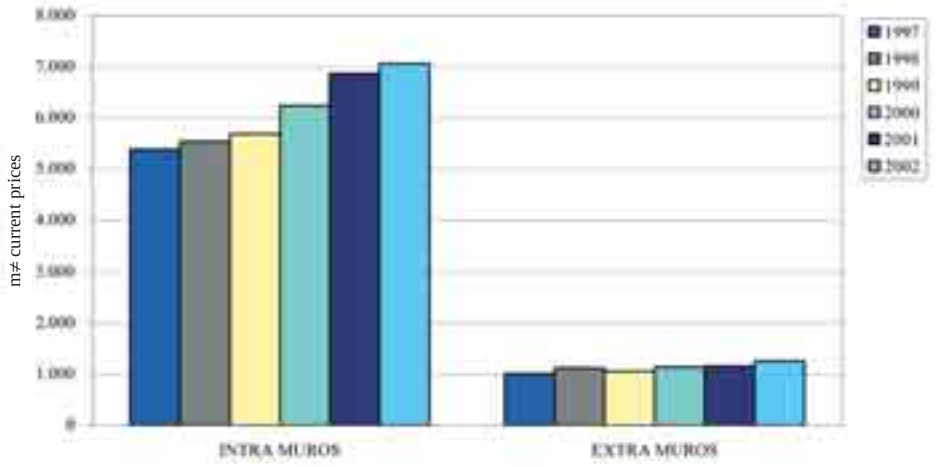
The trend in the use of polluting transport means, such as cars and aircraft, continues to rise; this contributes significantly to the increase of pressure on the environment.
In 2001, the number of foreign visitors to Italy fell by 3.4% with the greatest fall being recorded in arrivals by ship and car, declining respectively by 7.4% and 3.3%. Despite these changes, in any case there is a definite tendency to choose the car as transport mode (73.6%), followed by air (17.2%), rail (4.8%) and ship (4.5%).

# 5. Industry

## Introduction

The environmental factor has gradually become an important criterion for selecting processing and production technology. Besides the need to safeguard basic resources and the environment, there is also the need to ensure responsible economic development for future generations.
Consequently, the basis of the relationship between environment and industry is changing from an abstract "regulatory approach" (in which the criteria of acceptability of the degree of pollution are set rather "statically" according to theoretical assessments, in many cases insufficiently related to the actual dynamics of the environmental and production system) to an approach taking greater account of developments in technology and the dynamics of the "criteria of environmental assessment".
European Directive 1996/61/EC, also known as the IPPC Directive (Integrated Pollution Prevention and Control), was drawn up to implement the most recent principles of prevention. It has the aim of preventing, reducing, and as far as possible, eliminating pollution due to industry, intervening at the source of polluting activities and guaranteeing a rational management of natural resources. Besides the concept of preventive action there is the objective of guaranteeing an integrated approach, in the sense that the environment is no longer interpreted in three separate areas (water, air and soil), but as a whole to be protected (in order to prevent pollutants from simply being shifted from one phase to another) and the environmental authorization procedures (air, water, waste etc.) are combined (at least for plants coming within this legislation) in a single authorization: the integrated environmental authorization, containing the necessary rules to guarantee the principles of prevention and limitation of pollution.
Industry is responsible for a wide range of environmental problems such as the consumption of resources, emissions in the air and water, the contamination of the soil, the production of waste. Many of these problems are specific to the various environmental sectors and are therefore covered in the chapters of the Yearbook dedicated to environmental matters. Today it is hard to find sufficiently accurate and representative data to cover the entire range of environmental problems due to industry.
A trend for industry towards a more general objective of modernization and technological development can be calculated by observing the trends in the research and development sector.
The vocation of the industrial sector for updating production cycles and processing and treatment technology represents one of the key aspects for the improvement in the effic ency of production, and consequently, for "environmental efficiency". The trend of industry towards technological updating, in fact, is also the effect of the commitment of the government and local authorities to the definition of new regulations and actions allowing for the development of cleaner production, using the basic concept of BAT (Best Available Techniques).

**INDICATOR:** Expenditure for research and development in the industrial sector

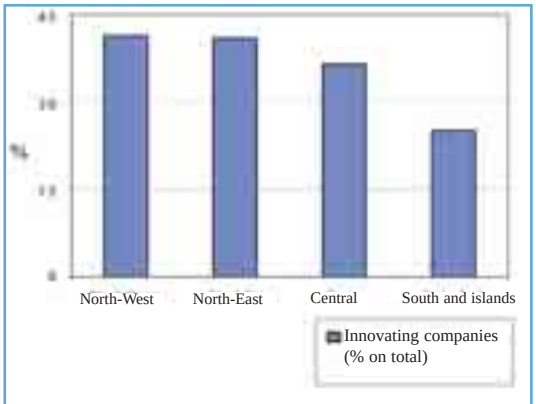



Source: APAT on ISTAT data

**Figure 5.1: Expenditure for research and development in industry – Years 1997 - 2002**

Figure 5.1 shows how there has been an increase in corporate expenditure for research and development; this trend should in any case be considered positive although this expenditure does not specifically aim at environmental protection, it involves a definite increase in the technological updating capacity of enterprises, a strategic factor for an improvement of environmental perfomance.

**INDICATOR:** Innovation in the industrial sector




Source: APAT on ISTAT data

**Figure 5.2: Innovation in industry in the 3-year period 1998 - 2000**

Figure 5.2 shows that in the 3-year period 1998-2000, in North-Western and in North-Eastern Italy, about 40% of firms produced innovation; the result was slightly lower in Central Italy, while in the South this rate was about 25%. While acceptable as an assessment of the overall situation, these data refer to the entire 3-year period and do not allow for trends assessment; they will be used as a basis for assessments in the next 3-year period.

# 6. Environmental quality of organizations, firms and products

## Introduction

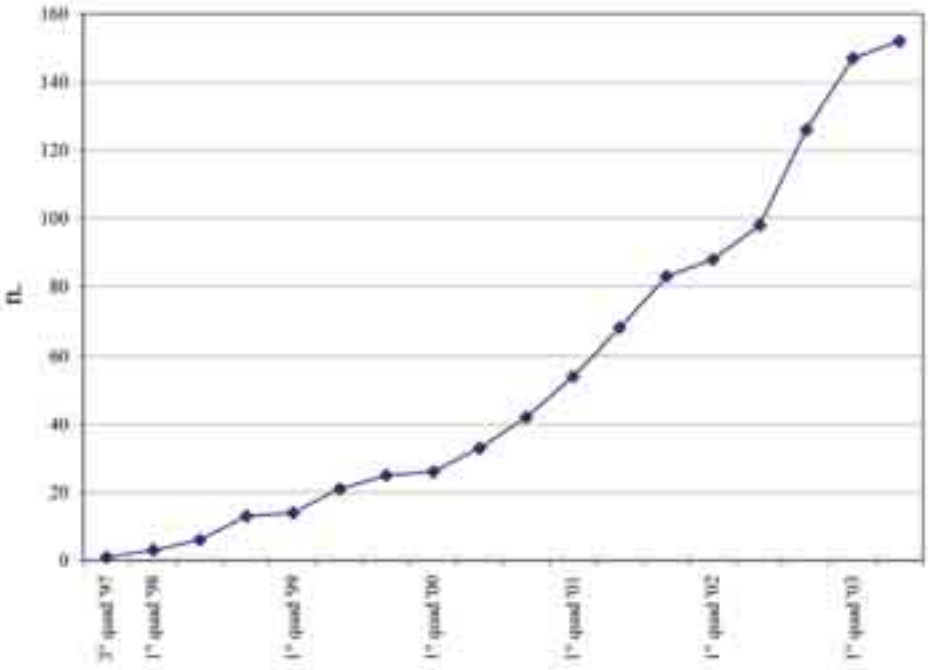
In the first five years of application, EMAS and Ecolabel regulations have shown their great value as instruments of environmental prevention and improvement. Thus the key objective underlying the Sixth Action Programme (2000-2006) and the Integrated Product Policy (IPP), can be identified in the development and consolidation of a number of measures which, applying environment-friendly production and ecologically aware consumption, can in the medium/long period lead to the creation of a "green market". Since 1997 (year in which the EMAS and Ecolabel schemes became effectively operational in Italy), the two schemes have become increasingly widespread and with a significant annual growth rate. This chapter illustrates the characteristics of these instruments (EMAS, Ecolabel and UNI-EN-ISO 14001) and their implementation state in our country.

## Environmental quality in organizations and firms

The EMAS Regulation (2001/761/EC) was created to enhance the safeguarding of the environment. The implementation of the environmental management system required by EMAS, leads to the increased performance efficiency of the member organizations and the containing of costs deriving from the incorrect management of production processes.
EMAS is accessible to all types of organization both production or services, so that it is a particularly valid instrument for achieving the objectives of sustainability in order to implement a process of synergy between the protagonists (firms, consumers, administrations).
The initial environmental analysis, the first step to be taken in order to obtain EMAS registration, has the purpose of leading organizations towards the identification of the points that are critical from the environmental point of view in their activity, while at the same time allowing the recognition of any aspects not complying with legislation, and of the dispersion of resources caused by careless or incorrect management. At the end of this complex analysis organizations are able to determine their critical points, to define their own environmental policy and to draw up an environmental programme allowing for constant improvement in performance. As for the reaching of the objectives included in the programme, organization must provide objective evidence through the data and indicators contained in an environmental declaration, which also includes general information on the enterprise. The accuracy of the declaration is shown by the certification of an accredited environmental verifier .
In Italy the institution having jurisdiction for the registration and accrediting of environmental monitoring is the Ecolabel Ecoaudit Committee with the technical support of APAT, Inter-Departmental Service for Environmental Certifications.
Within the voluntary systems, important reference points for the development of eco-management are the UNI-EN-ISO 14000 series, drawn up by the International Organization for Standardization. The UNI-EN-ISO 14001 is a rule which can be implemented by any type of

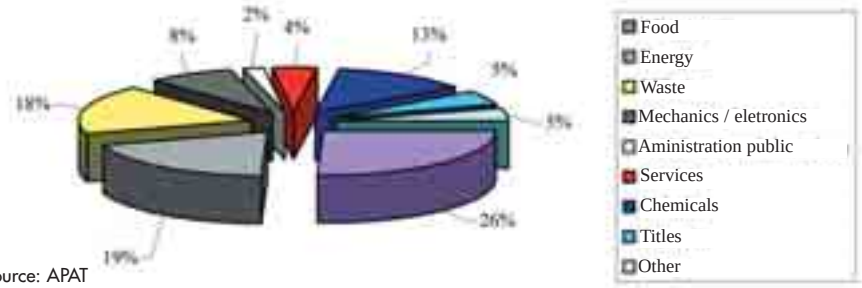
organization intending to achieve improvement of the environmental impact of its activities, through the adoption of an environmental management system. In this sense it was included in the new EMAS standards.
In Italy there are 148 organizations with EMAS registration (August 31st, 2003). Among these there are many non-industrial ones in the services and civil service sectors: the municipality of Varese Ligure, the Bibione Tourist Pole, the Banca Verde of the Monte dei Paschi di Siena and Unicredito Bank, the Department of environment of the Province of Viterbo, the Regional Park of Mont Avic (Valle d'Aosta) and the Val Senales Cable Car Complex (Trentino Alto Adige). There are 3,756 organizations registered by EMAS on the European level, and of these 2,414 are located in Germany, with 16 registered on an experimental basis in the future EU member countries (9 in the Czech Republic, 1 in Malta, 1 in Slovakia, 1 in Romania and 4 in Hungary).

***INDICATOR***: Number of EMAS registrations




Source: APAT

**Figure 6.1: Figures for EMAS registrations in Italy (1997 - August 2003)**

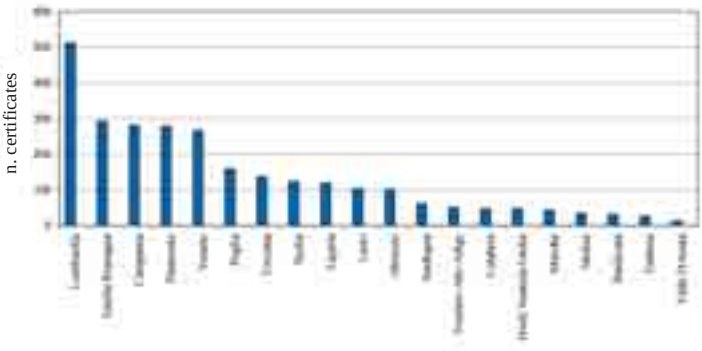



Source: APAT

**Figure 6.2: Distribution of registrations per production sector in Italy (updated to August 31st, 2003)**

The number of EMAS registrations can be considered as an indicator for the environmental awareness of the organizations. By implementing EMAS they actually intend to decrease the pressure of their activities, products and services on the ecosystems. Since EMAS is a voluntary structure there are no pre-set objectives. The number of registrations is a major indicator that the European Commission uses to measure the state of penetration of the scheme on the Community level, and to monitor the development of programmes for environmental prevention and improvement.
The analysis of trends in EMAS registrations in Italy (1997 – 2003) shows that the awareness of organizations for environmental problems is growing from year to year (figure 6.1). The production sectors with the highest number of EMAS registrations in Italy (figure 6.2) are food (26%), energy (19%) and waste (18%). There are no registrations in the mechanical and automobile sector, tanneries, health, biomedical and in textiles. There is a large number of organizations in Northern Italy registered with EMAS (85%), followed by Central Italy (8%), the South (5%) and the islands (2%).

***INDICATOR***: Number of UNI-EN-ISO 14001 registrations




Source: SINCERT

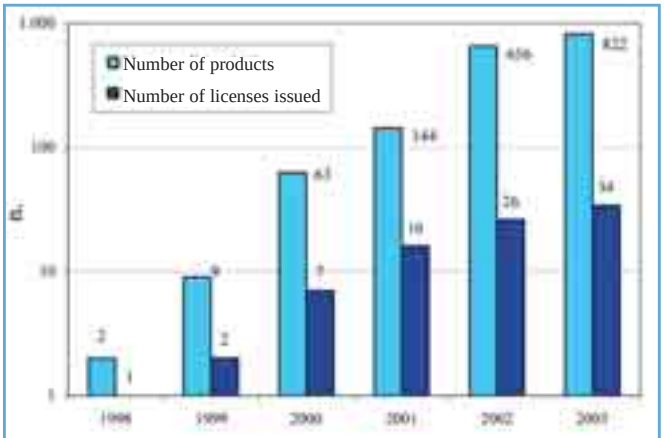
**Figure 6.3: Geographical distribution of UNI-EN-ISO 14001 certification (updated to August 31st, 2003)**

The number of UNI-EN-ISO 14001 certificates can be considered as a further indicator of awareness of environment by enterprises and organizations.
A widespread presence of environmental management systems indicates awareness of the theme of sustainable development, benefiting the quality for the environment. The number of certificates, on the other hand, indicates how many organizations have reached these objectives and thus comply with the standards.
The information provided by the indicator should therefore be interpreted as a response to the problems of pressure and impact caused by pollution related to production activities.
UNI-EN-ISO 14001 certification shows a high distribution of certification in Lombardia, Emilia Romagna, Veneto and in some regions of the South such as Campania (figure 6.3). The indicator rose by 27% from August 2002 to August 2003. The reference legislation has no pre-set objectives since this instrument is voluntary. The updating of information is conducted periodically by the SINCERT, on the basis of the certifications issued.

## Environmental quality of products

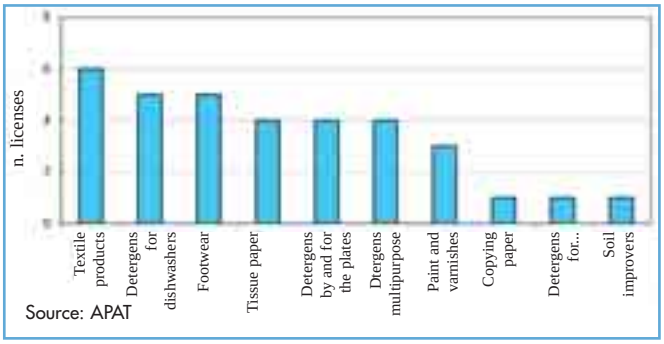
The Ecolabel (Regulation 1980/2000/EC) is the European label of ecological quality favouring the best products and services from the environmental point of view, thus distinguishing them from competitors on the market, and maintaining in any case high standards of performance. The label certifies that the product or service has a low environmental impact throughout its lifecycle.
Ecological criteria are defined through a Life Cycle Analysis (*LCA*) of the product, highlighting environmental impact (air quality and water, reduction of waste, energy saving, protection of the ozone layer etc.) generated in the various phases in the product life. Ecological criteria have the purpose of reducing this impact. Products and services must respect the criteria established for each group of products.
Labels can be used on consumer products (except for foods, drinks and pharmaceuticals) and services. Twenty-one groups of Ecolabel products have been defined. These include various types of detergents (for dishwashers, washing machines, multipurpose and hand washed dishes), footwear, appliances (washing machines, dishwashers, refrigerators, televisions), tissue paper, copying paper, paint, soil improvers, personal computers, textile products, light bulbs and hard floor covering.
Many advantages accrue to both producers and consumers. The Ecolabel is based on a system of voluntary agreement; it is selective, only the best products from the environmental point of view are labelled. It offers immediate and reliable information on the environmental characteristics of the product and it is valid throughout Europe. Moreover, the credibility of the Ecolabel is increased by the granting procedure, since the label is issued by an independent institution (Ecolabel-Ecoaudit Committee, Ecolabel section) with the technical support of APAT (Inter-Departmental Service for Environmental Certifications).

***INDICATOR***: Number of Ecolabel registrations




Source: APAT

**Figure 6.4: Figures for Ecolabel licenses (updated to 30/06/2003)**




Source: APAT

**Figure 6.5: Distribution of Ecolabel licenses in Italy by group of products (updated to 30/06/2003)**

The number of Ecolabel registrations is an indicator of response. It represents "environment-friendly consumption" of enterprises, and therefore of consumers, thus highlighting the environmental awareness in the production sector.
This indicator should therefore be considered as an expression of awareness regarding the importance of conservation of natural resources and of the safeguarding of the environment by present-day society (enterprises and consumers), in line with the principles of "environmental sustainability" set in the Sixth Action Programme of the European Community.
In Italy, from 1998 to 2003 (figure 6.4), 34 Ecolabel licenses were issued for a total of 822 products labelled by 10 groups of products (paints, detergents of various types, footwear, textile products, copying paper, tissue paper and soil improvers).
The efficiency of this voluntary instrument can be seen by the increase of approximately 30% in Ecolabel licenses issued in Italy between 2002 and 2003, making it the Member State with the highest number of licenses on the European level, followed by France (30) and Denmark (28).
The figures show that textile products, detergents for dishwashers and footwear are the groups of products most labelled in Italy (figure 6.5). In Europe, the most labelled groups of products are textiles (49), paints (36) and soil improvers (11).



# 7. Control and Monitoring

## Introduction

Environmental control and monitoring, in the most common meaning of activities for checking, responds to the need to ascertain the respect of the rules and requirements that come from legislation and regulations. In case of non-fulfilment or ascertained non-compliance, there is also the need to promote adequate support actions for the achievement of the compliance requested, applying fines and/or adequate deterrents and penalties to allow the identification and suppression of irregular and illegal behaviour.
Control and monitoring activities are thus an *institutional response*, according to the DPSIR framework, to contain pollution and environmental impact.
The National, Regional and Autonomous Provinces (Trento and Bolzano) for the Environmental Protection Agencies (APAT/ARPA/APPA) as well as other institutions such the Carabinieri Division for Environmental Protection (CCTA, formerly NOE), the Port Authorities, river basin authorities, the Magistrate for Water and the State Forestry Corps (CFS) have jurisdiction for environmental control and monitoring.
The system of environmental agencies is promoting organizational, methodological and educational initiatives to optimise the instruments for the planning and reporting of environmental control and monitoring activities.
The selecting process of standard indicators, typical of monitoring activities, has not yet been completed. The ones included hitherto represent the first proposals, which can be changed and expanded subsequently.
The following tables and figures show, although partially, the number of environmental control, monitoring and inspection activities (subdivided by thematic areas) conducted by the Agency System and the other institutions and government authorities with jurisdiction in these matters (CCTA, State Forestry Corps etc.), with regard to the year 2002 and previous years.
Operations of data collection still show lack of homogeneity in the criteria used to define the objectives and the different types of control and monitoring activities: there are no standard procedures which at national level may guarantee the quality of performance and the information acquired. Difficulties in representation still persist.
Not all of the Agencies have completed the forms made available by APAT, although the forms are unchanged this year. Some regions have aggregated their data according to their computer system.
The data shown refer to the past five years (1998-2002) and with respect to the past a greater uniformity in the methodology employed in the registration of this data has been observed.
With respect to the last year, the number of responses by the ARPA has increased and the difficulties in the drawing up and recording them have decreased.
The data provided by the regions do not always represent all the provincial departments, due to the unfortunate lack of an automatic flow of information from the peripheral to the regional offices.

***INDICATOR***: Control and monitoring activities

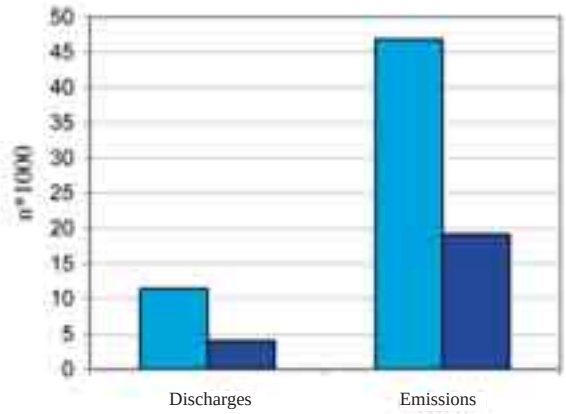
**Table 7.1: Activities of environmental control conducted in Italy by ARPA, APPA in 2002**

| Subject of control and monitoring | Inspections | Measurements/ samples | Determinations | Measures authorizations and opinions | Other |
|---|---|---|---|---|---|
| Water protection (total): | 209,904 | 91,394 | 1,489,244 | 13,192 | 349 |
| *Discharge* | 46,775 | 19,385 | 214,940 | 11,452 | 13 |
| *Surface water* | 40,656 | 55,159 | 934,389 | 757 | 1 |
| *Groundwater* | 122,473 | 16,850 | 339,915 | 983 | 335 |
| Protection of the air (emissions) | 19,153 | 142,308 | 973,928 | 3,984 | 328 |
| Protection of the soil | 36,808 | 20,206 | 89,117 | 1,259 | 882 |
| Waste | 19,309 | 7,977 | 97,888 | 1,231 | 181 |
| Physical agents (total): | 61,921 | 190,351 | 45,783 | 3,808 | 1,069 |
| *Noise* | 11,080 | 106,820 | 3,574 | 1,154 | 289 |
| *NIR* | 16,669 | 46,086 | 9,528 | 2,284 | 725 |
| Ionising radiation | 34,172 | 37,445 | 32,681 | 370 | 55 |
| Food | 17,941 | 67,056 | 708,448 | 151 | |
| Asbestos | 7,633 | 20,234 | 11,722 | 1,081 | |
| Industrial risk | 2,007 | 934 | | 681 | 18 |
| Bathing | 64,141 | 41,416 | 259,356 | 96 | |
| GMO | 29 | 688 | 773 | 2 | |
| Other | 9,574 | 10,016 | 114,206 | 333 | |
| **TOTAL** | 448,420 | 592,580 | 3,790,465 | 25,818 | 2,827 |

Source: Prepared by APAT on ARPA/APPA data

**LEGEND:**

The data refer to 18 regions




Source: Prepared by APAT, on ARPA/APPA data

**Figure 7.1: Comparison between inspections and authorizations for liquid discharge and atmospheric emissions - Year 2002**

The indicator assesses the extent of control and monitoring activities conducted on a local level, planned and unplanned, considering the complexity of regulations and the local situation too, through the quantification of the number of formal or technical acts in relation to the various environmental matrices, such as air, water, soil, waste management, physical agents (noise, vibrations,



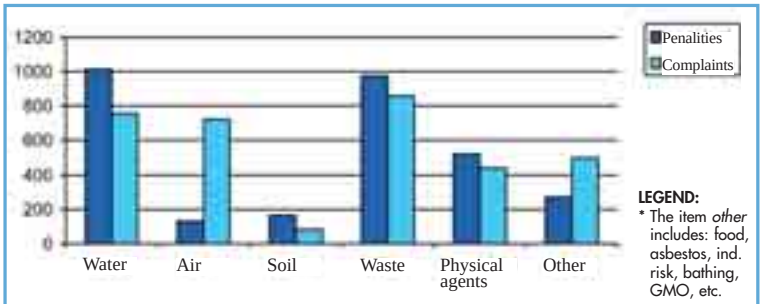
ionising and non-ionising radiations), risk to human health etc., in a given area, conducted by the authorities having jurisdiction. The data available regard the year 2002 (table 7.1).
Figure 7.1 shows the relation between the control and monitoring activities and the authorizations granted for liquid discharge and emissions in the air. Figures for authorizations are incomplete, since the Provinces involved have not digitalized their registers for discharge: this makes acquiring information processes somewhat difficult.

***INDICATOR***: Measures and penalties for violations

**Table 7.2: Measures and penalties for violations deriving from inspection activities, conducted by the ARPA/APPA year 2002.**

| Subject of control and monitoring | Fines Year 2002 | Complaints and confiscations Year 2002 |
|---|---|---|
| Water protection (total): | 1,011 | 755 |
| *Discharge* | 1,011 | 536 |
| *Surface water* | | 104 |
| *Groundwater* | | 115 |
| Protection of the air (emissions) | 132 | 721 |
| Protection of the soil | 167 | 85 |
| Waste | 974 | 857 |
| Physical agents (total): | 526 | 433 |
| *Noise* | 523 | 215 |
| *NIR* | 3 | 73 |
| Ionising radiation | | 145 |
| Food | 7 | 130 |
| Asbestos | 8 | |
| Industrial risk | | 28 |
| Bathing | 8 | 22 |
| GMO | | |
| Other | 250 | 322 |
| **TOTAL** | 3,083 | 3,353 |

Source: Prepared by APAT on ARPA/APPA data




Source: Prepared by APAT on ARPA/APPA data

**Figure 7.2: Fines levied and complaints filed in 2002 by thematic area**

**Table 7.3: Measures and penalties for violations detected by inspection activities, conducted by the central government and other institutions**

| Central government and other institutions | Subject of the control and monitoring | Number measures and penalties 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|
| State Forestry Corps | Protection of the soil (waste) | | | | 7,618 |
| | Conservation of nature | | | | 959 |
| | Other (building) | | | | 2,359 |
| | Water protection (discharge) | | | | |
| | Protection of the air (emissions) | | | | 305 |
| | Physical agents | | | | 1 |
| | Other (agro-food, forestry, fraud against the EU) | | | | |
| | *TOTAL* | 40,449 | 59,067 | 50,702 | 11,242 |
| Carabinieri Division for Environmental Protection | Water protection (discharge) | 2,310 | | 3,461 | 202 |
| | Protection of the air (emissions) | 675 | | 1,269 | 37 |
| | Physical agents | 240 | | 767 | 1 |
| | Waste | 7,300 | | 4,958 | |
| | Conservation of nature | 1,290 | | 1,575 | 98 |
| | Industrial risk | 27 | | | |
| | Protection of the soil | | | | 553 |
| | *TOTAL* | 11,842 | 17,173 | 12,030 | 891 |
| Port authorities | Protection of marine water | 186 | | | |
| | Waste management | - | | | |
| | Conservation of nature | 159 | | | |
| | Merchant vessels | 717 | | | |
| | Other (fishing surveillance) | 155 | | | |
| | Protection environment | | 2,241 | | |
| | Fishing | | 7,000 | | |
| | Conservation of nature and of State land | | 4,417 | | |
| | Marine archaeology | | 48 | | |
| | Marine-coastal water protection | | | 171 | 298 |
| | *TOTAL* | 1,217 | 13,706 | 171 | 298 |
| Magistrate of the Water | Water protection (discharge) | 269 | 132 | 92 | |
| | Waste | - | - | - | |
| | *TOTAL* | 269 | 132 | 92 | |
| Agecontrol S.p.A. | Report on olive oil mill waste | 338 | 199 | 170 | 139 |
| | **TOTAL** | 338 | 199 | 170 | 139 |

Source: Prepared by APAT on data supplied by CFS, CCTA and Agecontrol S.p.A.

The indicator assesses the effects and consequences, both administrative and penal, deriving from inspection activities, if the rules and procedures required by legislation, regulations and the supervisory institutions are not respected.
It quantifies over a period of time the number of acts issued by institutions having jurisdiction (penalties, notifications of offences etc.) to those who fail to respect the law and regulations.
Figure 7.2 compares administrative, sanctions and penalities (confiscations and complaints) by thematic area in the various sectors where inspection activities are conducted.



*INDICATOR*: Bathing standards

**Table 7.4: Comparison at national level of data on coastal bathing standards in 2001 and 2002**

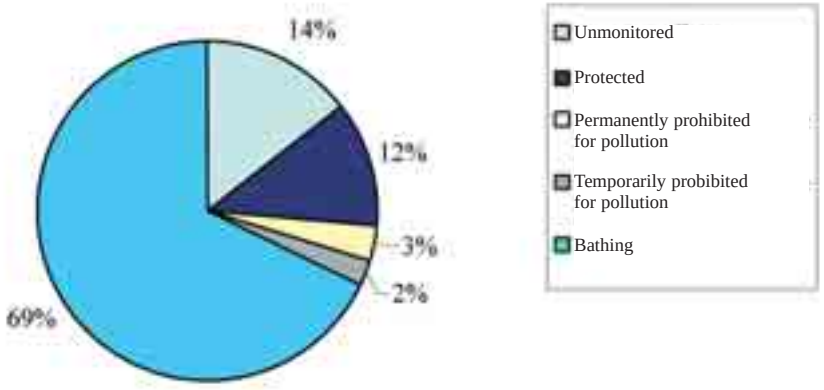
| Parameters | 2002 | | 2001 | |
|---|---|---|---|---|
| | km | % | km | % |
| Total length of coast | 7,375.3 | 100.0 | 7,375.3 | 100.0 |
| Unmonitored coast | 1,058.5 | 14.4 | 1,059.4 | 14.4 |
| Coast permanently prohibited for reasons not due to pollution | 884.4 | 12.0 | 884.5 | 12.0 |
| Coast permanently prohibited for reasons due to pollution | 254.0 | 3.4 | 269.7 | 3.7 |
| Coast temporarily unsuited to bathing | 169,0 | 2.3 | 130.9 | 1.8 |
| Coast suited to bathing | 5,000.6 | 67.8 | 5,017.1 | 68.0 |

Source: Ministry of Health

**Table 7.5: Coast monitored on total of the coast to be monitored in the Italian regions - Year 2002**

| Region | Length of marine coast | Coast with permanent prohibition of bathing not due to pollution | Coast with prohibition of bathing for pollution | | Coast suited to bathing | Percentage of unpolluted coast |
|---|---|---|---|---|---|---|
| | | | Permanent regional prohibition | Temporary regional Prohibition | | |
| | km | km | km | km | km | % |
| Liguria | 349.3 | 60.5 | 1.1 | 10.5 | 277.2 | 96.68 |
| Toscana | 601.1 | 75.0 | 10.7 | 1.5 | 386.1 | 76.71 |
| Lazio | 361.5 | 47.4 | 27.0 | 14.5 | 272.6 | 88.52 |
| Campania | 469.7 | 29.5 | 4.7 | 82.3 | 347.0 | 80.16 |
| Basilicata | 62.2 | 0.7 | 1.6 | 0.0 | 58.6 | 95.34 |
| Calabria | 715.7 | 34.3 | 29.8 | 19.5 | 627.9 | 92.52 |
| Puglia | 865.0 | 49.0 | 41.5 | 5.9 | 702.8 | 86.91 |
| Molise | 35.4 | 0.3 | 0.7 | 0.8 | 33.6 | 95.76 |
| Abruzzo | 125.8 | 3.7 | 4.8 | 3.3 | 114 | 93.56 |
| Marche | 173.0 | 11.5 | 5.8 | 4.3 | 151.2 | 94.05 |
| Emilia Romagna | 131.0 | 29.0 | 2.7 | 0.4 | 92.5 | 92.75 |
| Veneto | 158.9 | 52.4 | 0.0 | 12.9 | 93.6 | 91.88 |
| Friuli Venezia Giulia | 111.7 | 49.3 | 0.0 | 0.0 | 62.4 | 100.00 |
| Sicilia | 1,483.9 | 176.6 | 62.4 | 12.0 | 932.5 | 74.74 |
| Sardegna | 1,731.1 | 265.2 | 61.2 | 1.1 | 848.6 | 64.34 |
| Italia | 7,375.3 | 884.4 | 254.0 | 169.0 | 5,000.6 | 79.80 |

Source: Ministry of Health




Source: Prepared by APAT based on Ministry of Health data

**Figure 7.3: Monitoring of bathing in 2002 for total length of marine coast**

Table 7.5 shows the percentage of unpolluted coast in each coastal region, including areas suited to bathing and protected areas.
On the basis of the data we can observe that out of a total of 15 regions, 9 have over 90% of unpolluted coast and only 2 regions are under 75%.



# 8. Environmental information, capacity building and education

## Introduction

The correct presentation of data on environmental information, capacity building and education requires a further phase of development, in relation to methodology and the information basis. Currently, indicators for an appropriate monitoring and summarization of these topics have not yet been defined at national or European Community/international level. There is a similar lack of an adequate informative basis to enable the adoption of the indicators that are still being defined. In this context, starting from this edition of the Yearbook, data have been collected and systematically organized in order to provide some initial information on these topics. The elements described here must therefore be considered as mere examples.
APAT, at national level, started methodological research on the topics indicated in the following paragraphs with the objective to be achieved, on the basis of close co-operation of the Regional and Provincial Agencies and consultation of the national reference centres, the definition of adequate indicators allowing for a correct representation of the topics.
The acquisition of data, mainly for 2002 only, regarding the ARPA/APPA System, as shown in this edition of the Yearbook, has been conducted by APAT, which has initiated a specific survey. This action has been performed through the Working Group of the Referees of the ARPA/APPA for Environmental Communication, Information, Capacity Building and Education (CIFE) co-ordinated by APAT, by a specially planned questionnaire. This working instrument, which still requires further improvement, contains questions on communications initiatives (by radio, television, the press, conferences, seminars etc.), websites, reporting activities, training courses and educational initiatives. For these reason, the results of the survey, which also has been carried out in a short period of time, should thus be considered experimental. It should also be noticed that the values shown derive mainly from approximate estimates and not from a systematic monitoring. This could result in subsequent editions of the Yearbook also in some differences in some of the definitions of the specific indicators, so that the data could also differ substantially from those in the 2003 edition.
The acquisition of information from institutions outside the Agency System, especially the Ministry for Environment and Territory, ISTAT etc., has occurred mainly by consultation of their websites, and in some cases also with the offices having jurisdiction.
The chapter contains three paragraphs, each of which covers one of the topics concerned.

## Environmental information

Having *environmental information* (access to which is a right of the public that must be guaranteed by the authorities having jurisdiction, as stated in the Rio de Janeiro Declaration on the Environment and Development, 1992) is a fundamental condition for making plans on the environment, verifying their effectiveness and reporting the results of the policies applied. The 2003 Yearbook deals with environmental information with reference to communication, through reports, via websites and documentary types (libraries). Since October 2002 the

Agency for Environmental Protection and Technical Services (APAT) has been operating at national level, grouping together the functions of the National Agency for Environmental Protection of (ANPA), the National Geological Service (SGN), the National Hydrographical and Marine Survey Service (SIMN), and the Library of the Department for National Technical Services(DSTN). In some cases there is a separate description of the activities of environmental information conducted by these institutions.
For conventional types of communication, synthetic information on ARPA/APPA System have been presented in initiatives via radio and television (broadcasts, interviews etc.) and in the press (articles, press releases, brochures etc.). Then some environmental communication events have been organized (conferences, seminars, study initiatives etc.), and stands set up in events promoted by other organizations.
As for communication through reports, a brief summary is given on the international, community and national situations. With regard to the latter, estimates are provided of the publications by the Ministry for Environment and Territory, and by APAT (distinguishing between former ANPA and former SGN-SIMN publications). A summary is also provided at regional level, with estimates of the publications by ARPA/APPA and/or with joint participation.
As for environmental communication via websites, some graphical representations are provided of the parameters related to the number of sites and of visitors of the sites of the Agency System (thus including APAT/ANPA) and of pages downloaded.
For documentary type communication, estimates are provided of the activities undertaken by the APAT Library. Among other things, the Library has the role of co-ordinating the mapping activities of a national group of libraries (GEA Pole). Members include the Library of the Ministry for Environment and Territory and of the ICRAM (Central Institute for Scientific Research Applied to the Sea). The APAT Library, open to the public pursuant to the Decree of December 6$^{th}$, 2000 DSTN/2/ 25110, has prestigious and large book and map resources, consisting of 2,350 different periodicals (of which 680 current), 52,595 volumes of periodicals, 46,874 articles from of periodicals, 16,894 monographs, and 47,000 thematic papers (of which 15,140 are Italian).

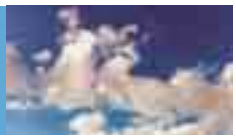
## Environmental capacity building

These activities, aimed at transforming knowledge about the environment into professional skills and wide-ranging job opportunities, are analysed in the Yearbook on the wider, national level and more in particular, with regard to the training initiatives conducted within the Agency System.
In this context, this first overview of initiatives for training and extending scientific and technical knowledge in the environmental sector by the Agencies of the APAT-APPA-ARPA system highlights a contrast. On the one hand there are course activities and those developed through company courses and apprenticeship, while on the other the data on the environmental training initiatives conducted at national level still show a widely differing information panorama throughout the country, at least in terms of overall volumes of activities.



## Environmental education

This is one of the indispensable instruments for promoting better knowledge related to environmental problems and the adopting of more environmental-friendly lifestyles by all categories of citizens: adults, young people and children. The theme is presented with reference to the main international and European strategies declaring an environment-friendly lifestyle to be the usual one proposed, such as in Agenda 21 and the Sixth Community Environment Action Programme, providing an overview of the main initiatives developed in the INFEA national system and, in particular, in the Agency System.



# 9. Atmosphere

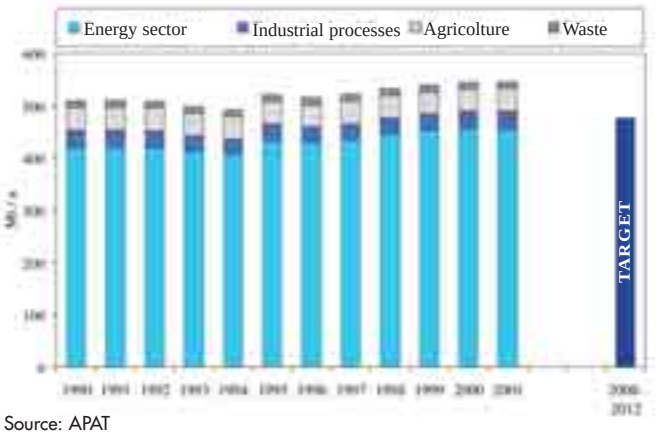
## Introduction

Air pollution is defined as any change in the atmosphere composition due to the presence of one or more substances in amounts and with characteristics that may alter the normal environmental conditions and presents a direct or indirect danger for human health, ecosystems and material assets. The pollutants released into the atmosphere are either produced by human activities (transport, industry, power plants, domestic heating, etc.) or have a natural origin (volcanic activity, biogenic emissions, sea spray etc.).
Problems related to atmospheric pollution involve various spatial and time scales. On the one hand, the air quality in the urban environment has strictly local relevance and is characterized by processes involving from several minutes up to some hours or days. On the other hand, emissions of acidifying substances and of ozone precursors may have transboundary impacts and time scales up to several days. Finally, the emissions of substances contributing to climate change and to changes in the stratospheric ozone layer, with time spans of several years in this case, have global relevance.
The indicators on atmospheric environment are organized in two categories: emissions (pressure indicators) and air quality (state indicators). Quantification of emissions, their sector distribution and development over time are based on estimates. Data concerning pollutant levels at ground level derive from networks for monitoring air quality, mainly managed by public institutions.

## Emissions

The substances released into the atmosphere contribute to the following phenomena: climate change, decrease of stratospheric ozone, acidification, photochemical smog and deterioration of the air quality. The assessment of emissions is made through suitable processes of estimation, based on emission factors and indicators of activities. With regard to greenhouse gases, the reference methodology is the one indicated by the Intergovernmental Panel on Climate change (IPCC). For the other pollutants, the methodology employed is the one indicated by the CORINAIR (COoRdination-INformation-AIR) Project of the European Environment Agency, with emission sources classified according to the Selected Nomenclature for Air Pollution (SNAP97). The analysis of national emissions, sector contributions, development over time and spatial distribution are a key element to establish environmental priorities and to identify the targets and the policies to adopt, on a national and local scale. The indicators selected respond to criteria of traceability, reliability and easy interpretation, and are relevant to the major problems concerning the atmosphere.

***INDICATOR:*** Greenhouse gas emissions ($CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$): trends and sector breakdown

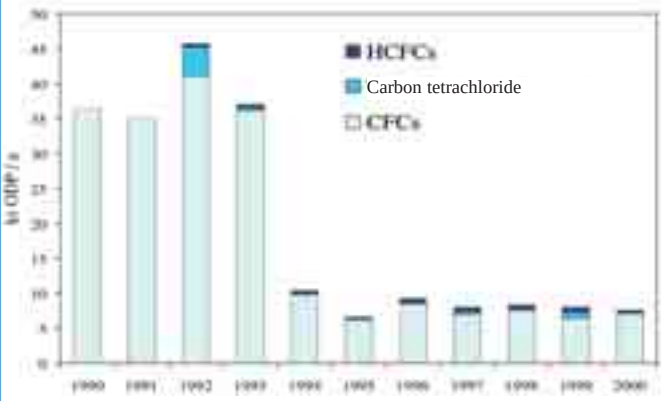



Source: APAT

**Figure 9.1: National emissions of greenhouse gases in $CO_2$ equivalent**

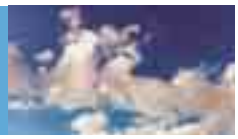
In the context of the Convention on Climate Change and in particular the Kyoto Protocol, Italy has undertaken to reduce overall national emissions of greenhouse gases in the period 2008-2012 by 6.5% with respect to the base year. The base year for carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$) is 1990, while for fluorinated gases (hydrofluorocarbons HFCs, perfluorocarbons PFCs, sulphur hexafluoride $SF_6$) is 1995. The total emissions of greenhouse gases considered by the Kyoto Protocol in 2001, in terms of $CO_2$ equivalent, are 7% higher than the base year. Trends in emissions are strictly correlated with energy consumption.

***INDICATOR:*** Production of substances harmful to stratospheric ozone (CFCs, $CCl_4$, HCFCs)



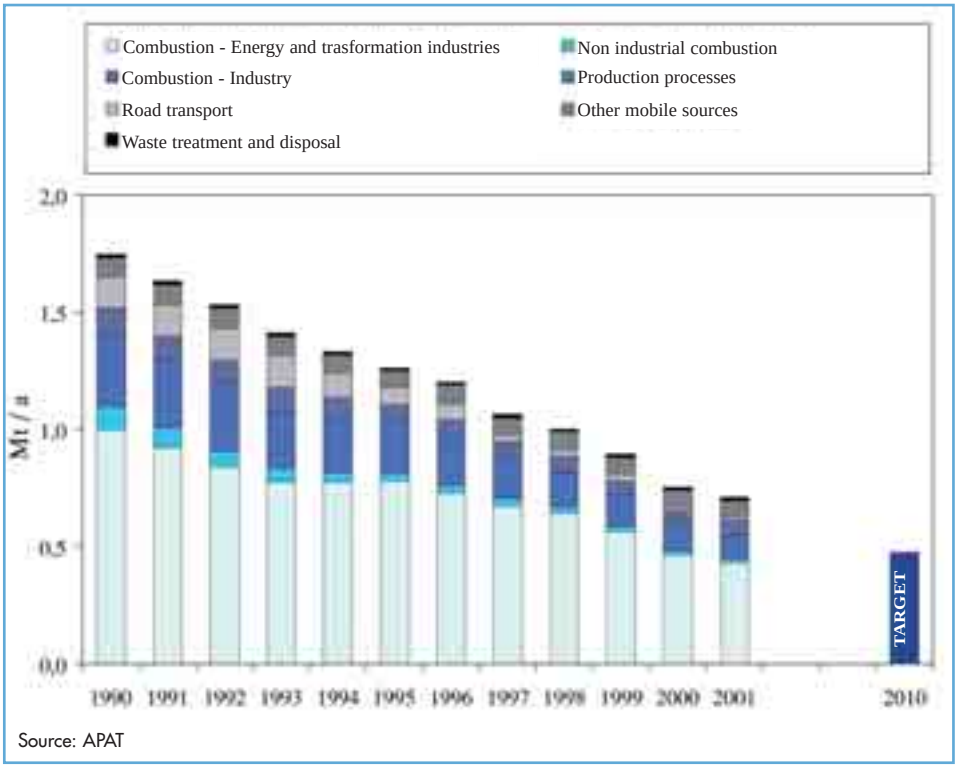

Source: APAT

**Figure 9.2: National production of substances harmful to stratospheric ozone in terms of ODP - *Ozone Depleting Potential***



The Montreal Protocol commits the parties to stabilise, reduce and then prohibit the production and consumption of substances harmful to the ozone layer ($O_3$) in the upper atmosphere (stratospheric ozone) according to a scheme defined by targets and deadlines.
In Italy, Law 549 of December 28th, 1993, and subsequent amendments and additions, provides procedures for the reduction and subsequent cessation in the use of ozone-depleting substances. In particular the use, marketing, import and export of ozone-depleting substances must cease by December 31st, 2008.

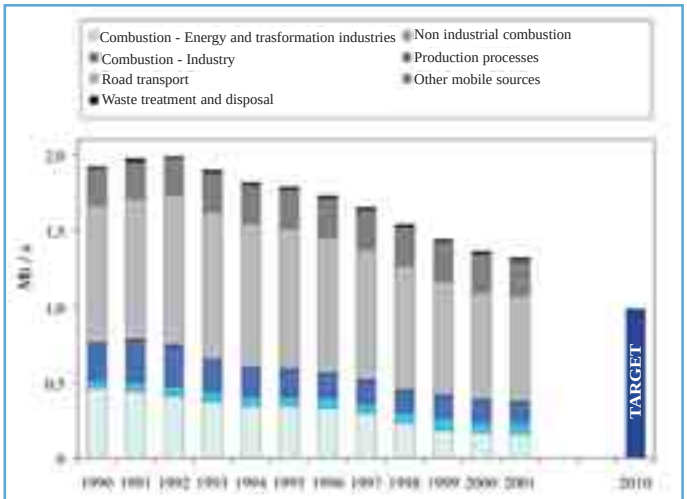
***INDICATOR:*** Emissions of acidifying substances ($SO_2$, $NO_X$, $NH_3$): trends and sector breakdown




Source: APAT

**Figure 9.3: National emissions of sulphur dioxide ($SO_2$)**

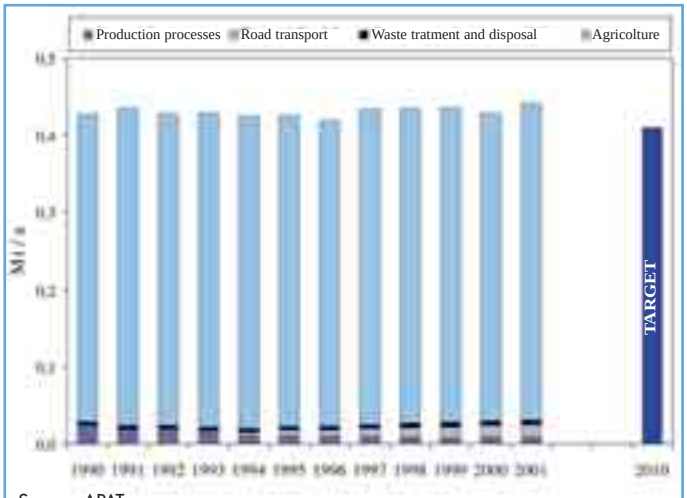
Under the NEC (National Emission Ceilings) Directive 2001/81/EC for national limitation of some air pollutants Italy is required to reduce national emissions of sulphur dioxide to 0.475 Mt by 2010, i.e. a reduction of 33.1% with respect to 2001. The emissions of sulphur dioxide were reduced in Italy by 49.2% between 1980 and 1990, and by 59.4% between 1990 and 2001.




Source: APAT

**Figure 9.4: National emissions of nitrogen oxides ($NO_x$)**

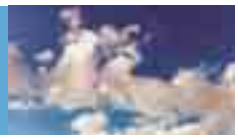
Under the NEC Directive 2001/81/EC, Italy is required to reduce national emissions of nitrogen oxides to 0.990 Mt by 2010, i.e. a reduction of the 24.8% with respect to 2001. The emissions of nitrogen oxides rose in Italy by 25.5% between 1980 and 1992 (when they reached a peak), and fell by 33.9% between 1992 and 2001.



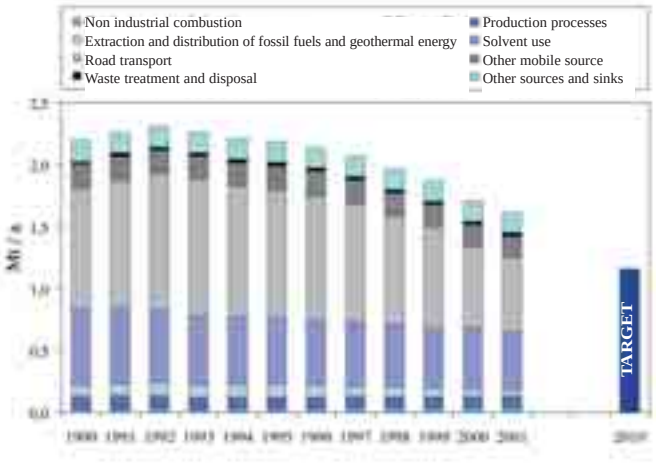

Source: APAT

**Figure 9.5: National emissions of ammonia ($NH_3$)**

Under the NEC Directive 2001/81/EC, Italy is required to reduce national emissions of ammonia to 0.419 Mt by 2010, i.e. a reduction of 5.2% with respect to 2001.



**INDICATOR:** Emissions of the precursors of tropospheric ozone ($NO_X$ and NMVOC): trends and sector breakdown




Source: APAT

**Figure 9.6: National emissions of Non-Methane Volatile Organic Compounds (NMVOC)**

Under NEC the Directive 2001/81/EC, Italy is required to reduce national emissions of Volatile Organic Compounds other than methane to 1,159 Mt by 2010, i.e. a reduction of 21% with respect to 2001. The emissions of Non-Methanic Volatile Organic Compounds rose in Italy by 6.1% between 1980 and 1992 (the year when they reached a peak), and fell by 32% between 1992 and 2001.

**INDICATOR:** Emissions of benzene ($C_6H_6$): trends and sector breakdown

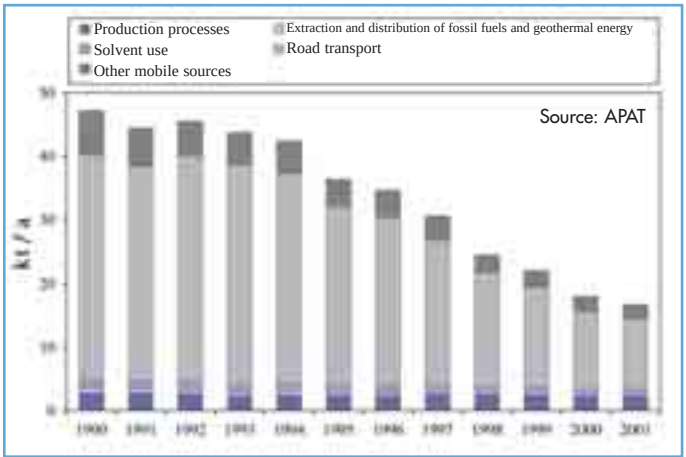
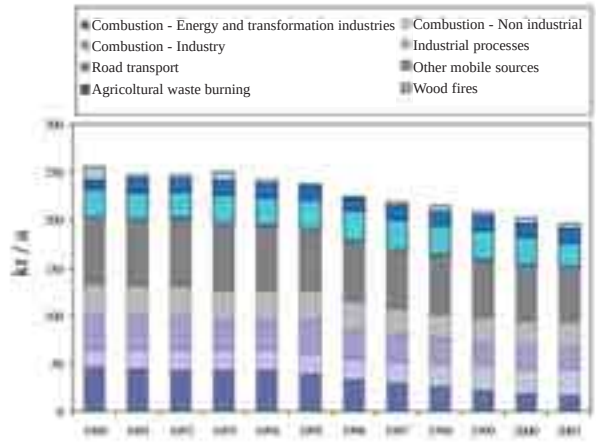



**Figure 9.7: National emissions of benzene ($C_6H_6$) according to the SNAP97 sector breakdown**

The emissions of benzene derive mainly from the use of fuel in transport, as a product of both combustion and evaporation, and in the second place from some production processes and systems for the storage and distribution of fuels (service stations, depots).
With regard to road transport, most of this pollutant (approximately 95%) originates from vehicles exhaust, where benzene is present as an

uncombusted substance, and as a product of the rearrangement of aromatic hydrocarbons in oil. A part (5%) derives from evaporation emissions from tanks and carburettors also from parked vehicles. The high rate of motorization in city centres and the ascertained cancer risk make benzene one of the most important pollutants in urban areas.

***INDICATOR:*** Emissions of PM10: trends and sector breakdown



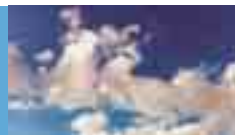

Source: APAT

**Figure 9.8: National emissions of PM10 according to the SNAP97 sector breakdown - Years 1990- 2001 (thousand tons)**

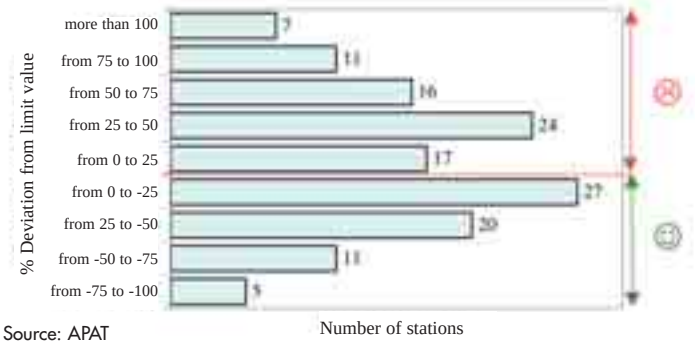
Particles with dimension of less than 10 μm (PM10) have a natural and man-made origin. Man-made emissions are mainly due to traffic and combustion processes (industrial plant and residential heating plant). Particles of natural origin are produced by soil erosion, marine aerosol, biogenic aerosol (plant fragments, pollen, spores), volcanic emissions and long distance conveyance of sand (dust from the Sahara).
The indicator represents a national estimate and the corresponding sector breakdown of PM10 emissions. Reductions of emissions are observed above all in the energy and industrial sectors, and to a lesser extent, in transport.

## Air quality

The indicators for air quality developed for the environmental data Yearbook are those which, on the basis of the data recorded by the monitoring networks and collected by the APAT within the SINAnet network, are considered to be the most significant for assessment purposes with respect to the limit values stated in regulations. Among these, we should recall the ones in the new European directives implemented by the Ministry Decree 60 2/4/2002, and referring to sulphur dioxide ($SO_2$), nitrogen oxides ($NO_x$ = NO+ $NO_2$ expressed as $NO_2$), nitrogen dioxide ($NO_2$), particulate with dimension less than 10 μm ($PM_{10}$), carbon monoxide (CO) and benzene ($C_6H_6$). This summary shows some figures describing the situation in 2002.



**INDICATOR:** Air quality: concentrations of nitrogen dioxide ($NO_2$)

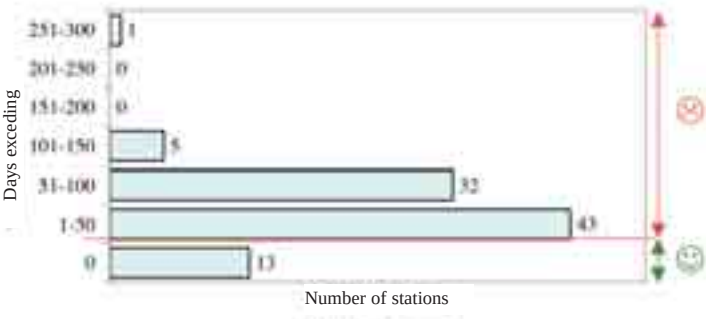



Source: APAT

**Figure 9.9: Annual average concentrations of $NO_2$ in 2002, distribution of the percentage deviation from limit value for health protection (40 μg/m³, Ministry Decree 60/02, in force after January 1st, 2010). Negative percentage values indicate that the concentrations are below the forthcoming limit value - Year 2002**

Ministry Decree 60/02, for average $NO_2$ annual concentrations, sets the limit value for health protection to be achieved by January 1st, 2010 in the order of 40 μg/m³. As an indicator, the annual average percentage deviation from the limit value was calculated. Figure 9.9 shows the indicator distribution for all the stations with data available in 2002. In particular, the future limit value of the annual average for $NO_2$ for health protection is exceeded in 54% of the stations examined.

**INDICATOR:** Air quality: concentrations of ozone ($O_3$) in the air at ground level

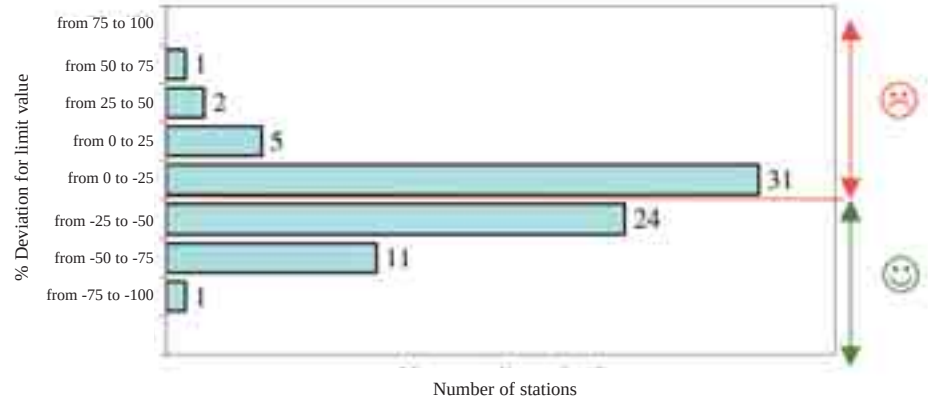



Source: APAT

**Figure 9.10: $O_3$, distribution of the number of days in 2002 on which the health protection level is exceeded (110 μg/m³ average over 8 hours, Ministry Decree May 16th, 1996). The stations under the red line reported no exceedance Year 2002**

Ozone in the troposphere is a secondary pollutant, i.e. it is not emitted directly by one or more sources, but is produced due to solar radiation in the presence of primary pollutants such as nitrogen oxides ($NO_x$) and Volatile Organic Compounds (VOC). The overall pollution phenomenon that includes high concentrations of tropospheric ozone is called "photochemical smog". Photochemical pollution is also a trans-boundary phenomenon: under particular weather and emission conditions, photochemical pollutants are formed and conveyed hundreds or thousands of kilometres.
Until the implementation of the recent Directive 2002/3/EC, the quality targets are set by the Ministry Decree May 16th, 1996. The indicator proposed is the number of days in which the health protection level is exceeded (110 μg/m$^3$ for the average on 8 hours). Figure 9.10 shows the distribution of the indicator on all the stations with data available in 2002. In 86% of the stations at least one episode of exceedance has been recorded and in 40% these episodes are over 50.

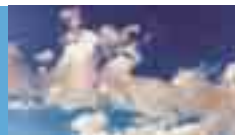
***INDICATOR***: Air quality: air concentrations of PM10




Source: APAT

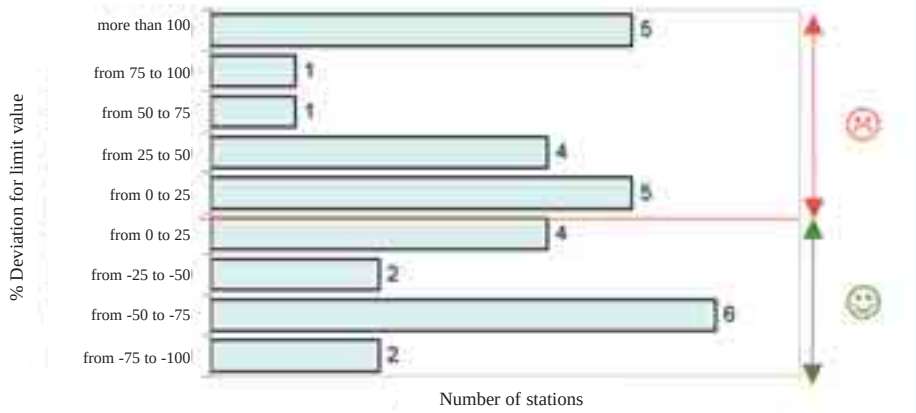
**Figure 9.11: Annual average concentrations of PM10 in 2002: distribution of the percentage deviation from the limit value for health protection (Ministry Decree 60/02). Negative percentage values indicate that concentrations are below forthcoming limit value**

A significant part of PM10 in the atmosphere has a secondary origin and is due to the reaction of gaseous compounds such as nitrogen oxides, sulphur oxides, ammonia and organic compounds.
Moreover, the components of dust include compounds such as polycyclic aromatic compounds and heavy metals.
The limit values for health protection are indicated in the recent Ministry Decree 60 of April 2nd, 2002 implementing the European Directive 1999/30. The limit value of the annual average PM10



concentrations, to be achieved by January 1st, 2005, is 40 μg/m3. Figure 9.11 shows the percentage deviation of the annual average figures from the limit value, at all the stations with data available in 2002. Approximately half the recorded values exceed the forthcoming limit.

***INDICATOR***: Air quality: air concentrations of benzene ($C_6H_6$)




Source: APAT

**Figure 9.12: Annual average of concentrations of $C_6H_6$ in 2002, distribution of the percentage deviation from the limit value for health protection (5 μg/m3 in force after January 1st, 2010, Ministry Decree 60/02). Negative percentage values indicate that concentrations are below the forthcoming limit**

For health protection, the limit of benzen ($C_6H_6$), indicated by the recent Ministry Decree 60 of April 2nd, 2002 implementing the European Directive 2000/69, is 5 μg/m3 for the average annual value, to be achieved by January 1st, 2010. Figure 9.12 shows the percentage deviation of the annual average figures from the future limit, for all the stations with data available in 2002. Considering the limit value becoming applicable in 2010, approximately half the recorded values exceed the planned limit of 5 μg/m3.

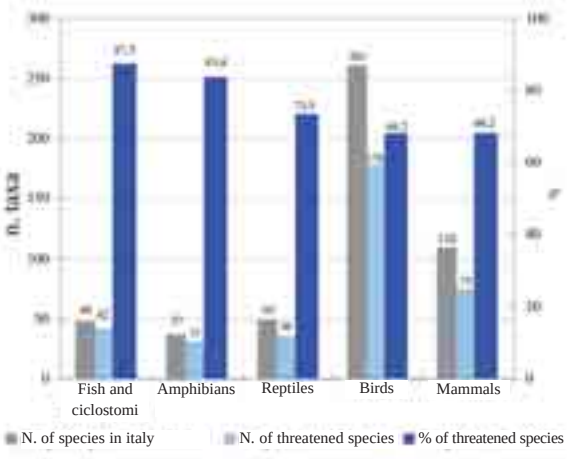


# 10. Biosphere

## Introduction

The biosphere is the product of interactions between soil, rocks, water, air and living organisms they contain. It constitutes a complex system, the terrestrial ecosystem, in dynamic balance with the Earth's other components. In tackling problems, we cannot adopt a reductive approach (i.e. investigating a single part of the system, while keeping surrounding conditions constant), but should rather adopt a holistic survey method aimed at understanding the complexity of the system.
Therefore, given the close interrelations both within and with other thematic areas, the indicators for the biosphere presented here involve different themes, only apparently distant and unconnected.
In particular, in selecting these indicators, we have tried to represent the main problems related to biodiversity conservation, parks and protected areas setting up, forests and landscapes protection.
Substantially, the indicators show that there is still a high level of threat for animals, plants and natural habitats as a result of various critical points ranging from environmental pressure to territorial fragmentation. There are a number of regulatory instruments, direct and indirect, at national and international level to contrast the loss of biodiversity. Direct measures are those directly protecting species and ecosystems. Indirect measures are aimed at reducing the sources of pressure. The gradual, but continuous increase of Italian forest area may represent a good example of the positive effects of lower pressure together with effective protection measures.

***INDICATOR:*** Level of threat for animal species

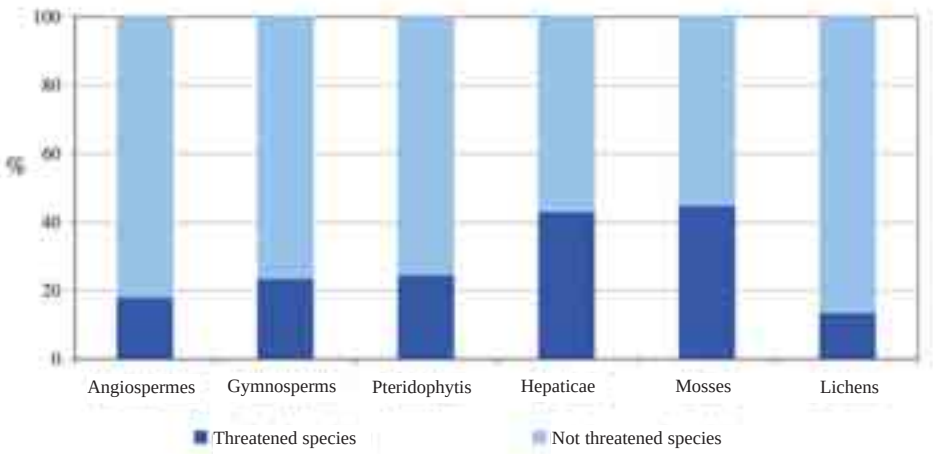



Source: prepared by APAT/CTN_NEB on data from: Zerunian S., 2002. "*Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*", Edagricole – Edizioni Agricole de Il Sole 24 Ore Edagricole S.r.l., Bologna. Ministry for Environment and Territory – Department for the Conservation of Nature, 1998. " *Checklist delle specie della fauna italiana - fascicolo 110 – vertebrati*". http://www.scn.minambiente.it. Calvario E., Sarrocco S., (Eds.), 1997, "*Lista Rossa dei Vertebrati italiani*". WWF Italy, Biological Diversity Sector, Italian Ecosystem Series, DB6.

**Figure 10.1: Percentage distribution of threatened animal species by systematic groups**

Figure 10.1 shows the particularly high level of threat for vertebrates in Italy. The conservation problem seems to be particularly serious for fresh-water fish and amphibians, as well as being significant for the other systematic groups. This is probably due in the first case to the poor state of conservation of inland waters, and in the second to problems such as the deterioration and disappearance of wetlands, the habitat where amphibians spend most of their lifecycle.

***INDICATOR***: Level of threat for plant species




Source: APAT/CTN_NEB on data:
ANPA, 2001. "Liste Rosse e Blu della Flora Italiana" Stato dell'Ambiente Serie 1/2001.
WWF Italy - Min. Environment SCN, 1997 . "Libro Rosso delle Piante d'Italia".
Pignatti S., 1982. " Flora d'Italia", Edagricole, Bologna

**Figure 10.2: Percentage distribution of threatened Italian plant species for systematic groups**

The systematic groups shown in figure 10.2 are threatened at national scale as a whole for 20.34% of the species composing it. At national scale the danger is particularly high for Bryophyta (Hepaticae and musses, respectively 43% and 44.74% of the species). This is probably related with the poor state of the wetlands where they live, but also with the processes of intensification of agriculture and forestry, and with pollution phenomena.



## *INDICATOR:* Total protected land areas

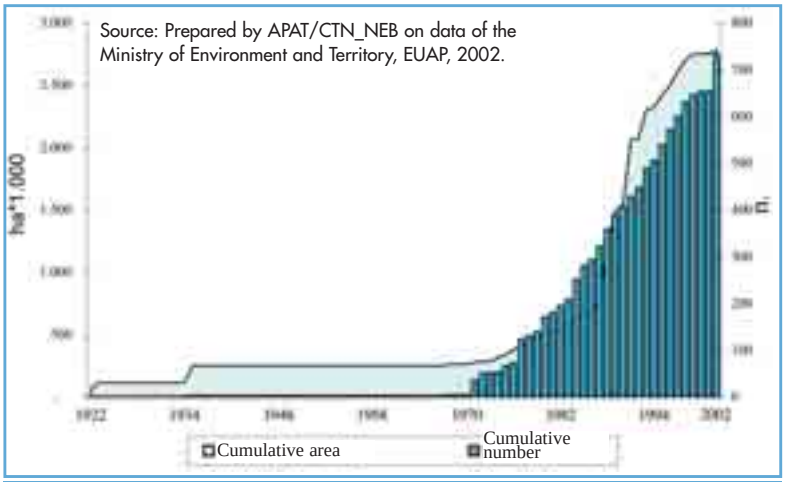
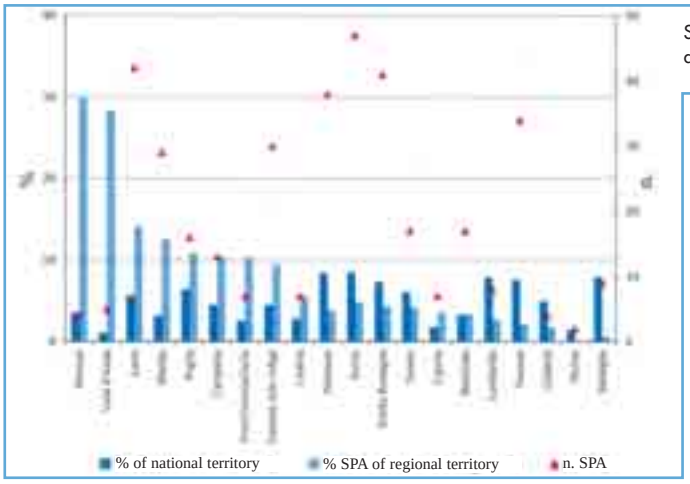



**Figure 10.3: Annual change of cumulative area and cumulative number of protected land areas**

The land portion of Italian protected areas totals 9.25% of the country. Figure 10.3 shows a significant increase of the area and number of protected areas from the mid-1970s, promoted mainly by the regions, which in those years started to play their institutional role. The various measures enacted, before and after the 1991 National Framework law on protected areas, have provided constant stimulus to protection activities. Since the later 1990s, central government too has been involved in identifying new areas role promoting over the past decade of the setting up of many new protected areas.

## *INDICATOR:* Special Protection Areas (SPA)

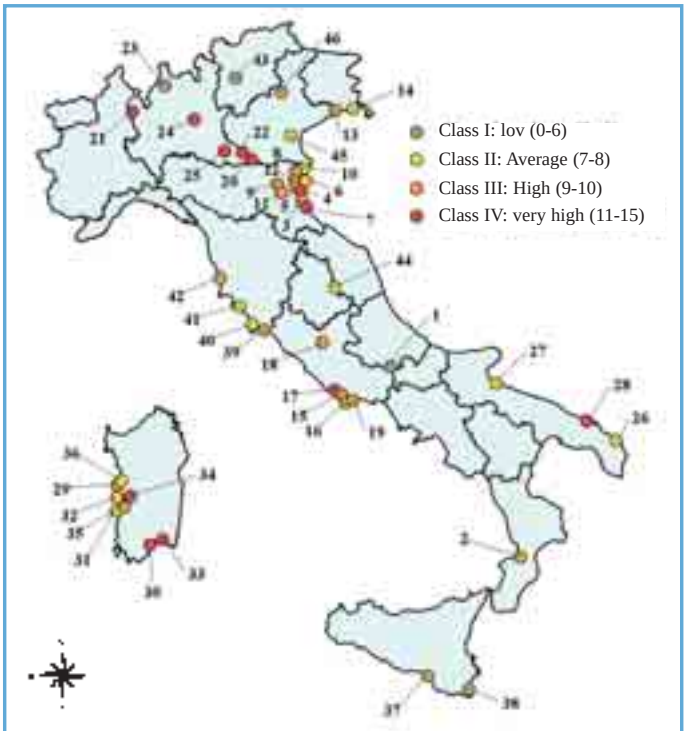



Source: Ministry for Environment and Territory, 2003

**Figure 10.4: Number and percentage of areas of Special Protection Areas (SPA) on total regional areas. Comparison with the regional percentage of national territory. Year 2003**

The Special Protection Areas (SPA) were set up after the issue of the "Bird Directive" (Dir. 79/409/EEC), regarding the conservation of wild birds deserving protection. Italy has set up a total of 377 SPA with a total area of nearly 2,000,000 hectares (6.6% of the national territory). On the regional level, the situation is quite varied and does not seem to be a significant correlation between the extension of the regions and the percentage of territory protected by SPA. From 1997 to 2003 there has been an increase of 146% in the SPA area. This figure is a positive institutional response to the requests of the European Union, although the target set by the Directive has not been achieved.

***INDICATOR:*** Human pressure on wetlands of international interest



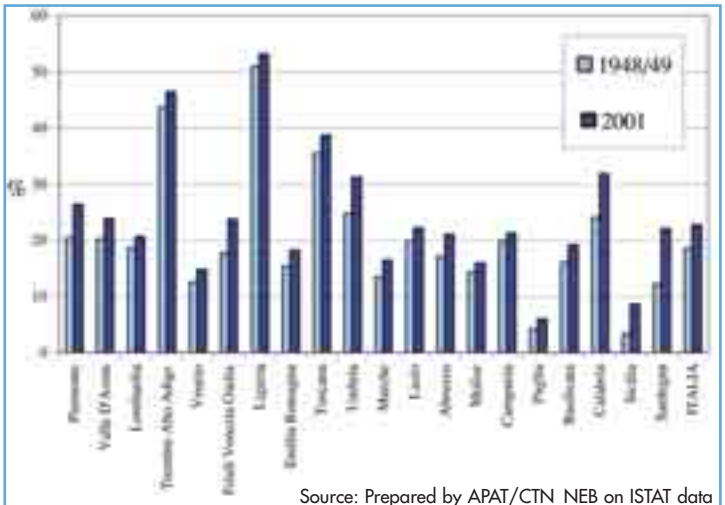

Source: Prepared by APAT/CTN_NEB on data from: Ramsar Convention Bureau; CORINE Land Cover (1996) and TELEATLAS, 1999.

**Figure 10.5: Index of human pressure on Ramsar areas**

The index shown in figure 10.5 summarizes the main pressure factors on wetlands protected under the 1971 Ramsar Convention (urbanization, farming activities and infrastructures). The index of human pressure mainly shows high or very high values (classes III and IV, i.e. 67% of the total wetlands) above all due to the high rates of farming activities, since ponds and wetlands are located in flat areas. This highlights the precarious equilibrium of these environments, highly sensitive due to their internal processes, and constantly threatened by surrounding human activities.



***INDICATOR:*** Forest area: state and changes

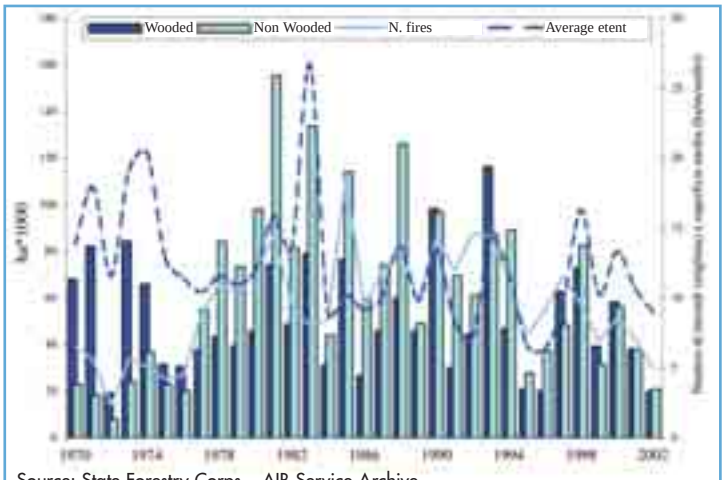



Source: Prepared by APAT/CTN_NEB on ISTAT data

**Figure 10.6: Index of regional forest area. Values for 1948/49 and 2001**

The index of regional forest area (ratio between forest area and regional area) has shown a general increase from the end of World War II up to the present. The national average has risen from 18.6% in 1948/49 to 22.8% in 2001, showing a gradual, but continuous, increase of the Italian forest area.

***INDICATOR:*** Extent of forest fires




Source: State Forestry Corps – AIB Service Archive

**Figure 10.7: Annual area destroyed by fire (with and without forest), average extension and annual number of forest fires. Years 1970 - 2002**

An overall survey of data from 1970 to 2002 shows fluctuating trends in fires, with peak years and subsequent attenuation. There was in any case a highly critical period in the mid-1980s, followed by years in which the level of fires has remained high, with a slight decrease in recent years.

# 11. Hydrosphere

## Introduction

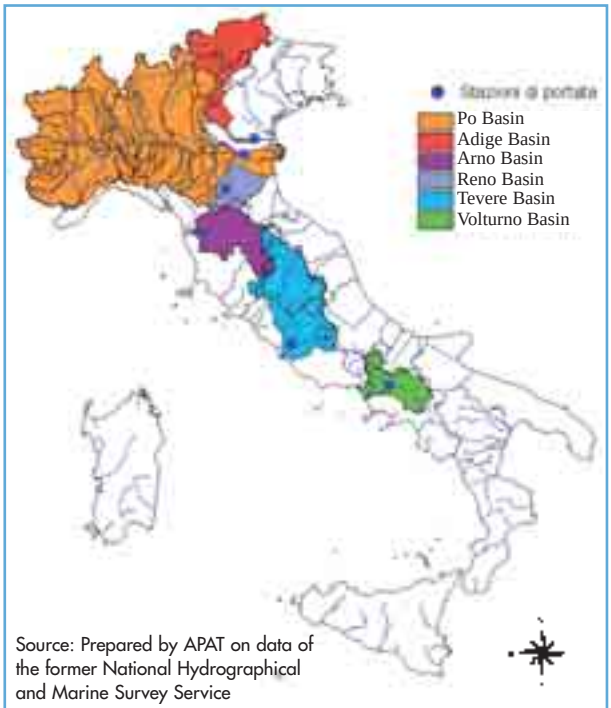
The hydrosphere covers two thirds of the Earth surface and allows for the exchange of substances and energy between all the ecosystems through the water cycle that develops between the land and lower levels of the atmosphere.
Water performs a fundamental task in shaping the landscape through continuous geomorphologic action. The presence of water bodies conditions and characterizes local and regional dynamics.
Water is an essential element in the life of mankind and of animal and plant species. The proper functioning of water bodies is essential for protecting the associated ecosystems.
Water is an essential element for the socio-economic development of the population. Its optimal use should consider the sustainability of its exploitation. Water resources are subject to quantity changes, due to required use and consumption, and to quality changes due to natural causes and human activities: these produce increasingly high and often irreversible pollution.
The state of water resources is illustrated by a selected group of indicators on three environmental themes: amount of water resources, quality of water and its uses. The quantity of resources substantially influences the quality of water bodies and the efficent use of resources.
The indicators presented in the Yearbook refer to inland water, coastal seawater and groundwater.
This summary shows only the indicators for inland water and coastal seawater.
Current regulations do not indicate specific environmental targets for rivers flow: a decree is expected to indicate the criteria for the definition of the basic outflow of rivers. With regard to volume, the annual outflow volumes in some of the main Italian rivers basins in 2000 showed a decrease with respect to the average for the 50-year period 1921-1970, with the exception of the Po and the Adige which recorded exceptionally high levels (October 2000).
The quality of coastal seawater, with regard to the trophic aspects, is on the whole good, since most of the stations sampled show a high (74%) or good (19%) trophic condition. There are problems in this respect in the remaining 7% of the stations sampled, leading to a mediocre condition (2% in a mediocre condition and 5% in a poor condition). The Adriatic coast of Emilia Romagna is the most critical region, while the Tyrrhenian coast has critical situations at the estuaries of some rivers, in the Provinces of Pisa (Morto River), Viterbo (Marta River) and Caserta (Sarno River).
The Ecological State of Rivers (ESR) is satisfactory, since 78% of the sampling stations on the 175 rivers monitored are in the good (37%) or sufficient (41%) category, i.e. in an ecological state corresponding to intermediate (sufficient to 2008) or final (good to 2016) environmental targets set by current standards.
The supply of water for drinking purposes seems substantially stable in the 3-year period 1999-2001, but the trend already observed in 1993-1998 with an excessive use of groundwater is confirmed. This trend, also aggravated by the use of groundwater for irrigation, affects groundwater recharge balance and in the coastal regions worsens the quality of this water due to the intrusion of saline water.



## Amount of surface water

The natural water cycle, from rainwater to the natural flow in water basins, evaporation and the distribution of water in the various types of water bodies, surface and underground, determines the local availability of the resource according to climatic conditions and the nature of the soil. Only part of the amount of water theoretically available, is a renewable resource. For the sustainable use of water resources, the depletion of water in the long term must not exceed the renewable amount of the resource.
The volumes of water basins, besides representing an essential element for the estimation of availability, are a basic factor for the assessment of the amount of pollutants carried by rivers to the final water bodies, such as lakes and the sea.
The measurement of the volume of rivers is conducted by the former branch offices of the National Hydrographical and Marine Survey Service (SIMN), now transferred to the regional level, according to standards and procedures published by the SIMN in the publication entitled "Norme tecniche per la raccolta e l'elaborazione dei dati idrometeorologici – parte II" (Technical norms for gathering and processing of hydrometeorological data - part II), in accordance with the regulations of the World Meteorological Organization (WMO).

***INDICATOR:*** Final volumes of the main Italian basins

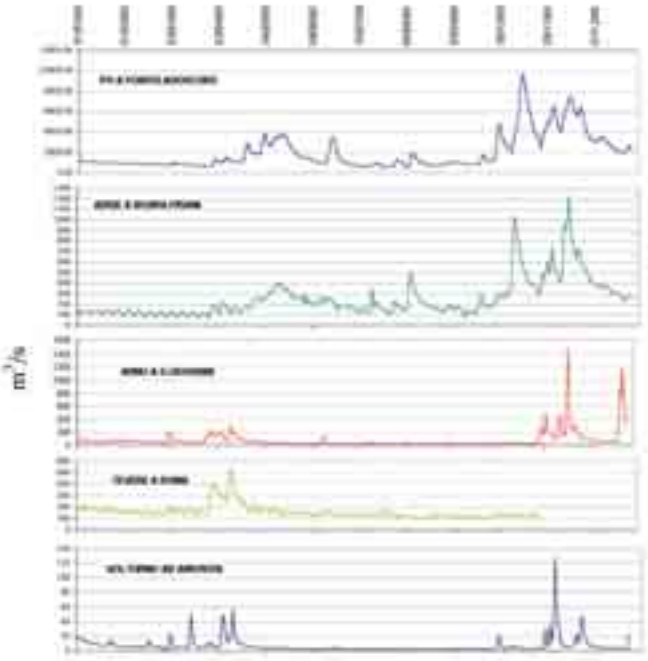



Source: Prepared by APAT on data of the former National Hydrographical and Marine Survey Service

This is an indicator measuring the volume of water flowing in a given data section of a river per unit of time (second).
The systematic measurement of the volumes of a river has a fundamental role since it enables us to:

- assess the response capacity of a basin to a weather event, indispensable for purposes of soil protection;
- determine the amount of resources available in the period, necessary for the assessment of the hydrological state and the definition of quality parameters.

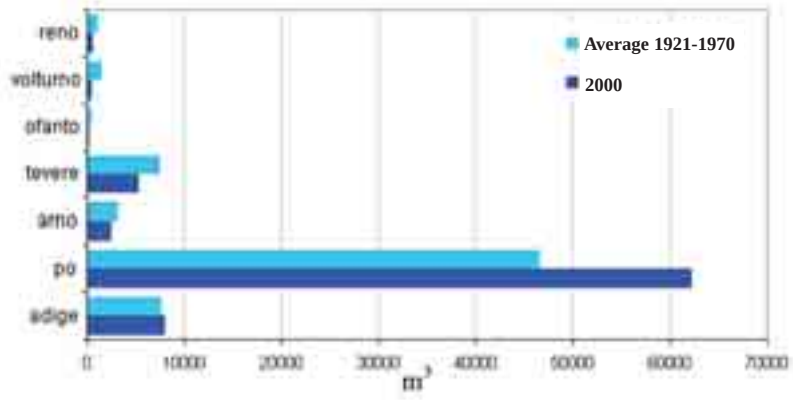
**Figure 11.1: Stations for final volume measurement of some Italian river basins**



Source: Prepared by APAT on data of the former National Hydrographical and Marine Survey Service (SIMN) and of the regional facilities to which the SIMN offices have been transferred.

**Figure 11.2: Daily volumes [m³ /s] for some Italian basins Year 2000**

The measurements of daily volume are shown in part II of the Hydrological Annals.
Figure 11.1 shows only the volume stations at the outlets of the main water basins, for which there is a continuous series of updated data up to 2000.
The trends in daily volumes depend on rainfall and the characteristics of the basin. Basins belonging to climatically homogeneous zones show the same distribution of maximum and minimum levels in the year. In par-




Source: Prepared by APAT on data of the former National Hydrographical and Marine Survey Service (SIMN) and of the regional facilities to which the SIMN offices have been transferred.

**Figure 11.3: Final annual volumes [m³] of some Italian basins**



ticular, 2000 was characterized by the floods in October. As we can see in figure 11.2, heavy rainfall triggered a rapid increase in the volumes of the rivers. Due to the heavy concentration of rainfall in Northern Italy, the Po and the Adige responded with high water levels.
Figure 11.3 shows trends in annual volumes of 2000 with respect to the average ones for the 50-year period 1921-70. The figures confirm that in general there is a decrease of the outflow volumes in 2000 with respect to the 50-year period, except for the Po and the Adige, where there has been an increase due to the high water event.

## Quality of water resources

*Quality of coastal seawater*

The knoweldge and the assess of the quality of coastal seawater are essential conditions for providing correct management of marine resources, in particular for Italy, with its 8000 km of coastline, densely populated and characterized by significant economic activities (industry, transport) and socio-cultural activities (tourism).
Coastal waters represent the main interface between the pressure factors located on the coast or just inland and the open sea, towards which first rivers and then marine currents convey and spread the effects. Moreover, these narrow areas of water host the most complex marine ecosystems (meadows of *"Posidonia o."*, *"coralliginous"* biocenosis etc.) as well as the basic phases of the processes regulating life in the oceans (reproduction areas, emergence of deep water etc.). They contain the highest level of biodiversity and environmental variety, resulting in a particular important and areas sensitive to changes.
The Yearbook on environmental data describes three indicators for coastal waters: TRIX (trophic index), suitability for bathing of coast waters and the Bacteriological Quality Index (BQI)
Nevertheless, the current edition of the Yearbook has not included suitability for bathing of coastal and inland waters and Bacteriological Quality Index (present in the 2002 Yearbook), since for technical reasons data were not available in time for inclusion in the "Report on Bathing" by the Ministry of Health, which is the primary source of data for developing these indicators.

*Quality of surface water*

The quality of water bodies can be assessed on the basis of numerous indexes. The Yearbook shows indexes regarding the specific uses for the water (water suitable for fish and shellfish) and integrated indexes on the pollution level deriving from macro-descriptors for pollutants (LIM); the biological condition is described by the Extended Biotic Index (IBE) of marine macroinvertebrates and by the Ecological State of Rivers (SECA) and of some major lakes. This summary includes the ESR index.

***INDICATOR:*** Trophic state Index (TRIX)


**Figure 11.4: Trophic State Index (TRIX), quality classes (annual means averages 2001-2002) in coastal waters, within 500 m offshore**

The trophic state (biomass quantification by phytoplankton and nutrients amounts) of coastal waters is represented by the TRIX index.

The TRIX index for the entire extension of the coastline (figure 11.4) shows that 93% of the monitoring stations comply with the environmental target set by regulations, corresponding to a high (74% of stations) or good trophic state (19% of the stations). Only 5% of the stations are in a mediocre condition, and 2%, located on the Adriatic coast of Emilia Romagna is in a poor state. The Porto Garibaldi station, in the town ship of Goro, shows the worst conditions.

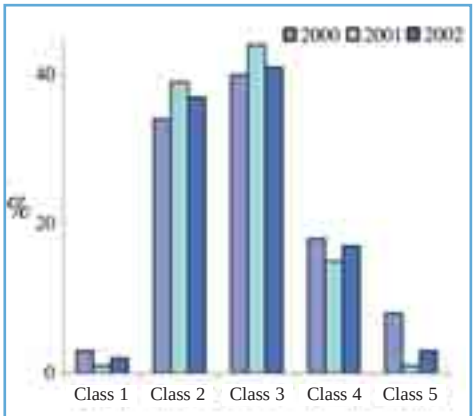
The critical situation of the Emilia Romagna, coast is basically due to the outflow of the Po River into the sea, along the border between Veneto and Emilia Romagna; this carries the waste discharge of 16 million people, and is a pressure factor affecting the Adriatic waters from a productive and hydrological (density) point of view. Adriatic currents tend to convey the Po outflow southwards to the Romagna coast, with limited dilution and mixing.

On the Tyrrhenian coast, most of the points monitored show a high trophic state. The critical sites, with a mediocre trophic state, are located at the mouths of some rivers such as the Morto River in the Province of Pisa, the Marta River in the Province of Viterbo and the Sarno River in the Province of Caserta.

All the sites of the Ionian Sea and the coasts of Sardegna show low trophic conditions and therefore a good environmental state.

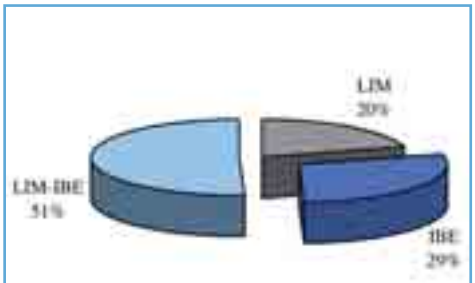


***INDICATOR:*** Ecological state of Rivers (SECA)




Source: Prepared by APAT/CTN_AIM on data provided by the Regions, ARPAs/APPAs

**Figure 11.5: Percentage distribution of ESR in the respective quality classes**




Source: Prepared by APAT/CTN_AIM on data provided by the Regions, ARPAs/APPAs

**Figure 11.6: Contribution of LIM and IBE indexes in determining the ecological quality class of rivers (SECA), Year 2002**

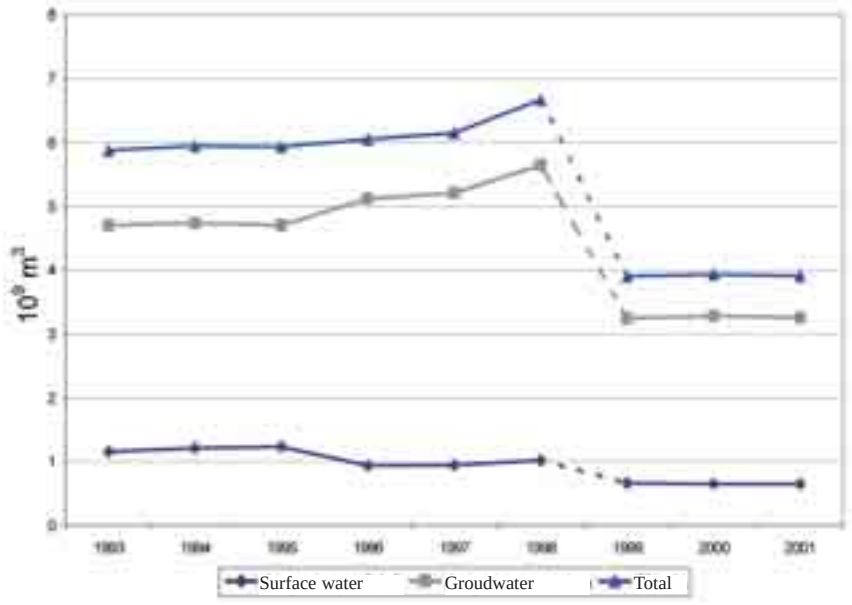
The Ecological State of Rivers (SECA) is determined by integrating the LIM (developed on the parameters of dissolved oxygen, $BOD_5$, COD, $NH_4$, $NO_3$, total phosphorus, orthophosphates, *Escherichia coli*) with the IBE index.
The ESR contains five classes of decreasing quality: class 1= high, class 2 = good, class 3 = sufficient, class 4 = poor and class 5= very poor.
The environmental target set in national legislation (Legislative Decree 152/99) for rivers is to achieve by 2016 a "good" state of environmental quality, corresponding to LIM level 2 and class 2 (good) for the EBI and ESR.
For 2003 data has been developed for 15 Regions and 2 Autonomous Provinces (14 in the 2002 Yearbook), excluding Calabria, Sardegna, Puglia and Piemonte, for which data is not available.
The ESR was calculated only where technically possible, i.e. in 513 monitoring stations for 175 rivers of the main Italian basins. With respect to the 2002 edition of the Yearbook, there is a 44% increase in the sampling sites and 52% in the rivers monitored. This improvement of geographical area is due to the intensification of the monitoring programmes required under the above-mentioned decree.
In the ESR (figure 11.5) classes 2 (good ecological state) and 3 (sufficient) are almost equivalent, with approximately 40% of stations each, i.e. 37% in the good class and 41% sufficient. It is significant that there are 17% of stations in class 4 (poor), while the occurrence of class 1 (high) and 5 (very poor) is very low, respectively 2% and 3% on the whole, 39% of the sites monitored show an ESR value compatible with the environmental target required under the

above-mentioned decree. Nevertheless, there is an increase in the number of stations with a poor or very poor result, probably due to the effect of the completion of national coverage of the index.
Figure 11.6 shows the percentage distribution of the ESR, LIM and IBE indexes for 2002. We can note that with 29% the IBE is the index with the greatest influence on determining the class of the ESR, with respect to the LIM at only 20%. In the remaining 51% the LIM and IBE rates contribute equally to the value of the ESR.

### Water resources and sustainable uses

The use of fresh water for drinking, and more generally for human consumption, is the priority use of the resource.
In Italy this use also represents a major pressure on the quantity of groundwater (better quality than surface water), which in general provides the main source for drinking water.

***INDICATOR:*** Water for drinking purposes




Source: Prepared by APAT on data of the Ministry of Health, Department of Prevention and Communication

**Figure 11.7: Source of water supply for drinking purposes - Years 1993 – 2001**



The indicator provides the measurement of the quantity impact of the utilization of surface water and groundwater to obtain drinking water. The indicator is of particular national significance since it shows an excessive use of groundwater for drinking purposes (figure 11.7). This leads to the over-exploitation of groundwater with possible effects of salt intrusion in the coastal regions.

For the 3-year period 1999-2001, figure 11.7 shows a decrease of overall utilisation of water for drinking purposes. This decrease is actually due to the fact that we cannot represent the national totals of the utilisation of surface water and groundwater, since only the following regions have sent different data: Piemonte, Veneto, Friuli Venezia Giulia, Tuscany, Marche, Umbria, Lazio, Campania, Puglia and Basilicata. Emilia Romagna has sent partial data referring to just one Province. The Autonomous Province of Trento has sent data on the amount of water distributed, which however may not be used for the purpose of correct assessment.

The comparison with previous years for the regions represented in the 3-year period 1999-2001 confirms the situation already indicated out, with a nearly constant utilization ratio between surface water and groundwater.

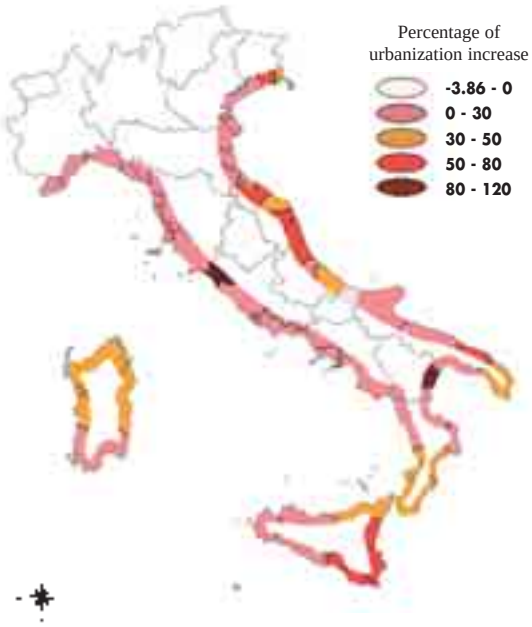
# 12. Geosphere

## Introduction

The recent document of the European Commission about soil protection - COM (2002)179 - highlights the major problems involving soil: even with the peculiarity and great diversity of our territory, they are similar to those in Italy. These are erosion (mainly due to water), local and diffuse contamination, soil sealing, soil compaction, loss of organic matter, decrease of biodiversity, salinization and hydrogeological risk such as landslides and flooding. The implementation of an european soil policy, leads to a series of targeted initiatives such as the creation of a soil monitoring network designed to provide accurate and comparable data. This new policy can no longer be delayed in Italy. Since a national reference body is lacking, the data produced so far are not suitable for developing indicators at national scale. Then it is essential to set up a monitoring network and to complete the national soil map (scale 1:250,000). It is also necessary to finish the related database, in order to fill the information gap and to develop and update the indicators describing soil quality, soil contamination and degradation, and land use.
Considering this, only some of the indicators identified for this theme can be developed; these indicators, assessed together with the related ones (risk to human health, natural risk and agriculture), in any case attempt to provide a sufficiently clear description of the current situation.
Soil protection law targets are currently rather general both at European and at national level, and may be summarized as follows: a Common Agricultural Policy (CAP) aimed at a less intensive agriculture, with a more balanced use of organic and inorganic fertilizers and pesticide products; a land use aimed at sustainability, avoiding excessive exploitation, loss by impermeabilization (due to urbanization and infrastructures); a monitoring activity of erosion and desertification phenomena; and, finally, a remedy for local (contaminated sites) and diffuse contamination.
The indicators developed on the basis of the currently available data describe, even if not completely, the complex natural situation of the geosphere system and its interactions with the other systems (Atmosphere, Biosphere, Hydrosphere). For the *"soil quality"* theme we cannot evaluate, at national level, the content of heavy metal for agricultural soils; instead, we can notice that the nutrient ratio appears to be stable. With regard to physical and biological soil degradation, high risk desertification areas are mainly located in Southern Italy (with peaks of approximately 50% in Puglia), while areas with risk of erosion, due to water, are spread throughout the whole country. In both cases no trend can be defined due to the lack of timeseries. The situation of soils, contaminated by diffuse sources, seems to be stable for most of the Italian regions, while the regional setting up has enabled the identification of thousands of contaminated sites. The land use panorama is not very positive; despite the lack of data, there is an obvious trend towards the expansion of soil sealed areas.



## *INDICATOR:* Urbanization in coastal areas



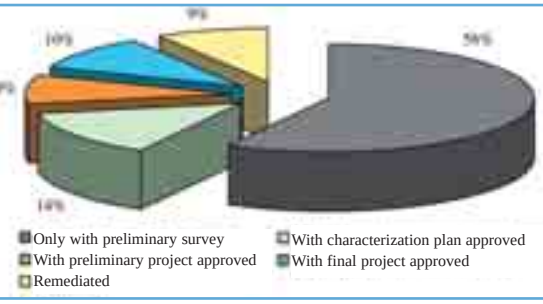

Source: Prepared by APAT/CTN_TES on Lacoast data

**Figure 12.1: Change in urbanized areas between 1975 and 1992 in the 10 km coastal belt; data on provincial level**

Through the measurement of areas used for intensive agriculture, urban expansion, creation of road and railway infrastructures, we can estimate the trend of land use; in general, we can see that the last decade shows a gradual decrease of agricultural areas, with the recovery of woodland or semi-natural areas. There has also been an increase of soil sealing. This trend, extended throughout the country, is particularly evident in the coastal area, as shown by the indicator in figure 12.1; the increase of urbanized areas in the period 1975-1992 exceeded 50% in many provinces.

## *INDICATOR*: Contaminated sites

## *INDICATOR*: Contaminated sites of national interest




Source: Prepared by APAT/CTN_TES on regional and ARPA/APPA data

**Figure 12.2: Sites included in the regional registers – Distribution by state of advancement of recovery Year 2003**


Source: Prepared by APAT/CTN_TES MATT on regional and ARPA/APPA data

**Figure 12.3: Localization and dimensioning of national interest sites - Year 2003**

The regional inventories provided by the Ministry Decree 471 October 25th, 1999, though still in the initial phase, are starting to provide data on the number and characteristics of contaminated and remediated sites. Important information on this theme is also provided by data on national interest contaminated sites data, included in the Ministry Decree 468 September 18th, 2001 (National programmes for environmental recovery and remediation of polluted sites) and recently integrated by the Law 179 July 31st, 2002, (Regulations on environmental topics).

In figure 12.2, the sites included in the regional inventories (approximately 2,500) are divided on the basis of the state of remediation process. These data, regarding mid-2003, refer to 15 regions only. For most of the sites included in the inventories, only a preliminary assessment can be made, although in many cases the classification plan is under way. One third of the sites are now in full recovery, being approved by at least one of the three planning documents provided by the Ministry Decree 471/99, i.e. the classification plan, the preliminary project and the final project. For 9% of the remediation sites, the process has been concluded with the required provincial certification. It should be recalled that for a larger number (approximately 1,000) of other sites, not included in the figure, remediation has ended in recent years without provincial certification, since the recovery projects were approved before the issue of the Ministry Decree 471/99.

In terms of costs if we only consider the 41 contaminated sites of national interest (figure 12.3) in the Ministry Decree 468/01, we can notice an overall assessment of the remediation costs at 3,149 million €, while the total funded under the various laws, between capital and interest, totals 547 million €, equivalent to 17.4% of the requirements.



***INDICATOR:*** Sludge used in agricultural areas

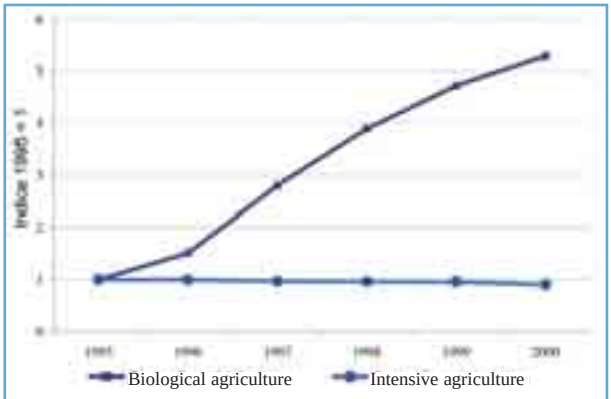
**Table 12.1: Average amount of heavy metal additives, on an annual basis per unit of area concerned in the use of sludge**

| Year | Cadmium g/ha x y | Copper g/ha x y | Nickel g/ha x y | Lead g/ha x y | Zinc g/ha x y | Mercury g/ha x y | Chrome g/ha x y |
|---|---|---|---|---|---|---|---|
| **1995** | 13 | 2,913 | 714 | 1020 | 9,729 | 13 | 671 |
| **1996** | 13 | 1,505 | 481 | 334 | 3,327 | 7 | 455 |
| **1997** | 7 | 1,498 | 238 | 320 | 3,228 | 3 | 359 |
| **1998** | 22 | 1,615 | 356 | 463 | 4,188 | 6 | 556 |
| **1999** | 18 | 1,369 | 243 | 417 | 3,891 | 6 | 421 |
| **2000** | 17 | 1,541 | 368 | 452 | 3,898 | 6 | 655 |
| **Average 1995-2000** | **15** | **1,740** | **400** | **501** | **4,710** | **7** | **519** |
| | | | | | | | |
| **D 86/278/EEC** | 150 | 12,000 | 3,000 | 15,000 | 30,000 | 100 | — |
| **Target Dir** | 30 | 3,000 | 900 | 2,250 | 7,500 | 30 | 3,000 |
| **Target Dir 2015 MT** | 15 | 2,400 | 600 | 1,500 | 6,000 | 15 | 2,400 |
| **Target Dir 2025 LT** | 6 | 1,800 | 300 | 600 | 4,500 | 6 | 1,800 |

Source: Prepared by APAT/CTN_TES on MATT data

***INDICATOR:*** Areas used for low environmental impact crops

***INDICATOR:*** Areas used for intensive agriculture




Source: Prepared by APAT/CTN_TES on ISTAT and INEA data

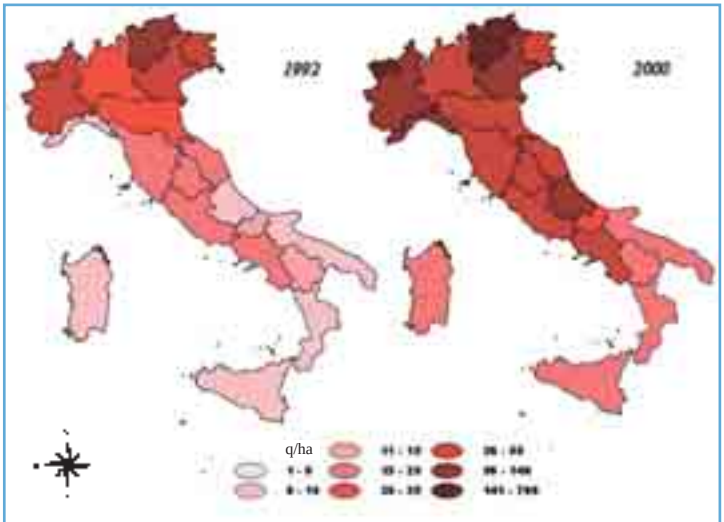
**Figure 12.4: Indexed trend (1995=1) of areas for biological agriculture and intensive agriculture Years 1995-2000**

In regard to soil quality and diffuse contamination, data concerning the soil content of heavy metals are still incomplete and difficult to assess. On the other hand, it is interesting to consider the data on the amount of metals brought into agriculture from the use of sludge from waste treatment (table 12.1), which is also a source of organic matter and nutrients, and into biological agriculture (figure 12.4). This is undoubtedly an effective response to this problem and, more in general, to the entire problem of contamination and land use.

The addition of metals, deriving from the use of sludge in recent

years, has always been not only under the current legislative limits, but also under the limits set in the Directive being issued. In the medium and long-term, the restrictions stated in the draft Directive, will cause problems for concentrations of cadmium, mercury and zinc. In order to continue the agricultural use of sludge it will be necessary to improve its quality.
The indexed trend of intensive and biological agriculture confirms the positive trend of a decrease in intensive areas and an increase in the farmed biologically area; this latter, although in 2000 it occupied only 8% of the Utilised Agricultural Areas (UAA), rose from 202,000 hectares in 1995 to 1,069,000 hectares in 2000.
Other interesting data about of diffuse contamination regard to animal breeding and the related waste, and balance of nutrients in the soil, with the assessment of the surplus of nitrogen and phosphorus that can cause pollution of surface and groundwater.

***INDICATOR***: Soil compaction risk related to the number and power of farm machinery




Source: Prepared by APAT/CTN_TES on ISTAT data

**Figure 12.5: Sigma weight of farm machinery by hectares of UAA by region, 1992-2000 (q/ha of UAA)**

The problems of physical degradation are effectively represented through the factor of current erosion risk, and the sensitive areas to desertification. It is also interesting to evaluate the risk of compacting through the proxy indicator of sigma weight Σp (t/ha UAA). This indicator refers to the weight of farm machinery, its annual use and the area of planted fields and fruit trees. Figure 12.5 shows the sigma weight of farm machinery in tons per hectare of UAA. This sigma weight rose from 1992 to 2000. Regional data, apart from Trentino Alto Adige and Valle d'Aosta, where the value is strongly affected by the small area of UAA, show high weights for Piemonte and Veneto, but highlight that almost all the regions show values for 2000 higher than 1992 national average.



# 13. Waste

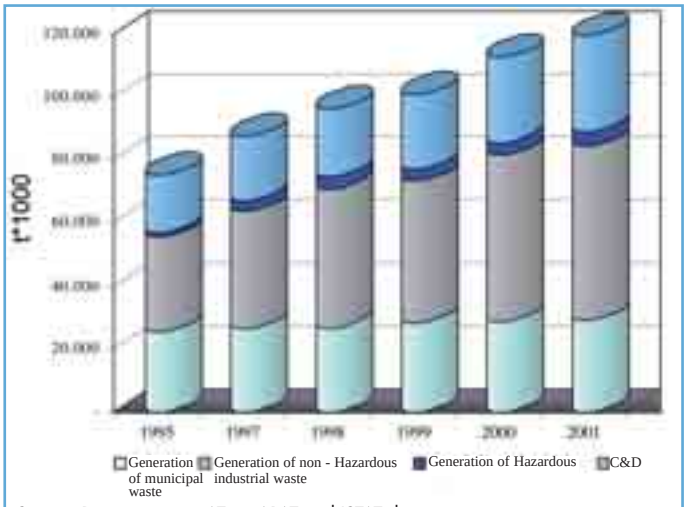
## Introduction

The generation of waste is constantly rising in most European countries, as shown in the Kiev Report (Europe's Environment: Third Assessment), the document of the European Commission that illustrate the environmental situation in the Member States (EU15), in the countries of Eastern Europe (applicant member countries) and in the countries of the Caucasus and Central Asia (EECCA).
Each year the EU produces approximately 1.3 billion tons of waste (excluding agricultural waste) with a per capita rate of approximately 3.5 tons. The European Environment Agency (EEA) estimates that most of the waste produced in the European Union comes within five major flows: waste from manufacturing activities (26%), quarry and mining waste (29%), waste from building and demolition (22%), municipal waste (14%) and agricultural and forestry waste, for the latter it is difficult to estimate the amount. Dangerous waste amounts to approximately 27 million tons.
The data show a rising trend in production that is far greater than economic growth, considering that, in the period 1990-1995, the latter was 6.5% compared to an increase in the generation of waste of about 10%.
There is broad agreement that without new policy measures, the generation of waste in the EU will continue to increase. According to the OECD estimates, the production of Municipal waste in the OECD countries will rise in the period between 1995 and 2020 by 43%, reaching a per capita rate of 640 kg per year. Again, according to the OECD, other important flows of waste, such as industrial, building and demolition waste, will show a significant increase.
With regard to waste management, the most reliable data are related to municipal waste. They indicate some progress in the use of treatment methods different from disposal in landfills, although the latter are still the most widely used form of management (57%). Some progress has been made in recycling and composting of solid municipal waste, rising from 15% in 1995 to 20% in the late 1990s.
The situation is extremely diversified in the various European Union countries. In some countries disposal in landfills is still the most widely employed method for the disposal of municipal waste, with a rate of 80% or higher; in others, the percentages are less than 20%. There is an even wider gap for the biodegradable fraction of municipal waste; in many countries, disposal of biodegradable waste in landfills is prohibited (France, Norway, Denmark and Netherlands) and in others this will come into force by 2005 (Germany, Sweden and Finland). In some countries the disposal in landfills of waste with high calorific potential is prohibited (Sweden), in others this prohibition will soon apply; in Austria and Germany by 2004 and 2005 respectively, it will be prohibited the dispose of waste with a calorific potential over 6,000 kJ/kg in landfills. In Italy, from January 1$^{st}$ , 2007 the prohibition will involve waste with an *Inferior Calorific Potential* (ICP) greater than 13,000 kJ/kg.
This approach will lead to a remarkable increase of the waste used for energy recovery, which currently covers a percentage lower than 20% of the generation of municipal waste. There are considerable differences between the various Member States, with France, Sweden, Denmark

and The Netherlands showing high levels of incineration with or without energy recovery.
There has been much new legislation in the past years on the European and national level with deep effects on the current system of waste management. Among national measures considered to be the most important for the launching of the integrated management system, we can mention the Legislative Decree 36 of January 13th 2003, implementing the Directive 1999/31/EC on landfills and the Decree of the Ministry for Environment and Territory of March 13th , 2003 on the criteria allowing waste in landfills.
Two other important directives, now implemented, are the Directive 2000/53/EC on discarded vehicles and the Directive 2000/59/EC on port waste collection plants for the waste products from ships and cargo residues, with implementation enacted respectively by Legislative Decrees 209 of June 24th ,2003 and 182 of June 24th, 2003.
The implementation of the Directive 1999/31/EC on landfills and the forthcoming enactment of the implementation of the Directive 2000/76/EC on the incineration of waste complete the reference legislation on waste treatment introduce measures that should provide incentives to new models of management increasingly based on the recovery of energy and of materials from waste.
The Directive 2001/77/EC on the promotion of the energy produced from renewable sources on the domestic electricity market, soon to be implemented, and the reaching of the targets under the Kyoto Protocol and the White Book on renewable sources calling for a 12% use of these energy sources by 2010, should guarantee an increase of waste used for energy recovery.
In this context, we can also include the prohibition from January 1st, 2007 of disposal in landfills of waste with an *Inferior Calorific Potential* (ICP) higher than 13,000 kJ/kg; this will require major flows of waste, such as the fluff from the demolition of automobiles, to have forms of management other than landfills.
The full implementation of the regulation about discarded vehicles and the implementation of the directives on waste from electrical and electronic equipment, setting ambitious targets of recycling and recovery, will likewise contribute to the launching of the recovery system.
The situation is also similar with Decree 203/03, which, when implemented, will require pubic offices, bodies and enterprises with a majority of public capital to cover at least the 30% of their annual requirements with materials and goods made from with recycled material.
Achieving the targets of the reduction of biodegradable material discarded in landfills pursuant to Legislative Decree 36/03 will lead to a growth of the system for aerobic and anaerobic biological treatment of this waste, which after treatment must be transferred to useful applications.
Also in this case, legislation may have an important role in guaranteeing real market expansion, above all for the materials deriving from the treatment of the more polluting organic fractions which are unlikely to be applicable in agriculture.
The indicators presented have been chosen on the basis of the relevance, the availability of data and timeseries.
The data refer to municipal waste, industrial waste (defined as the sum of non-dangerous and hazardous industrial waste), and hazardous industrial waste taken separately.



***INDICATOR:*** Total waste generation per unit of GDP

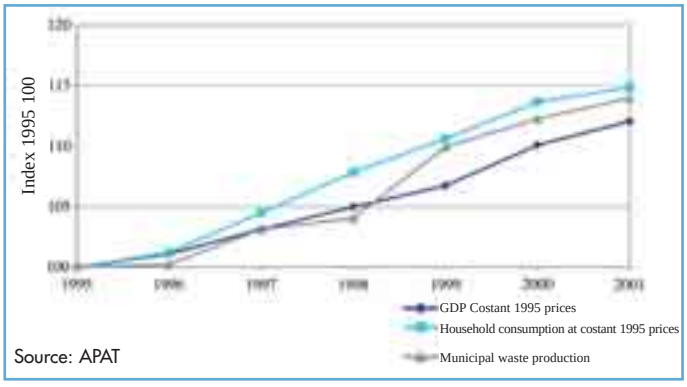



Source: Prepared by APAT on APAT and ISTAT data

**Figure 13.1 Distribution of total waste generation Years 1997 – 2001**

Italy has timeseries of data on total waste generated from 1995 to 2000; compared with the GDP for base year 1995, there is still a close relationship between economic growth and generation of waste in these years.

The total amount generated in 2000 was over 112 million tons of waste subdivided into 83.7 million tons of industrial waste, of which 4 million tons of hazardous industrial waste and 28.9 million tons of municipal waste. Industrial waste includes material deriving from building and demolition estimated, in an APAT study, as being 27 million tons. For 2001 municipal waste totalled 29.4 million tons, together with 90.5 million tons of industrial waste, of which 4.3 million tons are hazardous industrial waste and 31 million tons of material derived from building and demolition.




Source: APAT

**Figure 13.2: Distribution of the various types of waste for total generation - Years 1997 - 2001**

Comparing the data of municipal waste generation with some socio-economic indicators, such as Gross Domestic Product (GDP) and household consumption at constant 1995 prices, similar total increases for the period 1995-2001 can be observed for the various parameters. While, as previously observed, the percentage increase in waste generation was 14 %, GDP rose by 12.1% and

household consumption by 14.8%. Referring to 1999-2001 data, we can also observe a GDP increase slightly higher than the rate for municipal waste generation (5.3% compared to 4.1%, figure 13.2).

***INDICATOR:*** Generation of municipal waste

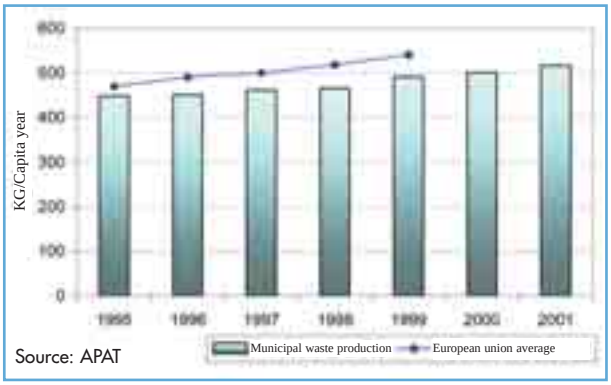



**Figure 13.3: Amount of per capita municipal waste produced in Italy (kg/inhabitant year) with respect to the average of the European Union - Years 1995-2001**

Municipal waste is increasing throughout Europe. It is estimated that over 306 million tons are collected each year, also considering the countries soon to become members of the European Union.
In Italy the generation of municipal waste in 2001 totalled 29.4 million tons, with an increase of 1.6% compared to 2000. This confirms the trend towards the reduction of the waste growth rate, already observed in the period 1999-2000, after the significant increase of about 5.7%, recorded in the 2-year period 1998-1999 (the highest of the period 1995-2001). Overall generation rose by 14% from 1995 to 2001, with an average annual growth rate of approximately 2.2%.

***INDICATOR:*** Amount of municipal waste fraction separately collected

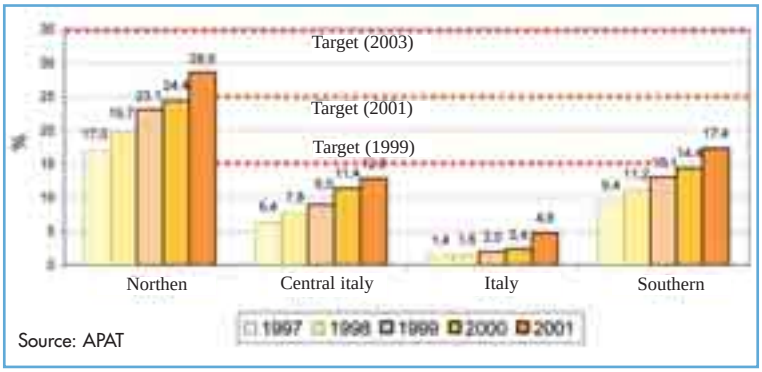


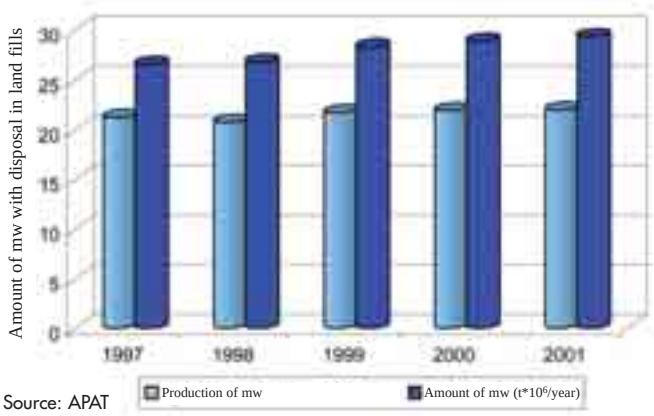

**Figure 13.4: Amount of municipal waste fractions collected separately with respect to the targets of the Legislative Decree 22/97**

In Italy, fractions collected separately now takes place in 96% of the municipalities, with peaks of 99.8% in the North-east and up to 90% in Southern Italy, as shown by a study conducted by FISE-Assoambiente on "Forms of municipal waste management". All the



metropolitan areas have started up a fractions collected separately programmes of waste, while in towns with a population under 5,000 the percentage goes down to about 91%.
In 2001, according to the target set in the Legislative Decree 22/97, complete fractions collected separately should have reached 25%. In 2000 it reached 14.4%, while in 2001 it reached 17.4%, achieving two years late on the national level the targets set by the Legislative Decree 22/97 for 1999. Considerable differences are likewise observed between different geographical areas. While the North has a rate of 28.6%, thus going beyond the 2003 target, Central and Southern Italy and the islands, despite considerable progress made above all in the organization of the system, have not yet achieved the planned target.
In 2001 fractions collected separately totalled 5.1 million tons, with a percentage increase of 3% compared to 2000. In absolute terms this increase, the highest for the entire 5-year period 1997-2001, totalled 940,000 tons.

***INDICATOR***: Amount of municipal waste with disposal in landfills

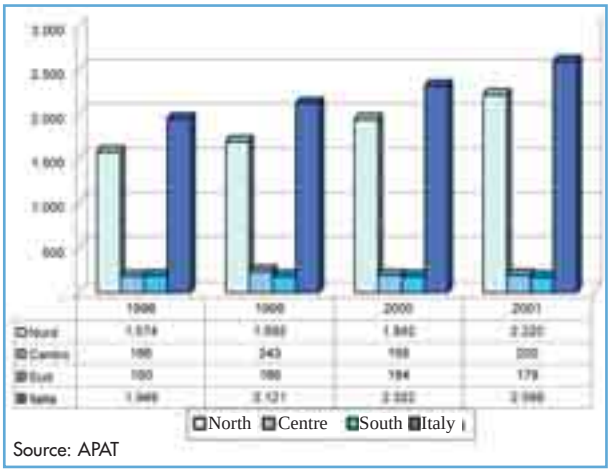



Source: APAT

**Figure 13.5: Amount of municipal waste with disposal in landfills compared to the total amount generated**

On the whole, in 2001 disposal of approximately 67.1% of municipal waste took place in landfills, amounting to about 20 million tons. The fall in disposal in landfills, compared to 2000, was approximately 5.3%.
This confirms the already recorded change of trend for 2000, when there was a fall in disposal in landfills; although this is still the most widespread form of disposal, there is an increase in other types of treatment and disposal such as composting and energy production. This result, also achieved thanks to incentives to the differentiated collection systems, is mainly due to the growth in the composting sector, especially composting of the selected fractions of waste, both in terms of the amount of waste treated and of the number of plants.
Together with the development of treatment after differentiated collection, there has been an increase in the use of waste for energy production, mainly due to the technological development that has drastically reduced the number of plants lacking energy recovery technology (in 2001, out of the total of 44 incineration plants for municipal waste only 8 lacked energy recovery equipment).

***INDICATOR***: Amount of municipal waste incinerated

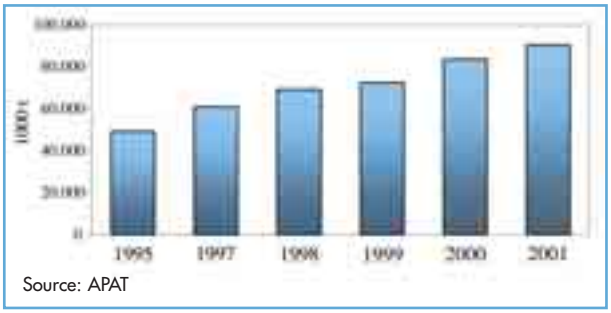



Source: APAT

**Figure 13.6: Amount of municipal waste incinerated**

The amount of municipal waste sent to incineration plants is approximately 2.6 million tons. The gap between regions in Northern and Southern Italy is widening, since in 2000 many Southern regions still lacked equipment for the thermal treatment of waste. The national percentage increase was approximately 10% between 2000 e 2001.

***INDICATOR:*** Generation of industrial waste




Source: APAT

**Figure 13.7: Amount of industrial waste generated Years 1995 - 2001**

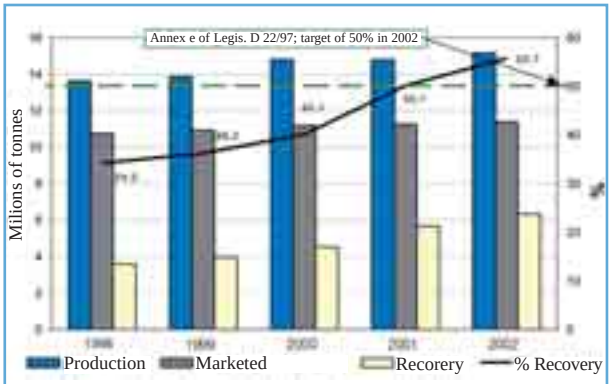
The total amount of industrial waste generated in Italy in 2000 was 83.7 million tons, of which 4 million tons of hazardous waste. The industrial waste category includes materials from building and demolition estimated in a research conducted by APAT to be over 27 million tons. In 2001, industrial waste increased to 90 million tons, while hazardous waste remained stable at 4 million tons. The estimated amount of waste from building and demolition was over 30 million tons. In Italy, as in many other countries of the European Union, the amount of industrial waste generated rose by over 50% between 1997 and 2001. The causes of this increase (figure 13.7) lie in improved economic conditions, with the industrial development rate shown in macroeconomic figures. The manufacturing industry, building and demolition, mining and quarrying and agriculture are the economic activities most contributing to the generation of industrial waste. In general, approximately 75% of generated waste originates from industrial activities, while the remaining 25% derives from domestic activities.



***INDICATOR:*** Marketed packaging, total and by type of material

***INDICATOR:*** Packaging generation, total and by material categories

***INDICATOR:*** Packaging recovery, total and by type of material




Source: Prepared by APAT/CTN_RFM on Istituto Italiano Imballaggi, CONAI, Consorzi di Filiera data

**Figure 13.8: Indicators on total amount of packaging and percentage of packaging recovered in 1998-2002 with respect to the target set for 2002**

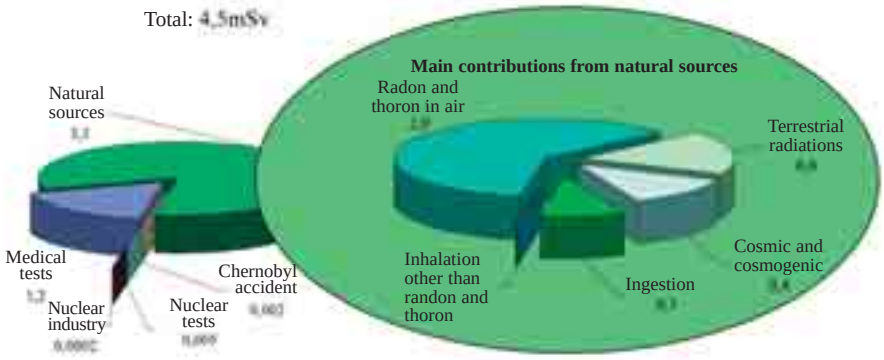
The recycling and recovery of packaging policies are increasingly important due to the growing volumes produced and released to the market every year. The European reference standard for packaging and packaging waste is the Directive 94/62/EC. This Directive sets as fundamental targets the prevention and minimizing of the environmental impact deriving from the cycle of packaging and the resulting waste, as well as the harmonization of national regulations in order to avoid distortions within the European single market. In line with these targets, the system for the management of packaging waste must first of all be based on prevention i.e. the reduction at the source of the amount and danger of waste, then on recovery in all its forms of reuse, recycling of material and recovery of energy, and finally on disposal. Since the latter has no function of saving resources and thus involves a risk for the environment, it must be only the final option for any waste that cannot be recovered or otherwise treated. The principles underlying the Directive have been implemented in Italian legislation by the Legislative Decree 22/97 (Title II), which identifies a set of targets to achieve over the 5-year period 1998 - 2002. Results achieved are fully satisfactory, and the target of minimum percentages of total recovery, total recycling and recycling for each single material was actually well exceeded. In 2002, over 6 million tons of packaging waste was recovered, equivalent to over 55% of the packaging put on the market, while the overall percentage recycling has exceeded the top rate of 45% set by legislation, amounting to 50.5% in 2002.
Progresses have been made mostly in recent years due to awareness campaigns, voluntary agreements, agreements with the municipalities and the strengthening of the network of facilities for the collection of packaging waste. The targets for the next 5-year period are being defined, and indicated in the proposed revision of the Directive 94/62/EC that should be approved by December 2003. The current proposal, in particular, calls for a minimum overall target of recovery equivalent to 60% in weight and minimum targets for the recycling of each single material equivalent to 60% for paper and glass, 50% for steel and aluminium, 22.5% for plastic and 15% for wood. The Directive also shows the overall targets of recycling, with the minimum set at 55% and the maximum at 80% in weight.

# 14. Ionising radiation

## Introduction

Ionising radiation consists of emissions of particles and/or energy, capable of modifying the structure of the material with which they interact. In the case of biological tissue, such interaction may lead to cell damage. In most cases, this damage is repaired by the normal defence mechanisms of the organism, but in some cases, also according to the degree and period of exposure, the cells involved may undergo permanent damage with effects on the health of people exposed. Certain effects, called "*deterministic*", are encountered above very high exposure thresholds, causing anatomic lesions and loss of functionality of organs and tissues. Other effects, due to more frequent exposure, have a "*stochastic*" occurance; in other words, for the same dose received, the damage varies on a wholly casual basis from one individual to another. The stochastic effects are defined as "*somatic*" or "*genetic*", according to whether they occur in the exposed individual or in his descendants. The probability of adverse effects on exposed individuals is evaluated by a specific quantity, known as "*effective dose*", used to quantify the risk deriving from exposure to ionising radiation.
Besides the effective dose, classificable as an impact indicator, two state indicators are shown: the "*Concentration of activities of radon indoors*", as the main source of exposure to ionising radiation, and the "*Radioactivity concentration of artificial radionuclides in environmental and food matrices*", describing the situation of manmade radionuclides in the environment.

***INDICATOR***: Average individual effective dose in one year




Source: Prepared by APAT on APAT, ISS, CRR, ENEA, UNSCEAR, NRC data

**Figure 14.1: Estimate of contributions to the average effective dose of the Italian population (milliSievert/year)**

The indicator represents the impact of the main sources of radiation on the Italian population. The unit measure is milliSievert (mSv). Figure 14.1, listing estimates of the main contributions to the effective dose, shows that 73 % of the total is due to natural sources. The data shown refer to the averages for the entire population. Higher values, for individuals and groups of the population, may occur in relation to particular cases, for example, the presence of high concentrations of radon in dwellings or workplaces or exposure caused by natural materials in some particular work activities.

## *INDICATOR*: Concentration of radon indoors

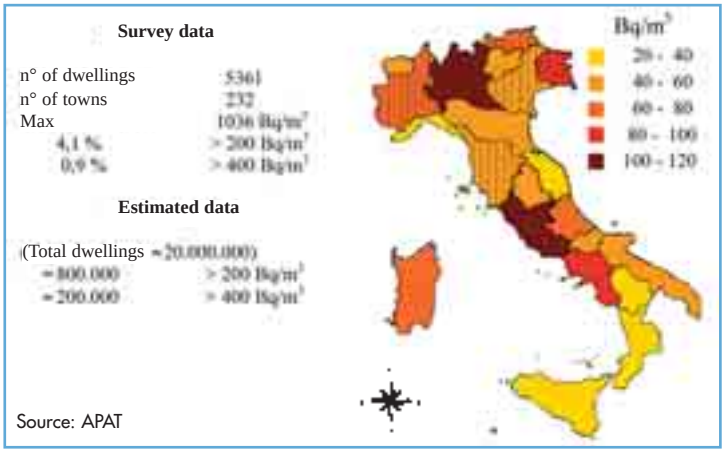
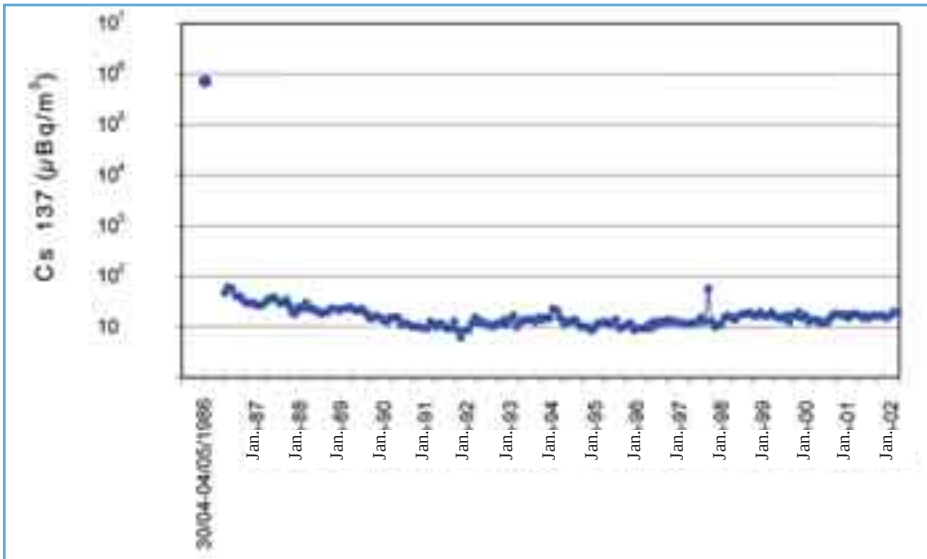



**Figure 14.2: Annual average concentrations of Rn222 radioactivity in dwellings in the Italian regions and autonomous provinces (the choice of the interval is given by way of example only) (1989 - 1997). The broken line shows the regions where surveys have already been conducted**

Radon is a natural radioactive gas emitted by soil that accumulates it in indoor areas. This gas contributes to approximately 45% of the total effective dose; moreover radon exposure is associated with an increased risk of lung cancer. Figure 14.2 shows the results of a survey conducted on a statistically representative sample to determine the average concentration of radon in dwellings (where people stay longest) in all the Italian regions. European regulations fix radon concentration values for dwellings, defined as "*action levels*", above which measures for the reduction of the risk are recommended. These values are 400 Bq/m$^3$ for existing buildings and 200 Bq/m$^3$ for new buildings (as design parameter). In Italy, it is estimated that approximately 800,000 homes have concentrations exceeding 200 Bq/m$^3$ and approximately 200,000 have concentrations exceeding 400 Bq/m$^3$. In order to make a detailed assessment of the distribution of radon in Italy and to rationalize possible recovery measures, mapping is required to identify the areas where there is greater probability of high concentrations. The mapping process must be completed in order to provide an effective response in terms of protection of the population. This is also recognized by the Legislative Decree 230/95 and subsequent amendments, stating that by August 31$^{st}$ 2005 the risk areas must be published in the "*Gazzetta Ufficiale*".

With regard to the methodologies of data collection and processing, indoor measurements have been used in surveys already conducted in some Italian regions (Veneto, Friuli Venezia Giulia, Toscana, Piemonte and the Autonomous Province of Bolzano), mainly in houses and schools. The surveys are typically conducted by dividing the area on a grid basis, also taking into account the geological composition of the area concerned.

***INDICATOR***: Radioactivity concentration of artificial radionuclides in environmental and food matrices (atmospheric particulate, wet and dry deposits, milk)




Source: Prepared by APAT on data from: ENEA-DISP, *Rapporto annuale sulla Radioattività Amientale in Italia, Reti Nazionali*, 1986-87, 1988, 1989, 1990; ANPA, *Rapporto annuale delle Reti Naizonali di Sorveglianza della Radioattività Ambientale in Italia*, 1991, 1992, 1993, 1994-97, 1998; APAT.

**Figure 14.3: Trends of the concentration of monthly radioactivity in Italy of Cs137 (μBq/m³) in atmospheric particulate**

The assessment of radioactivity concentration of artificial radionuclides in environmental and food items (atmospheric particulate, deposits in soil and milk) allows for the control of environmental pollution by radionuclides deriving from diffuse sources of radioactivity such as ground deposits deriving from nuclear tests or accidents at nuclear plants.
The main reference parameters are: the presence of artificial radionuclides in samples of atmospheric particulate corresponding to known volumes of air; wet and dry deposits and deposits in pasteurised; fresh and long conservation (UHT) cow's milk.
According to Art. 104 of the Legislative Decree 230/95, and subsequent amendments and in-

tegrations, the national network for the surveillance of environmental radioactivity is the instrument to estimate the exposure of the population due to diffuse sources.
European Recommendation 2000/473/Euratom of June 8th, 2000 provides indications to member countries on the conducting of environmental radioactivity monitoring.
Most of the data are collected by Regional Reference Centres for Environmental Radioactivity (CRR) of the Regional and Autonomous Provincies Agencies for Environmental Protection. At the end of 2002, the network for radioactivity surveillance was reorganized, also considering the lack of homogeneity on the geographical level.
For example, figure 14.3 shows time trends (on a monthly basis) regard to the concentration of Cs-137 in the atmospheric particulate; the value for the first days of May 1986 refers to the arrival of the Chernobyl cloud in Italy, while the peak in June 1998, more evident for the Northern Italy, is due to an accident at a Spanish steel mill near Algeciras.

# 15. Non-ionising radiation

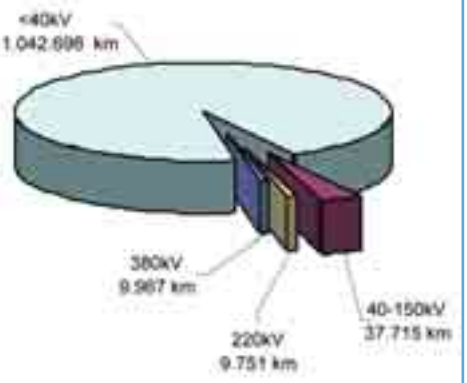
## Introduction

In the last decades the increasing use of new technologies has lead to an increase, throughout the country, of sources of electric fields, magnetic fields and electromagnetic fields, making the problem of exposure to non-ionising radiation increasingly relevant.
Non-ionising radiation (NIR) is produced by natural and manmade sources. Electromagnetic fields produced by the latter type of sources have frequency between 0 Hz and 300 GHz and are related to the system for the production, distribution and final use of electricity (low frequency fields, usually known as ELF fields), as well as to television and radio communications plants, and more especially mobile telephony and television and radio broadcasting (high frequency or radio frequency - RF).
In this summary, in order to provide a complete and representative description of the specific environmental problem of "electromagnetic fields", three indicators have been chosen: *"Extension in kilometres of power lines, subdivided by voltage, and number of transformer stations and primary power cabins in relation to the geographical area"* and "*Density of broadcasting and telecommunications systems and sites and overall power throughout national territory*", quantifying the main sources of pressure, and *"Broadcasting and telecommunication sites found to exceed limits and remediation state"*, quantifying situations of non-compliance with regulations in force and the response of the bodies having jurisdiction.
In general there is a constant increase of issued regulations and of monitoring activities; this confirms the growing concern of local bodies for the problem of electromagnetic fields.
The situations of non-compliance observed by the monitoring activities conducted by ARPA/APPA on the sources of electromagnetic fields (radio and television broadcasting stations, mobile phone signal stations and power lines) and the state of remediation do not show significant changes with respect to the data for the previous year.
Light pollution, which occurs as an alteration of the natural condition of the night sky with significant consequences for the natural and human equilibrium, is now recognised as a problem by the international scientific community. The phenomenon of natural alteration of the night sky is due to the light coming from various human activities and dispersed upwards, due to inefficient equipment and to the lack of properly designed facilities.
The indicator chosen for the theme "Luminous radiation" is "*Percentage of the population living where the Milky Way is no longer visible*", which assesses the impact of luminous radiation in terms of alteration of the visibility of the night sky.

***INDICATOR***: Extension in kilometres of power lines, subdivided by voltage, and number of transformer stations and primary power cabins in relation to the geographical area

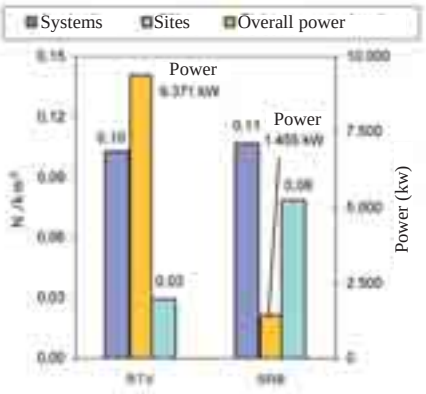


***INDICATOR***: Density of broadcasting and telecommunication sites and overall power throughout the national territory




Source: Prepared by APAT/CTN_AGF on Terna, ENEL Distribution, Deval S.p.A. data

**Figure 15.1: Length of ENEL power lines, subdivided by voltage, 2002**

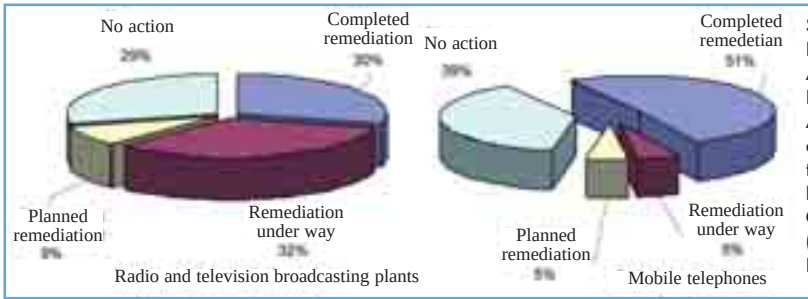



Source: Prepared by APAT/CTN_AGF on ARPA/APPA data collected through the APAT NIR (Non-Ionising Radiation) Observatory

**Figure 15.2: Density of broadcasting and telecommunication sites and overall power throughout national territory, 2002**

The two indicators quantify the main sources of non-ionising radiation throughout national territory. Figure 15.1 shows the length (km) of power lines subdivided by voltage. Figure 15.2 shows the density (number of plant and sites per km$^2$) and the overall power (kW) of radio and television broadcasting plants (RTV) and of the transmission stations for mobile telephones (SRB).

***INDICATOR***: Broadcasting and telecommunication sites found to exceed limits and remediation state

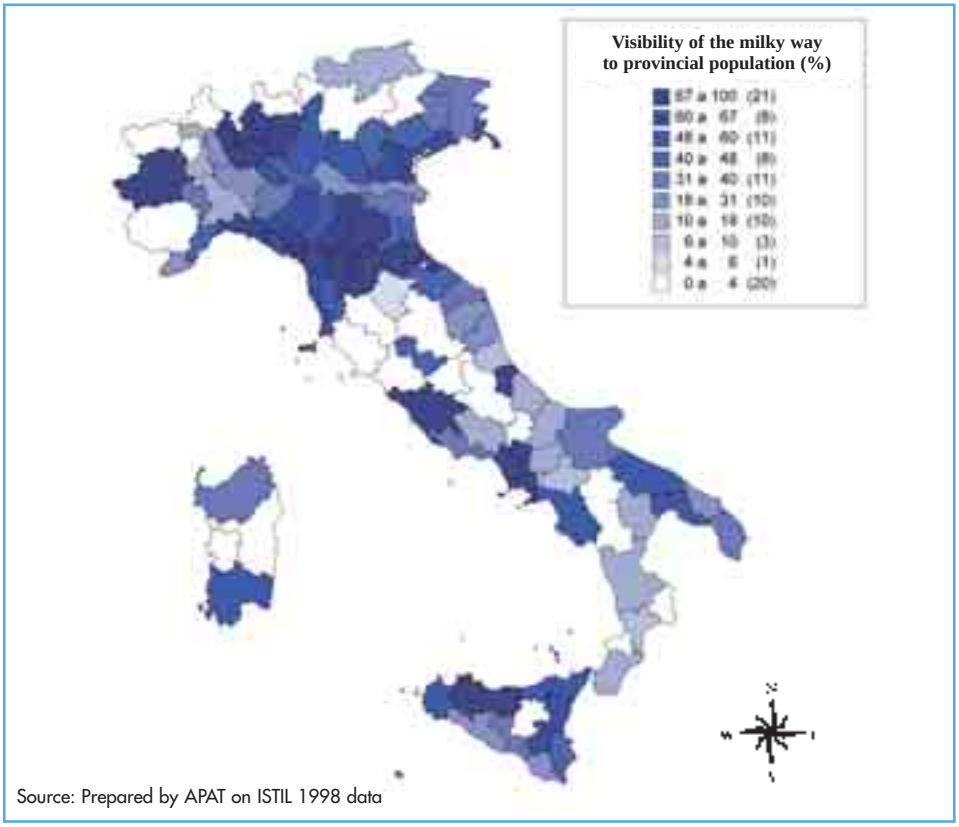



Source: Prepared by APAT/CTN_AGF on ARPA/APPA data collected through APAT NIR Observatory (Non-Ionising Radiation)

**Figure 15.3: State of remediation actions in sites found to exceed limits due to radio and television broadcasting and mobile phone plant, 2002**

The indicator, regarding sources of radiofrequency (RF), quantifies the state of remediation conducted for situations of non-compliance recorded by the monitoring activities conducted by ARPA/APPA. In figure 15.3, it is interesting to note that the two types of sources differ in the comparison between remediation completed and those under way. For SRB sites, when an action was undertaken, these have mostly been completed, while for the RTV sites there is a higher percentage of actions under way than those completed.

***INDICATOR***: Percentage of the population living where the Milky Way is no longer visible




Source: Prepared by APAT on ISTIL 1998 data

**Figure 15.4: Percentage of the provincial population living in areas where the Milky Way is not visible during normally clear nights**

Figure 15.4 shows the level of visibility of the *Milky Way* by the population in the various Italian provinces. The figure shows that, because of light pollution, over half of the Italian population can no longer see the *Milky Way*, even during the clearest nights. (ISTIL Report 2001, P. Cinzano, F. Falchi, C.D. Edvige)



# 16. Noise

## Introduction

Noise pollution is one of the causes of the worsening quality of life, especially in the urban environment, where the noise levels observed are often high due to the presence of numerous sources such as transport infrastructures, industrial, commercial, entertainment and temporary activities involving the use of sound, including building sites and outdoor concerts.
The law on noise pollution (Law 447/95) sets the basic principles for the protection of the outdoor and housing environment, defining the type of measures provided for prevention and remediation.
The indicators described below provide a summary of the current state of noise pollution and the protection measures undertaken by the bodies having jurisdiction.
The state indicator "*Inspected sources and their percentage with at least one unit exceeded*" provides an assessment of noise pollution in quality and quantity terms. The response indicator "*State of implementation municipal noise classification plans*" highlights the state of implementation of current regulations on the activities of local authorities in prevention and protection from environmental noise.
On the whole there is still little response by local authorities to the principles stated by law, in particular with regard to making noise classifications, remediation plans and 2-yearly reports. The data currently available on population exposure to noise are still relatively few, and often hard to compare due to different survey and analysis techniques used. In any case we can observe significant percentages of population exposed to levels higher than the reference tresholds (65 dBA Leq day; 55 dBA Leq night).

***INDICATOR***: Inspected sources and their percentage of these with at least one limit exceeded

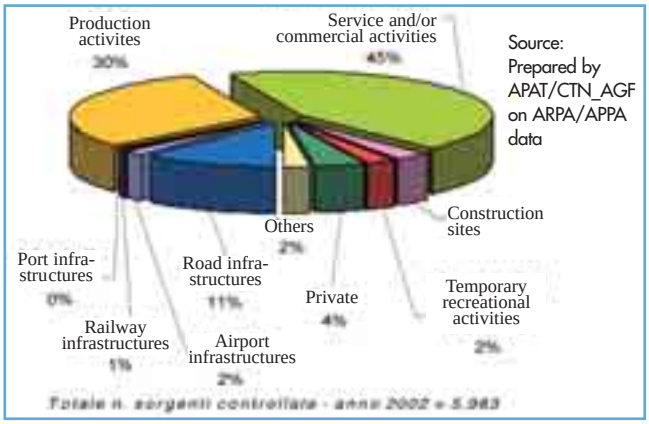
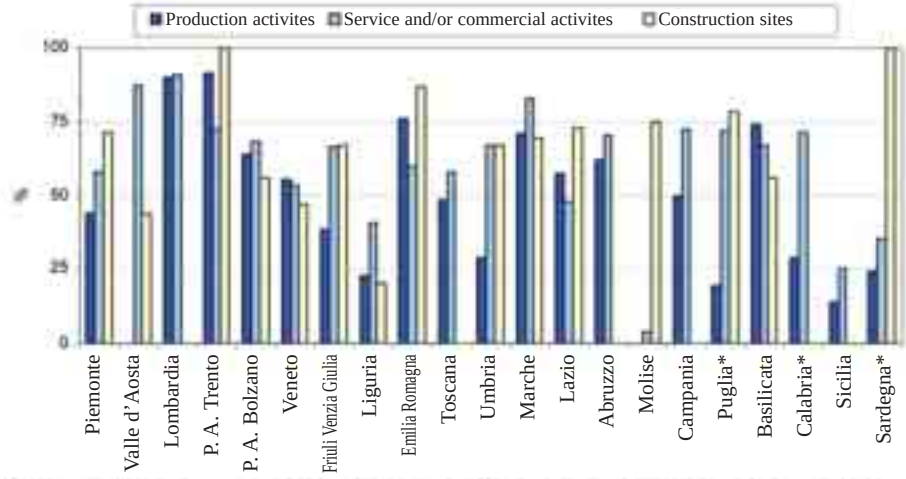



**Figure 16.1: Distribution of sources inspected in various types of activities/infrastructures**

The indicator illustrates monitoring activities, with measurement of compliance with current limits in the outdoor and/or home environment, usually conducted by ARPA/APPA, distinguishing

between the various types of sources (production activities, services and/or commerce, building sites, temporary recreation events, roads, railways etc.). It highlights situations of non-compliance through the percentage of sources inspected with at least one unit exceeded according to regulations.
Figure 16.1 shows the division by type, in percentage terms, of the sources monitored in 2002; the highest rates are in service and/or commercial activities (45%) and production activities (30% of the total).
Road infrastructures represent 11% of the sources inspected. It should also be stressed out that the specific regulations under the Law 447/95 have not been issued for the noise produced by roads, and moreover monitoring activities mainly take place after complaints by the public. Although vehicle traffic is the main and most widespread noise source in the urban setting, it is not the most frequent reason for complaint about noise presented to the authorities, as already observed in various studies.




Notes: Road structures: in Campania, Calabria and Sicilia, no checks were carried out; in Lombardia and Toscana, no information available on exeeding of limits; no limit appears to have been exceeded in Abruzzo, no checks were carried out on productive activities in Valle d'Aosta o Molise.
* Data with partial coverage of regional territory.

Source: Prepared by APAT/CTN_AGF on ARPA/APPA data

**Figure 16.2: Percentage of sources inspected with at least one unit exceeded, 2002**

Figure 16.2, for the three types of sources mainly inspected and for the various Italian Regions and Autonomous Provinces, shows the percentage of the sources inspected where at least one of the units was exceeded. On the whole, in over 50% of the cases a real problem of noise pollution was observed (recording of at least one unit exceeding regulations in force).

***INDICATOR**: State of implementation of municipal noise classification plans*

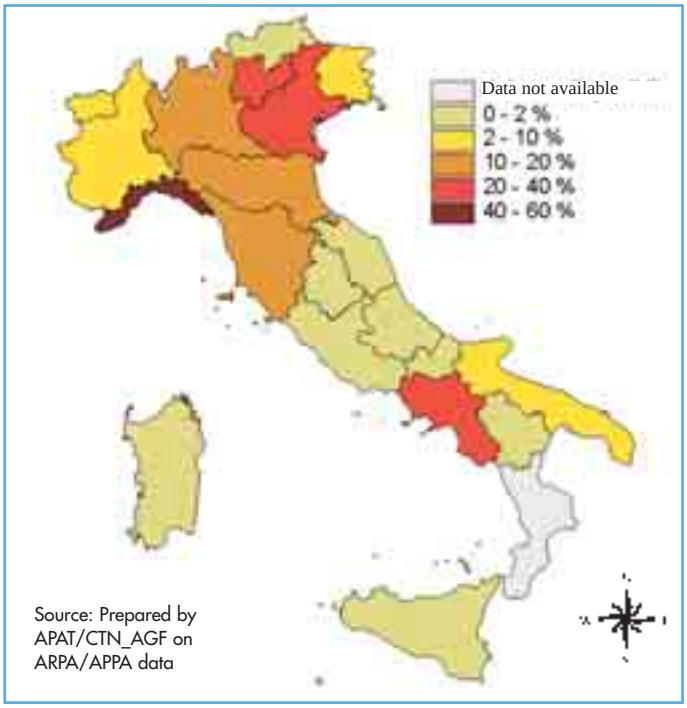



**Figure 16.3: Percentage of municipalities that have approved acoustic classification with respect to the total municipalities of each region/autonomous provinces - Year 2002**

The indicator shows the number of municipalities that have approved noise classification, with respect to the overall number of municipalities in the various Regions/Autonomous Provinces.
The Law 447/95 requires the municipalities, as already stated under the Decree of the President of the Council of Ministers dated March 1st, 1991, to undertake noise classification of the area under their jurisdiction, i.e. to assign to each homogenous portion of the territory under one of the six classes stated in the regulations (Decree of the President of the Council of Ministers November 14th, 1997 ), on the basis of the prevalent and real destination of use in the area (acoustic zoning). The Law 447/95, moreover, assigns the regions the task of defining the criteria by which the municipalities undertake acoustic classification of their territory.
Figure 16.3 shows the percentage of municipalities with zoning compared to the total municipalities of each region /autonomous province on December 31st, 2002. The data collected at national level show that only 12.5% of the Italian municipalities for which data is available (no data available for the Calabria Region) have approved acoustic classification.

# 17. Natural risk

## Introduction

Our environment is continually changing due to the action of powerful forces, where man is unable to intervene. Some events are related to the internal dynamics of our planet, such as eruptions and earthquakes, while others are caused mainly by extreme weather events with effects including floods, landslides, avalanches and accelerated erosion. Most of these events take place in a very short time and with serious effects, often causing disasters that are very costly in terms of human lives and damage to property. Phenomena generally related to the complex interaction between the climate and tectonics, though developing much more slowly with effects only rarely noticeable on an annual rate, can in any case have a significant impact on human activities.
Natural events are considered dangerous when they represent, directly or indirectly, a threat for human life, health or interests. Knowledge about the danger of phenomena is vital to understand the associated risk according to the probability of occurrence of an event of given intensity in a given period of time (hazard) and of the vulnerability of the hit area.
The indicators presented in the Yearbook aim at highlighting the most important aspects of the natural risk in Italy caused by volcanic and tectonic processes and by geomorphologic and hydraulic hazard. The indicators "surface faulting", "seismic events", "seismic classification", "volcanic eruptions", "flood events", "state of implementation of framework plans for hydrogeological setting" and "state of advancement of measures for the reduction of the hydrogeological risk, funded pursuant to Legislative Decree 180/98 and subsequent changes and amendments, have been chosen not to represent a change of the state of the environment, but rather to provide data that may be useful for local planning.
Since these are natural phenomena over which man has no control, no trends on the improvement or worsening of the presented indicators can be estimated. The data simply show a "relative" improvement, with respect to the past, of the indicator related to measures for safeguarding in the area of hydrogeological instability. This improvement derives from the fact that this indicator is related to the realization of works for risk reduction.

## Tectonic movements

The internal dynamics of our planet lead to a continous morphologic evolution of the Earth. The phenomena associated with these processes, more spectacular and also more serious for man, especially where urban development has not taken into sufficient account their probability of occurrence, are the ones regarding tectonic and volcanic activity. In particular, the indicators on the theme of tectonic and volcanic risk help summarise the risk associated with seismic or volcanic events above a certain size.
Up to now 4 indicators have been developed: *surface faults (capable faults), seismic events, seismic classification, volcanic eruptions.*

## *INDICATOR:* Surface faults (capable faults)


**Figure 17.1: Capable faults in Italy, from ITHACA database (2002)**

This indicator contains all the characteristics of capable faults, tectonic structures with movements dating to the late Pleistocene-Holocene period (active faults), which have been identified as being able to produce surface deformation in area in the near future. Their main characteristics are: location, length, maximum slip per event, maximum accumulated movement and average slip rate. This information is of great practical importance for local planning, since major manmade structures should be located at an adequate distance from active faults. Since 2000, APAT has collected information on these faults in a catalogue called ITHACA (*ITaly HAzard from CApable faults*), periodically updated and extended. This database and the associated map allow for the following: a) geodynamic interpretations; b) assessment of seismic risk; c) local planning; d) understanding of geomorphologic development.
Figure 17.1 shows an example of the mapping data collected so far.

## *INDICATOR:* Seismic events

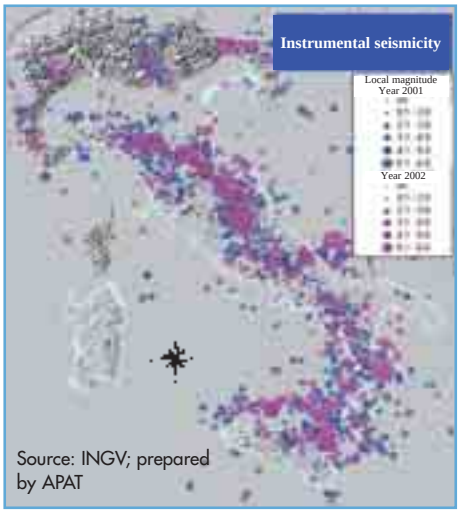



**Figure 17.2: Map of Italian seismic events recorded by the INGV network in the Years 2001-2002**

The indicator represents seismic events significant for risk purposes which have occurred in the year 2002, described in terms of maximum expected magnitude, aftershocks and local effects. The information related to this indicator is necessary for correct local planning.
During 2002, the seismic network of the National Institute of Geophysics and Volcanology (INGV), as for the previous years, made instrument of recording throughout the country.
Figure 17.2 shows the distribution of earthquakes in 2002 (indicated with pink circles) compared with 2001 (blue circles). In 2002 the

most significant quakes occurred in the following areas: Province of Udine (February 14th, 2002), Vallo di Diano (SA) (April 18th, 2002), Palermo (September 6th, 2002), Santa Venerina (CT) (October 29th, 2002), Eastern Molise (October 31st, 2002 ), Iseo Lake (November 13th, 2002).

***INDICATOR:*** Seismic classification

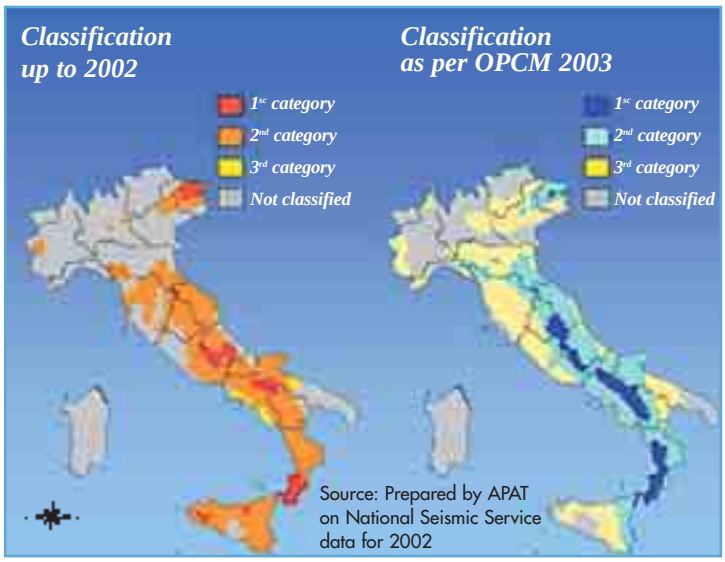



**Figure 17.3: Map of seismic classification**

The indicator describes the attribution of seismic categories to the various municipalities in Italy: consequent technical regulations on seismic construction are required for protection against disaster. These regulations have up to now been updated on the basis of the development of technical and scientific advances in this field. According to the classification up to 2002, approximately half of the Italian territory was subdivided in three categories ruling (1st, 2nd, and 3rd) with decreasing level of seismic risk. The unclassified areas are not subject to specific regulations, since they are not considered affected by a significant seismic risk. The used approach is thus based on probability and takes into account the kinematics and structural model of the Italian *peninsula* (seismic zoning), earthquake catalogues and attenuation laws. The purpose of the indicator is to provide an updated picture on the division of the country into areas with different seismic risk, where technical regulations for seismic building standards should be applied.

Figure 17.3 shows the distribution of the municipalities with seismic risk, with the classification currently enforced (regarding 2002) and the one proposed (included in regulations in 2003), provided by the National Seismic Service. In 1998 a working group set up by the National Commission for the Forecasting and Prevention of Major Risks made a new proposal of reclassification, still including three categories of risk, and based on the updating of scientific knowledge in the sector. This proposed reclassification was only implemented on March 20th, 2003 with Order of the Presidency of the Council of Ministers 3274.

***INDICATOR:*** Volcanic eruptions


Source: APAT

**Figure 17.4: Eruption of Volcano Etna in November 2002**

Italy has several active or potentially active volcanoes, determining high environmental risk. An indicator has thus been provided to represent the main volcanic events in Italy in 2002. The data have been collected by an on-line bibliographical search of the sites of the "National Volcanology Group" and "National Institute of Geophysics and Volcanology", in order to define volcanic risk in Italy.
In 2002 volcanic activity occurred on the south-eastern flank of Volcano Etna (October 2002-January 2003; figure 17.4), Stromboli (May-December 2002, causing tidal waves affecting the coast), and Panarea (November 2002, with gas emissions from the sea floor).

## Hydrogeological risk

A survey of the Italian territory shows how the expansion of human settlements often occurs without paying the necessary attention to all the environmental parameters. The recent disasters which occurred in Piemonte (1994), Sarno (1998), Soverato (2000), Valle d'Aosta (2000) etc., are good examples of how man has occupied areas situated in critical locations with respect to geological dynamics. Urban expansion often takes place with insufficient planning and the building of basic infrastructures is completed without taking suitable measures for risk reduction. Every year such situation requires heavy expenditure for the reconstruction of buildings, remediation of damage, recovery of production activities, and sometimes the price is paid in terms of human lives. The hydrogeological risk and the defence of the soil (defined as all the activities of planning and protection of the land) have thus become the focus of attention for experts, politicians and the public, since the serious and frequency of several events (floods, landslides, avalanches) recently occurred in our country.
The indicators shown in this paragraph provide a survey of the situation of flood events, river basin plans and the implementation of urgent measures for safeguarding from hydrogeological instabilty (Legislative Decree 180/98 and subsequent changes and amendments). They have been chosen as suitably representing the phenomenon of "hydrogeological instabilty" on a national scale and due to the actual availability of data.

## *INDICATOR:* Flood events

Source: APAT

**Figure 17.5: Landslide near the town of Palata (CB)**

The indicator is based on data regarding the main flood events which affected Italy during 2002 and the first two months of 2003. The information is taken from technical reports and/or archives prepared by APAT, public bodies, various institutions and ministry departments, and regard the rainfall data of the events, the causes and type of instability, the size of the affected area, the number of involved people and the amount of resources necessary for environmental recovery and/or risk mitigation. The purpose is to provide an updated archive of the number and type of flood events and hydrogeological factors of national interest, caused by particularly heavy rainfalls, in order to assess the type of impact on the land in terms of damage to persons, infrastructures, production activities and cultural heritage.
Figure 17.5 shows the landslides near the town of Palata (CB) after the flood of January 2003.

## *INDICATOR:* State of implementation of framework plans for hydrogeological setting

**Table 17.1: Framework plans for hydrogeological setting (PAI) adopted by the bodies involved**

| *Basin Authority* | Planning not yet started | Draft plans available and/or being drawn up | Plans applied | PAI adopted | PAI approved |
|---|---|---|---|---|---|
| | n. | | | | |
| ***National*** | 1(c) | 5 (a) (b) | | 1 | |
| Interregional | 1 | 2 | 5 (d) | 3 | 2 (e) |
| ***Regional and autonomous provinces*** | | 6 | 4 | 7 | 1 |

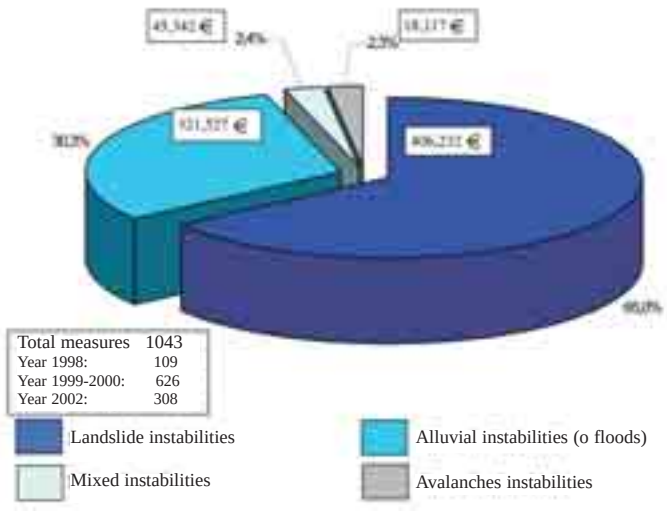
Source: Prepared by APAT on Ministry for Environment and Territory data, 2002

**LEGEND:**

(a) The Basin Authority of the Po River, besides the PAI approved, has adopted 2 Framework Plans to integrate the PAI (Ivrea and Casale Monferrato), 4 Draft Framework Plans (integration to PAI 1, hydrogeological state of the Delta, variants for the Lambro and Pellice Rivers).
(b) The Basin Authority of the Adige River has adopted the variant to the Draft Framework Plan.
(c) The Basin Authority of the Upper Adriatic has adopted the PAI Plan for the basin of the Livenza River.
(d) The Basin Authority of the Magra River has adopted 2 Draft Framework Plans (Magra and Parmignola Rivers).
(e) The Basin Authority for the Basilicata watersheds has adopted the first updated PAI Plan.

The implementation of the Framework Plan for hydrogeological setting (PAI) defines the levels of hydrogeological risk in Italy and the application of suitable protective measures allowing for effective actions to counter geomorphologic and hydraulic instabilty. The indicator represents the state of PAI implementation by the Basin Authorities having jurisdiction, in terms of development, adoption and approval, first of the Draft Plans and then of the PAI plans. The purpose is to show the state of implementation of framework plans for the hydrogeological conditions (PAI), provided for in Art. 1 para. 1 of the Legislative Decree 180/98.
The data, directly acquired by the Ministry for Environment and Territory and developed by APAT (table 17.1), are distributed with regard to the competed Basin Authorities and on an annual basis. Comparing the data with those of the previous year, there is the confirmation of further advancement of the PAI plans application, with the increase of the number of draft plans and PAI plans, and plans being applied, adopted and approved, testifying a more dynamic stage in the basin planning system.

***INDICATOR:*** State of advancement of measures for the reduction of the hydrogeological risk, financed pursuant to the Legislative Decree 180/98 and subsequent changes and amendments.




Source: Prepared by APAT on Ministry for Environment and Territory data

**Figure 17.6: Percentage distribution of urgent measures financed pursuant to the Legislative Decree 180/98 and subsequent changes and amendments, on the basis of the types instability (updated to July 2003)**

The indicator consists of the state of advancement exclusively of measures financed for defence from hydrogeological risk pursuant to the Legislative Decree 180/98 and subsequent changes and amendments. There are also specific measures for areas hit by fire, financed on the basis of Civil Protection Order (OPC) 3073/00, also based on the funds of the Legislative Decree 180/98. The indicator aims at showing the state of advancement of planned urgent measures planned and is suitable for representing the use of the allocated funds, indicating development over time on the national scale. In any case, this indicator does not provide information on the real effectiveness of the provided funding.

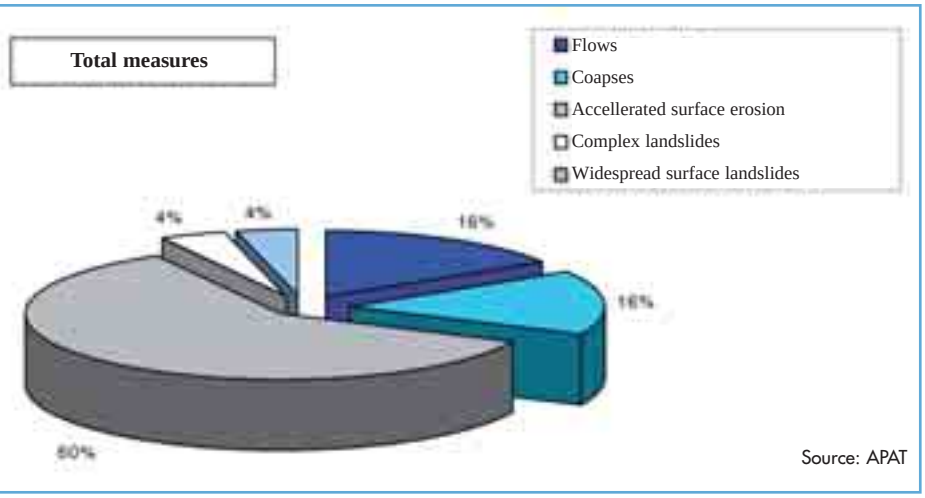



**Figure 17.7: Percentage distribution of measures financed under Civil Protection Order 3073 of 2000 according to the types of deterioration (updated to 2003)**

Up to December 2002, a total of 1,069 measures were financed, of which 1,043 (amounting to 791,218 million Euros) subdivided into planning years 1998, 1999-2000, 2002, and 26 measures, planned in the year 2000 (amounting to 12,785 million Euros), strictly related to the environmental and hydrogeological recovery of slopes subject to erosion and instability after fires occurring in hill and mountain areas (OPC 3073 of July 22nd, 2000).



# 18. Anthropogenic risk

## Introduction

The directive of the European Community 82/501/EC (also known as the "Seveso Directive") was issued in the 1980s in order to decrease the repeated occurrence of serious accidents in some types of industries (mayor accident hazards industries) for the protection of the population and the environment as a whole.
The "Seveso Directive" was implemented in Italy six years after issue with the Presidential Decree 175 of May 17th, 1988.
After 14 years of application, and applying the remarks submitted by the European Community Member States, the "Seveso Directive" evolved into the so-called "Seveso Directive II") "Seveso II" (Directive 96/82/EC), implemented in Italy on August 17th, 1999 with the Legislative Decree 334.
The elements characterizing mayor accident hazards industries, pursuant to the Directive, are as follows:

a) the use of substances which are potentially dangerous if used in certain industrial activities, in amounts exceeding certain thresholds, such as:
   - toxic substances;
   - inflammable substances;
   - explosive substances;
   - oxidine substances;
   - substances dangerous for the environment.

b) the possibility of uncontrolled development of industrial activities with consequent serious, immediate or deferred danger for man inside or outside the plant or for the surrounding environment due to:
   - emission of toxic substances;
   - fire;
   - explosion.

In order to ensure the effectiveness of the monitoring system of the major accident hazards industries, an adequate information system is required to allow the collection and the management of data on dangerous substances in the industries, the activities undertaken, the safety measures adopted and the possible scenarios involving potentially risk areas. This information, taken in relation with the vulnerability characteristics of the surrounding area, enables us to provide risk maps and to use this data for land use planning, information to the population and emergency preparadness.

## Industrial risk

The APAT Industrial Risk Service, together with the Ministry for Environment and Territory-Department for Pollution and Industrial Risks, is responsible for the creation and updating of the National Inventory for Activities with Mayor Accident Hazards, provided by the Legislative Decree 334/99 ("Seveso Law II"). APAT has started a project for setting up, together with the

Regional Agencies, a national geographical information system for a more effective management of the information collected in all the monitoring activities, such as technical reviews, inspections on safety management systems etc.
Until the completion of the project and the availability of complete risk mapping, the National Inventory has provided an initial set of information (identification data on the establishments and plants, activities, geographical location, substances present with the amounts and other information) thanks to which we can have preliminary elements on hazards for the population and the environment, located near a mayor accident hazards industry ("Seveso Law" Art. 6/7 and Art. 8).
On the basis of the information in the Inventory (situation on 31/12/02), in this summary we have selected two indicators representing the geographical distribution and concentration of mayor accident hazards establishments in the country, forming a good compromise between the requirement for detailed information and the effectiveness of the information.
The indicators are:

- number of mayor accident hazards establishments;
- number of municipalities with 4 or more mayor accident hazards establishments.

The following figures show the indicators selected throughout Italy.

***INDICATOR***: Number of mayor accident hazards establishments

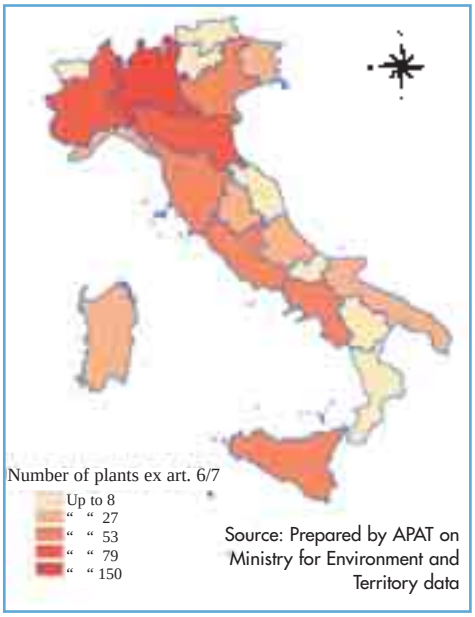



**Figure 18.1: Distribution of establishments subject to Art. 6/7 of the Legislative Decree 334/99 by region (December 31st, 2002)**

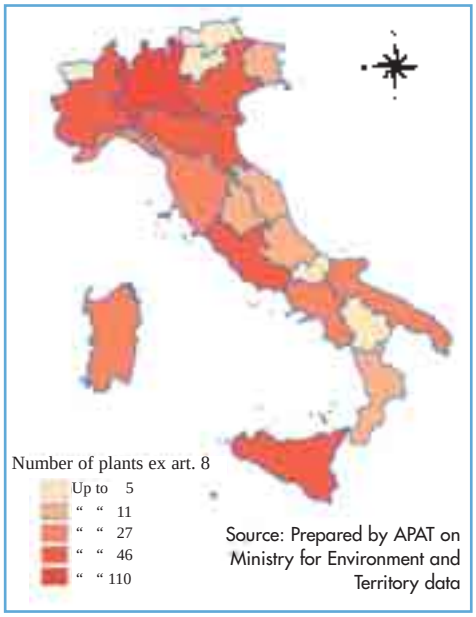



**Figure 18.2: Distribution of establishments subject to Art. 8 of the Legislative Decree 334/99 by region (December 31st, 2002)**

Figure 18.1 shows the national distribution of establishments subject to Art. 6/7 of Legislative Decree 334/99 (notification to the authorities having jurisdiction and adoption of a safety management system); figure 18.2 shows the distribution throughout Italy of establishments subject to Art. 8 of the Legislative Decree 334/99 (requirements under Art. 6/7 and presentation of a safety report).


**Figure 18.3: Provincial distribution of establishments subject to Art. 6/7 and Art. 8 of the Legislative Decree 334/99 (December 31st, 2002)**


**Figure 18.4: Provincial distribution of establishments subject to Art. 6/7 and Art. 8 of the Legislative Decree 334/99 (December 31st, 2002)**

Figures 18.3 and 18.4 show the provincial distribution of all establishments.
It should be noticed that the number of establishments at risk in Italy on December 31st, 2002 totalled 1,123 with a reduction of 13 compared to the figure recorded for December 2001 (1,136).
With regard to the distribution of plants subject to notification (Art. 6/7 and Art. 8) in the country, over 23% are concentrated in Lombardia, in particular in the provinces of Milano, Bergamo, Brescia and Varese.
Other regions with a large number of mayor accident hazards industries are Piemonte and Emilia Romagna (with approximately 10% each), and Veneto (approximately 8%). These have some areas of particular concentration such as Trecate (near Novara), Porto Marghera, Ferrara and Ravenna, the traditional refineries and/or petrochemical plants and others in the provinces of Torino, Alessandria and Bologna.
In South-Central Italy, the regions with the greatest number of facilities subject to notification are Lazio (about 7%), Sicilia (about 6%), Campania (about 6%), Puglia (about 4%) and

Sardegna (about 4%), due to the presence of petroleum and petrochemical plants in the areas of Gela, Priolo, Brindisi, Porto Torres and Sarroch and to the concentration of industries in the provinces of Roma, Napoli and Bari.
There are currently no establishments subject to Articles 6/7 and 8 in the provinces of Prato, Macerata, Crotone and Enna.

***INDICATOR***: Number of municipalities with 4 or more mayor accident hazards establishments


Source: Prepared by APAT on Ministry for Environment and Territory data

**Figure 18.5: National distribution of municipalities with 4 or more plants subject to Art. 6/7 and 8 of the Legislative Decree 334/99 (December 31st, 2002)**

Figure 18.5 shows the location of the 50 municipalities identified throughout Italy having 4 or more mayor accident hazards establishments, subject to Art. 6/7 and Art. 8 of the Legislative Decree 334/99 with a graphic indication of the number of mayor accident hazards establishments in their territory.
There are municipalities with 4 or more plants in 15 regions, in particular in the northern regions (Piemonte and Lombardia) and in the chemical and petrochemical poles in the South (Sicilia, Sardegna, Puglia).
The municipalities characterized by a large number of plants include Ravenna, Venezia and Roma (over 20), followed by Genova and Napoli (over 10); there are likewise significant concentrations in Trecate, Brindisi, Porto Torres, Taranto, Catania, Augusta-Priolo and Ferrara. With respect to the previous edition, we can observe that the number of municipalities with 4 or more mayor accident hazards establishments still totals 50, but a change took place in this particular classification, with



Modena, Vicenza, Terni, Palermo and Portoscuso (Ca) recording a decrease in the number of establishments in the "Seveso Law" (due to closure or changes in the amount of substances present) while L'Aquila, Opera (Mi), Narni (Tr), Piombino (Li) and Ragusa entered this category.
The choice of the threshold value of 4 establishments was made for practical reasons and does not involve a specific legislative orientation by the authorities having jurisdiction for purposes of the identification of the areas with a high concentration of plants subject to specific monitoring measures, pursuant to the Legislative Decree 334/99.

# APPENDIX

## 1. Agriculture

**Q1: Synoptic Table for Agriculture**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Agriculture | **Farms and utilized agricultural areas** | **Describe the number of farms and the total areas effectively used for agricultural purpose** | **D** | **I,R** | **1990-2000** |
| | **Distribution of fertilzers for agricultural use** | **Show the intensity of use of chemical and organic fertilzers** | **P** | **I,R** | **1971-2001** |
| | **Distribution of pesticides for agricultural use** | **Show the intensity of use of phytosanitry products** | **P** | **I,R** | **1990-2001** |
| | Use of pesticides per single type of crop | Show the intensity of use of phytosanitry products on a significant group of crop | P | I | 2001 |
| | Livestock farming | Provide information on the national mass of farm animals by species | P | I | 1960-2001 |
| | Surface extension and number of farms with a low environmental impact | Provide a measure about the extension and number of farms with a low impact on the quality of soil and fibres produced and in general on the environment | R | I,R | 1990-2002 |
| | **Eco-efficiency in agriculture** | **Provide indications about eco-efficiency in the agricultural sector, i.e. ability to detach economic growth factors from an increase in pressure and impact factors** | **R** | **I** | **1990-2001** |
| | Agricultural land area involved in the deliberate planting for experimental purposes of genetically modified plants (GMP) | Provide a measure of the extension and number of experimental planting of GMP, divided by type and quantity, in farmland | P | I | 1999-2002 |

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## 2. Energy

**Q2: Synoptic Table for Energy**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Energy | **Total emissions of greenhouse gases** | **Assess the role of energy processes in relation to greenhouse gas emissions** | **P** | **I** | **1990-2001** |
| | Emissions of greenhouse gases by economic sector | Assess the trend of greenhouse gas emissions from energy processes for the various economic sectors | P | I | 1990-2001 |
| | Total sulphur dioxide and energy processes emissions | Assess the role of energy processes with regard to sulphur dioxide emissions | P | I | 1980-2001 |
| | Nitrogen oxide emissions: total and from energy processes | Assess the role of energy process with regard to nitrogen oxide emissions | P | I | 1980-2001 |
| | **Total energy consumption by economic sector** | **Assess the energy consumption trend at national level and per economic sector** | **D** | **R** | **1990-2001** |
| | Final electric power consumption per economic sector | **Assess the electric energy consumption trend at national level and per economic sector** | D | R | 1990-2001 |
| | Ratio of final energy consumption to total energy consumption | Assess overall efficiency in primary energy conversion from the various utilizable energy sources | R | I | 1990-2001 |
| | Gross electric power production from co-generation plants | Assess the contribution of combined production plants for energy and heat to total electric power production | R | I | 1997-2002 |
| | Final and total energy intensities by sector | Assess the relation between energy consumption trend and economic growth | R/D | I | 1990-2001 |
| | **Total energy consumption by primary sources** | **Assess the contribution of the different energy sources to energy production** | **D/R** | **I** | **1990-2001** |
| | Production of electric energy by sources | Assess the contribution of the different energy sources to electric power production | D/R | R | 1990-2002 |
| | **Gross energy production from renewable sources expressed in equivalent fossil fuel** | **Assess the contribution of clean and inexhaustible energy sources to total energy production** | **R** | **I** | **1991-2001** |
| | Gross electric power production from renewable energy sources | Assess the contribution of sources of clean and inexhaustible energy sources to total energy production to the production of electric | R | R | 1991-2002 |

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|---|---|---|---|---|---|
| | Energy product prices | Assess the effect of international energy source markets and sector policies trends on energy prices | D/R | I | 1990-2002 |
| | Tax revenue from oil products | Assess to what extent tax levels correspond to external costs and favour the use of cleaner products | R | I | 1998-2002 |
| | External costs in energy production | Assess environmental and social costs of energy production | I | I | 1999 |

## 3. Transport

**Q3: Synoptic Table for Transport**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Transport | **Final and primary energy consumption by transport, share of total per mode and type of fuel. Percentage of unleaded petrol and alternative fuels (natural gas and LPG)** | **Quantify the environmental consequences of transport** | **D** | **P** | **1985-2001** |
| | **Greenhouse gas emissions ($CO_2$, $CH_4$ and $N_2O$)** | **Quantify the environmental consequences of transport** | **P** | **P** | **1990-2001** |
| | **Emissions of main air pollutants (NOx, COVNM)** | **Quantify the environmental consequences of transport** | **P** | **P** | **1985-2001** |
| | **Passengers*km by mode, passengers*km per capita and by GDP, vehicles*km; tons*km by mode, tons *km per capita and by GDP, vehicles*km** | **Quantify the evolution of transport demand and intensity** | **D** | **I** | **1985-2001** |
| | Capacity and extent of the infrastructure network | Quantify the evolution of transport demand and intensity | D | R | 2001 |
| | Energy efficiency and specific emissions of CO2, road (MJ/p per km) | Describe the utilized technologies | D/P | I | 1990-2001 |
| | Specific Nox, and NMVOC emissions, road (g/p*km) | Describe the utilized technologies | D/P | I | 1990-2001 |

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|---|---|---|---|---|---|
| | Road vehicles, total and per capita values, average of vehicles and percentage of vehicles | Describe the utilized technologies | D | I | 1990-2001 |

## 4. Tourism

**Q4: Synoptic Table for Tourism**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Tourism | Tourist infrastructures | Quantify the territory reception capacity | D | I, R | 1990-2001 |
| | **Tourist flows by type of transport** | **Identify the means of transport for tourist purposes** | **D** | **I** | **1996-2001** |
| | **Tourism Intensity** | **Determine the territory tourist load** | **D** | **I, R** | **1991-2001** |
| | Family expenditure for tourism | Determine the incidence of tourist expenditure on family expenditure and GDP | D | I | 1995-2001 |

## 5. Industry

**Q5: Synoptic Table for Industry**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Industry | Industrial Production Index | Assess the level of industrial production connected to main industrial pressures | D | I | 1994-2002 |
| | **Expenditure for research and development in the industrial sector** | **Assess expenses made by Industry in R&D which may be connected to expected technological innovation** | **R** | **I** | **1997-2002** |
| | **Innovation in the industrial sector** | **Assess the number of enterprises introducing innovation to contain environmental pressure** | **R** | **I** | **1998-2000** |
| | Polluting capacity of industrial processes in the chemical industry | Assess the polluting capacity of a ton of chemical production (unit of polluting capacity) over time | P | I | 1990-2001 |
| | Polluting capacity of industrial processes in the steel industry | Assess the polluting capacity of a ton of industrial production (unit of polluting capacity) over time | P | I | 1990-2001 |

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|---|---|---|---|---|---|
| | Number of plants subject to environmental integrated authorisation/licenses | Assess progress in the introduction of issuedenvironmental integrated authorisation as an instrument for the prevention and reduction of pollution | R | I,R | 2003 |
| | INES register: number of declarations and IPCC activities declared | Build a database for the national INES register and for the EFOR European Register | R | I,R,P | 2001 |

## 6. Environmental Quality of Organization, Firms and Products

**Q6: Synoptic Table for the Environmental Quality of Organizations, Firms and Products**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Environmental Quality of Organizations, Firms, Products | Number of EMAS registrations | Describe the environmental sensitivity of organizations and firms | R | I | 1997-8/2003 |
| | Number of UNI-EN-ISO 14001 registration | Describe the environmental sensitivity of organizations and firms | R | I | 2000-8/2003 |
| | Number of Ecolabel registrations | Describe the evolution, over the last years of environmental sensitivity related to italian products | R | I | 1997-6/2003 |

## 7. Control and Monitoring

**Q7: Synoptic Table for Inspections**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Inspectors | Control and monitoring activities | Assess the percentage ratio between the number of inspection activities performed and the optimal number of inspection activities required by demand for inspection by regulations and by territorial difficulties | R | R 18/20 | 2002 |
| | Measures and penalties for violations | Identify law observance on environmental topics over time | R | R 18/20 | 2002 |
| | Bathing standards | Assess the state of Italian coasts for the safeguarding of human health | R | R | 2001-2002 |

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## 8. Environmental information, capacity building and education

Topics dealt with in this chapter still need a phase of methodological development in regard to *reporting*. Thus, contrary from all others, no indicators are shown. Merely as an example, information, available and interesting data is provided.

## 9. Atmosphere

**Q9: Synoptic Table for Atmosphere**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Emissions | **Greenhouse gas emissions ($CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$): trends and sector breakdown** | **Estimate national emissions and evaluate sector contributions in order to verify the achievement of established targets** | **P** | **I** | **1990-2001** |
| | **Production of substances harmful to stratospheric ozone (CFCs, $CCl_4$, HCFCs)** | **Assess production of stratospheric ozone depleting substances in order to verify the achievement of targets established by the Montreal protocol and subsequent amendments** | **D** | **I** | **1990-2000** |
| | **Emissions of acidifying substances ($SO_2$, $NO_X$, $NH_3$): trends and sector breakdown** | **Estimate national emissions and evaluate sector contributions in order to verify the achievement of established targets** | **P** | **I** | **1990-2001** |
| | **Emissions of precursors of tropospheric ozone ($NO_X$ and NMVOC): trends and sector breakdown** | **Estimate national emissions and evaluate sector contributions in order to verify the achievement of established targets** | **P** | **I** | **1990-2001** |
| | Emissions of carbon monoxide (CO): trend & sector breakdown | Estimate national emissions and assess trends resulting from actions adopted to reduce emissions mainly from traffic and heating plants | P | I | 1980-2001 |
| | **Emissions of benzene ($C_6H_6$): trends and sector breakdown** | **Estimate national emissions and assess sector contributions in order to verify the effectiveness of emission reduction policies** | **P** | **I** | **1990-2001** |
| | **Emissions of PM10: trend and sector breakdown** | **Estimate national emissions and assess sector contributions in order to verify the effectiveness of emission reduction policies** | **P** | **I** | **1990-2001** |
| | Local inventories (regional and/or provincial) of emissions to the atmosphere (existence of inventories & territorial distribution) | Check the availability of local (region and/or provinces) inventories of atmosphere emissions | R | I | 1999 |

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| | | | | | |
|---|---|---|---|---|---|
| Air quality | Air quality: monitoring stations on the national territory | Provide an overall picture of answers to demands for air quality data | R | I,R 19/20 | 2002 |
| | Air quality: monitoring stations selected for the national gathering of data | Make available a small but representative amount of information on the air quality at national level | R | I,R 19/20 | 2002 |
| | Air quality: concentrations of sulhur dioxide ($SO_2$) | Check that regulations are observed | S | I,R 16/20 | 2002 |
| | **Air quality: concentration of nitrogen dioxide ($NO_2$)** | **Check that regulations are observed** | S | I,R 16/20 | 2002 |
| | **Air quality: concentrations of ozone ($O_3$) at ground level** | **Check that regulations are observed** | **S** | **I,R 16/20** | **2002** |
| | Air quality: carbon monoxide (CO) concentrations | Check that regulations are observed | S | I,R 15/20 | 2002 |
| | **Air quality: concentrations of benzene ($C_6H_6$)** | Check that regulations are observed and verify trend over time | S | I,R 13/20 | 2002 |
| | **Air quality: concentrations of PM10** | Check that regulations are observed and verify trend over time | S | I,R 13/20 | 2002 |

## 10. Biosphere

**Q10: Synoptic Table for Biosphere**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| | **Level of threat for animal species** | **Provide a general picture as to the level of threat to animal species (vertebrates) and taxa in greater danger of loss of biodiversity. Assess the level of threat of the various systematic groups** | **S/I** | **I** | **1997, 1998 2002** |
| | **Level of threat for plant species** | **Provide a general picture on the conservation of animal species, identifying areas at greater risk of loss of biodiversity** | **S/I** | **R** | **1982, 1997 2001** |
| | Hunting impact | Assess which Italian regions undergo greater pressure from hunting activities | P | R | 1992-1999, 2002 |

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| | | | | | |
|---|---|---|---|---|---|
| Biodiversity: trends & changes | Importance of fishing activities | Show sector trends through the analysis of change of the fishing fleet over time, as an indicator which may be connected to pressure on fishing resources | D | I | 1993-2003 |
| | Main types of habitat in the major protected areas | Estimate the distribution of habitat types in the major protected areas to assess the effectiveness of conservation objectives defined by national and European norms | S/R | I | 1996, 2002 |
| | Main types of habitat present in the proposed Sites of Community Interest (pSCI) | Assess the distribution of the various types of habitats present in the proposed Sites of Community Interest (pSCI) as in Enclosure I of the Habitat Directive within the "Sites of Community Interest" proposed at national level | S/R | R | 2000 |
| | State of conservation of the pSIC | Assess the level of preservation of natural and semi-natural habitats as per the Directive on Habitat within the Italian pSIC | S | R | 2000 |
| Effects of dlimate | Variation of glacier fronts | Verify any trends in glacier fronts and any anomalies attributable to Global Change | S | I | 1958 - 2001 |
| Protected areas | **Total protected land areas** | **Assess the percentage of national territory covered by protected land areas** | **R** | **R** | **1922-2002** |
| | Protected marine areas | Assess the percentage of national territory covered by marine areas | R | R | 2000-2002 |
| | **Special Protection Areas (SPA)** | **Assess the percentage of national territory covered by SPA and the trend of safe-guarding actions over the years** | **R** | **R** | **2003** |
| | Proposed Sites of Community Importance (pSIC) | Assess the percentage of national and regional territory covered by Proposed Sites of Community Importance (pSIC) | R | R | 2000-2003 |
| | Impact of communications infrastructures in protected areas | Assess the development of the main communications network present in protected areas, as indicators of antrophic pressure in protected areas | P | R | 1997, 1999 2002 |
| Wetlands | Wetlands of international interest | Assess the area covered by wetlands of international interest in relation to national territory and define their type of habitat | S/R | I | 1976-2002 |
| | **Human pressure on wetlands of international interest** | **Assess the measure of pressure potentially interfering with the preservation of wetlands of international interest** | **P** | **I** | **1996, 1999 2002** |
| | **Forest area: state and changes** | **Indicate the status and trend of forest cove-rage over the period in terms of typology,** | **S** | **R** | **1948-1949 2001** |

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| | | | | | |
|---|---|---|---|---|---|
| | | **territorial distribution and form of government** | | | |
| | **Extent of forest fires** | **Indicate the complex phenomenon of forest fires, highlighting event features and trend over the period** | **I** | **R** | **1970-2002** |
| Forests | Critical loads of total acidity and excesses | Assess the impact of acidifying atmospheric deposits on vegetal ecosystems throughout the national territory | I | I | 1999 |
| | Critical loads of nutrient nitrogen and excesses | Assess the impact of eutrophicising atmospheric deposits on vegetal ecosystems throughout the national territory | I | I | 1999 |
| | Defoliation of forest species | Indicate the level of resilience or susceptibility of forest species compared to the impact of atmospheric deposits and gaseous pollutants on forest ecosystems | I | I | 1997-2002 |
| Landscape | Land protected by Leg. D. 490/1999 | Provide the extension of provisions for bonds on property, environmental values and landscape beauty spots, with indications of the regional areas tied as per Leg. D. 490/1999 | R | P | 1996, 2000 |
| | Regions possessing approved countryside plan | Verify the existence of regional plans and planning co-ordination, with particular reference to the specific theme of countryside plans | R | R | 1997, 2002 |

## 11. Hydrosphere

**Q11: Synoptic Table for the Hydrosphere**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| | **Trophic State Index (TRIX)** | **Assess the trophic status of coastal sea water** | **S** | **R.c.[1] 14/15** | **2001-2002** |
| | Bacteriological Quality Index (BQI) | Assess the level of antrophic contamination (civil and agricultural) in sea-bathing waters | S | C.c.[2] 630/630 | 1999-2001 |
| | Bathing water quality | Assess the hygienic suitability of sea-bathing waters, based on regulatory standards | I | C.c.[2] 630/630 | 2000-2001 |
| | Macrodescriptors (75$^{th}$ percentile) | Provide further information to characterize watercourses | S | R 14/20 | 2000-2002 |
| | Level of pollutions from macrodescriptors (LIM) | Determine pollution level | S | R16/20 | 2000-2002 |

[1] R.c. = Costal regions, even if data has been gathered by sampling
[2] C.c. = Seaboard municipalities



| | | | | | |
|---|---|---|---|---|---|
| Water bodies quality | Extended Biotic Index (IBE) | Assess and classify water course biological quality | S | R17/20 | 2000-2002 |
| | **Ecological state of Rivers (SECA)** | **Assess and classify ecological water bodies quality** | **S** | **R16/20** | **2000-2002** |
| | Ecological State of Lakes (SEL) | Assess the ecological quality of lakes | S | 8/20 | 2002 |
| | Fresh water suitable for fish | Check that the targets established by regulations have been achieved | S | R17/20 | 1997-2001 |
| | Water suitable for molluscs | Check that the targets established by regulations have been achieved | S | R.c[1] 7/15 | 2000-2001 |
| | Chemical Status of Underground Waters (SCAS) | Define the degree of danger to aquifers from a chemical point of view and from natural and antrophic causes, measuring the achievement of targets established by regulations | S | R10/20 | 2000-2002 |
| Water resources & sustainable uses | **Water for drinking purposes** | **Measure the quantitative impact of water abstraction** | **P** | **R10/20** | **1993-2001** |
| | **Final volumes of the main Italian basins** | **Determine outflow of main rivers** | **S** | **B.n.[3]6/11** | **1921-1970 2000** |
| | Temperature of the air | Assess climate trends | S | R | 1960-1990 2000 |
| | Rainfall | Asses rainfall | S | R | 1960-1990 1999 |
| Water resources pollution | Average nutrients in the closure of basins | Further information to characterize rivers and their pollutant supply | **P** | B[4] 12 | 2000-2001 |
| | Potential organic content | Assess the impact on water quality of organic pollutant contents theoretically reaching a water source | P | R | 1990-1996 1999 |
| | Waste Water Treatment: compliance of urban waste water sewer systems | Assess the compliance of sewer systems according to the requirements of arts 3 & 4 of the Directive 91/271/EC, assimilated in Italy by Decree Law 152/99, subsequently integrated and amended by Decree Law 258/00 | R | R | 2001 |
| | Waste Water Treatment: compliance of urban Wastewater Treatment | Assess the compliance of sewer system according to the requirements of arts 3 & 4 of the Directive 91/271/EC, assimilated in Italy | R | R | 2001 |

[3] B.n. = n. of national basins according to Law n. 183/89
[4] C.c. = n. of hydrographic basins



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|---|---|---|---|---|---|
| | | by Decree Law 152/99, subsequently integrated and amended by Decree Law 258/00 | | | |
| | Programs and measures for drinking water | Asses the capacity to implement responses to plans of improvement for surface water employed for drinking purposes | R | I | 1999-2001 |
| | Programmes for bathing waters | Asses the capacity to implement responses to plans of improvement for areas not suited for bathing | R | I | 2001 |

## 12. Geosphere

**Q12: Synoptic Table for Geospheric Indicators**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Soil quality | Content of total heavy metals in agricultural land | Describe the presence of heavy metals in the soil owing to original materials or substances used as antiparasites or fertilzers | S | P 40/103 | 1980-2000 |
| | Balance of nutrients in soil (nutrient *input/output*) | Define the deficit or surplus status of nutrients per unit of cultivated area | S | R | 1994 -2000 |
| Physical & biological degradation of soil | Desertification risk | Estimate the desertification risk for Italian soill | P | I,R 4/20 | 2002 |
| | **Soil compaction risk related to the number and power of tractors** | **Estimate the soil compaction risk due to the passage of heavy machines on agricultural soil** | **P** | **R** | **1967, 1992, 1995, 2000** |
| | Water erosion of soil | Estimate the risk of soil erosion due to surface water action in complex agricultural system (basins) | I | I | 2003 |
| Local and diffuse contaminated soils | Stockbreeding & zootechnical waste water | Asses the incidence of stock loads on the territory through nitrogen production compared to treatable SAU | P | R | 1990-2000 |
| | **Areas used for intensive agriculture** | **Quantify the surface of arable land employed intensively, since the greater risks of pollution, degradation of the soil and loss of biodiversity are connected to this type of use** | **P** | **R** | **1995-2000** |
| | **Sludge used in agricultural areas** | **Assess the quantity of nutritional elements and of heavy metals deriving from the use of sludge in agriculture** | **P** | **R** | **1995-2000** |
| | **Contaminated sites** | **Provide the actual status of areas requiring reclamation interventions for the soil and/or for surface and underground waters** | **P** | **R** | **2003** |

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|---|---|---|---|---|---|
| Contaminant-ed sites | **Contaminated sites of national interest** | **Provide the actual reclamation status of national interest sites** | **P** | **R** | **2003** |
| | Reclaimed sites | Describe the number and location of reclaimed sites | R | R | 2003 |
| Use of territory | Land use | Provide a general description of the main antropical and/or economic activities on the territory | S | R | 1990 2001 |
| | Urbanization & Infrastructure | Describe territorial occupation for urbanization and infrastructures, deemed the main form of irreversible land loss | P | R | 1990 - 2001 |
| | Sites for the extraction of second category minerals (quarries) | Describe the distribution of extraction sites and related plants to obtain information about land quantities subtracted from agricultural activity; indirectly, this can be viewed as land loss indicator which can provide information on potential contaminated sites | P | P 46/103 | 1995-1998 |
| | Sites for the extraction of first category minerals (mines) | Quantify antropical activities of "sites for the extraction of first category minerals" with high environmental impact, strictly correlated with the local geological and geomorphological context | P | R | 1993 - 2001 |
| | Energy extraction sites | Quantify antropical activities of "sites for the extraction of first category minerals" with high environmental impact, strictly correlated with the local geological and geomorphological context | P | R | 1982 - 2001 |
| | **Urbanization in coastal areas** | **Quantify variations of the use of soil in coastal areas, with particular reference to urbanized areas** | **S** | **R** | **1975 1992** |

## 13. Waste

**Q13: Synoptic Table for Waste**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| | **Total generation of waste per unit of GDP** | **Measure the relationship between generation of waste and economic development** | **P** | **I** | **1997- 2001** |
| | **Generation of municipal waste** | **Measure the amount of waste generated** | **P** | **I, R, P, C** | **1995-2001** |

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|---|---|---|---|---|---|
| Waste generation | **Generation of industrial waste** | **Measure the quantity of industrial waste** | **P** | **I, R, P** | **1995 -2001** |
| | Quantity of appliances containing PCB | Measure the quantity of appliances on the Italian territory | P | I,R,P | 2000 |
| Waste management | **Amount of municipal waste with disposal in landfills** | **Measure the effectiveness of waste management policies** | **P,R** | **I, R, P, C** | **1996-2001** |
| | Number of landfills | Measure the impact generated in a determined geographical area | P | I, R, P, C | 1997-2001 |
| | **Amount of municipal waste incinerated** | **Verify trends in waste disposal** | **P,R** | **I, R, P, C** | **1996-2001** |
| | Number of incineration plants | Verify achievements of targets fixed by regulations in force | P | I, R, P, C | 1997-2001 |
| | Industrial waste recovery | Provide indications on the effectiveness of policies on the management of waste | P,R | I, R, P, C | 1997-2001 |
| | **Amount of municipal fraction waste** | **Indicate the effectiveness of municipal waste management policies** | **R** | **I, R, P, C** | **1996-2001** |
| Packaging generation and management | **Packaging generation, total and by type of material** | **Measure the quantity of packaging generated** | **P** | **I** | **1993-2002** |
| | **Marketed packaging, total and by type of material** | **Measure the total quantity of packaging effectively marketed at national level in order to assess if goals have been achieved** | **P** | **I** | **1998-2002** |
| | **Packaging recovery, total and by type of material** | **Determine the quantity of packaging recovered to satisfy regulatory targets** | **R** | **I** | **1998-2002** |

## 14. Ionising Radiations

**Q14: Synoptic Table for Ionising Radiation**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| | Work activities with Naturally Occurring Radioactive Materials (NORM) | Quantify "NORM-related" environmental pressure sources | D | I | 2002 |
| | Facilities authorized to utilize radioisotopes | Document the number and national distribution of facilities authorized to employ radiation sources (category A) | D | R 16/16 | 2002 |

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|---|---|---|---|---|---|
| | Scrap-metal treatment plants (collection, storage, fusion) | Monitor the number of scrap-metal treatment plants | D | I<br>R | 2002 |
| | Nuclear plants: activity of radioisotope discharged in the air and water | Monitor radioactive emissions in the air and water | P | I | 2002 |
| | Quantity of radioactive waste stored | Document typology and quantity of radioactive waste according to the different facilities | P | I<br>R 10/10 | 2002 |
| | **Concentration of radon indoors** | **Monitor one of the main sources of exposure to radioactivity for the population** | **S** | **I<br>R** | **1989-2002** |
| Ionising radiations | Absorbed gamma dose in air due to exposure to cosmic and terrestrial radiations | Evaluate the extent and distribution of the effective dose for exposure to cosmic and terrestrial radiations | S | I<br>R15/20 | 1970-1971<br>1986/2002 |
| | **Radioactivity concentration of artificial radionuclides in environmental and food matrices (atmospheric particulate, wet and dry deposits, milk)** | **Monitor radioactive fallout from atmospheric contamination and the presence of artificial radioisotopes in milk, and consequent level of environmental alteration** | **S** | **I** | **1986-2002** |
| | **Average individual effective dose in one year** | **Estimate contributions from sources of exposure to radioactivity (natural and antropic origin) for the population** | **I** | **I** | **2002** |

## 15. Non-Ionising Radiations

### Q15: Synoptic Table for Non-Ionising Radiations

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| | **Density of broadcasting and telecommunication sites and overall , throughout the national territory** | **Quantify the main pressure sources as regards to RF fields** | **D/P** | **R 15/20** | **2002** |
| | **Extension in kilometres of power lines, divided by voltage, number of transformer stations and primary power cabins in relation to the geographical area** | **Quantify main pressures sources as regards to ELF fields** | **D/P** | **R<br>I** | **1991-2002<br>2002** |

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|---|---|---|---|---|---|
| **Electromagnetic fields** | **Broadcasting and telecommunication sites found to exceed limits and remediation status** | **Quantify situations of non-compliance for Radio-Frequency sources (RTV & SRB) for the territory, ascertained by inspection activities performed by ARPA/APPA, and remediation status** | **S,R** | **R 19/20** | **1998-2003** |
| | Over-limits for electrical and magnetic fields produced by power lines, remediation activities | Quantify non-compliances for ELF sources on the territory and remediation actions | S, R | R | 1996<br>2002 |
| | Number of preliminary evaluations and inspection activities on RF field sources | Quantify response to regulatory requirements regarding inspection activities and surveillance over RF systems (broadcasting, radio stations for mobile telephone services) | R | R 13/20<br>R 15/20<br>R 17/20<br>R 19/20 | 1999<br>2000<br>2001<br>2002 |
| | Number of preliminary evaluations and inspection activities on ELF field sources | Quantify response to regulatory requirements regarding inspection activities and surveillance over ELF sources (power lines, transformer cabins). | R<br>R<br>R<br>R | R 13/20<br>R 14/20<br>R 15/20<br>R 16/20 | 1999<br>2000<br>2001<br>2002 |
| | Regional Regulatory Observatory | Assess regulatory response to problems concerning sources of non-ionising radiations,also with reference to the application of law | R | R | 1988-2003 |
| Luminous radiations | Luminosity with regard to the night sky | Monitor the luminosity of the night sky in order to assess effects of light pollution on ecosystems | S | I | 1998 |
| | **Percentage of the population living where the *"Milky Way"* is no longer visible** | **Assess the situation of visibility in the night sky of the *"Milky Way"*** | **I** | **I** | **1998** |

## 16. Noise

**Q16: Synoptic Table for Noise**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Noise | Number and surface area of airport infrastructures | Assess the number and importance of airport infrastructures | D | I, R | 2002 |
| | Number and capacity of port infrastructures | Assess the number and importance of port infrastructures | D | I | 2001 |
| | Airport traffic | Assess the amount of airport traffic | P | I,R | 1990-2000<br>2000 |
| | Rail traffic | Assess the amount of rail traffic | P | I,R | 1990-2001<br>1999 |

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|---|---|---|---|---|---|
| | Motorway traffic | Assess the amount of motorway traffic | P | I | 1990-2002 |
| | People exposed to noise pollution | Evaluate the percentage of people exposed to levels higher than established thresholds | S | I | 1994-2003 |
| | **Inspected sources and percentage of these with at least one limit exceeded** | **Assess noise pollution in qualitative and quantitative terms** | **S** | **R** | **2000-2002** |
| | **State of implementation of municipal noise classification plans** | **Assess the implementation of national law as regards the activities of the administrations in environmental noise prevention and protection** | **R** | **C 7692/8101** | **2002** |
| | State of implementation of municipal acoustic report | Assess the implementation of national law as regards the activities of the administrations in information activities | R | C 133/138 | 2002 |
| | Approved status of the report on municipal acoustic status | Assess the implementation of national law as regards the activities of the administrations in remediation plans | R | C 7692/8101 | 2002 |
| | Regional Observatory of the Norms | Assess the answer of the regions in terms of norms to issues involving pollution from noise, with reference to the implementation | R | R | 2002 |

## 17. Natural Risk

**Q17: Synoptic Table for Natural Risk**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Tectonics movements | **Surface faults (capable faults)**<br>**Seismic events**<br>**Seismic Classification**<br>**Volcanic eruptions** | **Reduce seismic risk** | **S**<br>**S**<br>**R**<br>**S** | **I**<br>**I**<br>**I**<br>**I** | **2002**<br>**2002**<br>**2002-2003**<br>**2002** |
| Hydrogeological Risks | **Flood events** | **Provide an updated and comparable archive of critical hydrological events of national significance, assessing their main effects on the territory also in terms of damages to persons, infrastructures, production and the cultural heritage** | **I/P** | **I** | **2002-2003** |
| | **State of implementation of framework plans for hydrogeological setting** | **Verify the existence of transitional hydrogeological arrangement plans (PAI) to identify areas at hydrogeological risk and identification of areas subjected to protection measures** | **R** | **R** | **2002** |

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|---|---|---|---|---|---|
| | State of advancement of measures for the reduction of the hydrogeological risk, financed pursuant to the Legislative Decree 180/98 and subsequent changes and amendments | Verify the implementation status of interventions included in urgent programmes to reduce hydrogeological risk | R | R | 2001-2002 2003 |

## 18. Anthropogenic Risk

**Q18: Synoptic Table for Anthropogenic Risk**

| SINAnet Theme | Indicator | Aim | DPSIR | Spatial Coverage | Time Coverage |
|---|---|---|---|---|---|
| Industrial Risks | Number of mayor accident hazards establishments | Estimate the hazards to which the air, soil, subsoil, water bodies and surface waters are subject due to the presence of establishments with major-accident hazards | P | I,R,P,C | 2002 |
| | Number of municipalities with 4 or more mayor accident hazards establishments | Provide initial elements to identify areas with high concentration of establishments with major-accident hazards | P | I,R,P,C | 2002 |
| | Typology of establishments with major-accident hazards | Estimate the prevalent hazards to which air, soil, subsoil, water bodies and surface waters are subject due to the presence of certain typologies of establishments with major-accident hazards | P | I,R,P,C | 2002 |
| | Amount of hazardous substances in establishments with major-accident hazards | Estimate the prevalent hazards to which air, soil, subsoil, water bodies and surface waters are subject due to the presence of certain hazardous substance in establishments with major-accident hazards | P | I,R,P,C | 2002 |
| | Amount of substances dangerous for the environment, to be found in each muncipality (characterized by the risk phrases R 50 or R:51/53). | Provide initial elements for the identification of areas potentially at risk of pollution to the soil the subsoil, underground and surface waters, the water bodies, due to the presence in plants with a high risk index of substances dangerous to the environment (risk phrases R50 o R51/53). | P | I,R,P,C | 2002 |

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**Key:**
Indicators indicated in the Summary are shown in bold face.

**Spatial coverage:**
Indicates the level of geographic data coverage to populate the indicator.
"I": National, where data is aggregate and rappresents the national level only;
"R x/20": Regional, where the data makes it possible to represent information at regional level and the data for x regions is available;
"P y/103": Provincial, where the data makes it possible to represent information at provincial level and the data for y provinces is available;
"C z/8100": Municipal, where the data makes it possible to represent information at municipal level and the data for z municipalities is available.

**Time Coverage:**
Indicates the availability for the timeseries and/or for the data indicated in the table.

**DPSIR model:**
For the definition of each model component see "Structure of the Yearbook Summary" on page XIII.