APAT
Agency for the protection of the
environment and for technical services

Environmental Data Yearbook

SUMMARY

EDITION 2002

In collaboration with
Italian Environmental Agency System
in the framework Italian Topic Centres (CTN)

SISTAN National Statistic System

Stato dell'Ambiente 9 / 2002

APAT - Agency for the protection of the environment and for technical services
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A great deal of information on Italy is available on the Internet. It can be access through the Italian server (www.apat.it)

ISBN 88-448-0073-X

Graphic Layout
Layout: Franco Iozzoli, APAT
Cover: Paolo Orlandi, APAT

Printing Co-ordination
APAT

Printed in Italy by
C.R.P. – Piazza della Trasfigurazione, 9 - 00151 Roma

Printed on ecological paper

Printing completed in November 2002

Environment (ANPA) and the Technical Services of the Prime Minister's Office – National Geological, Hydrographical and Marigraphic Services – have converged in the **Agency for the protection of the environment and for technical services (APAT).**

APAT will continue to perform, under the direction and supervision of the Ministry of the Environment and Territorial Protection, all the technical and scientific functions entrusted to it concerning the monitoring and control of the environmental protection sectors, soil and water quality protection, the prevention of technological hazards and the preservation of nature.

In such sectors, **APAT** will thus continue to be a point of reference for collaboration, consultancy, assistance and support activities for other public administrations, defined by specific conventions.

In the framework of a now consolidated environmental system, **APAT** will continue to do whatever is needed to integrate the Information System within the SINAnet network, in which may converge both the National Cartographic System and the Regional Environmental Information Systems (SIRA).

APAT's aims, priorities and resources will be defined by an annually updated three-year activity plan, actuating the directives of the Ministry of the Environment and Territorial Protection.

The Agency's organs comprise the Director General (assisted by an Advisory Committee) and the Board of Auditors, while its structure is divided into Departments and Interdepartmental Services. One novelty within **APAT** is the institution of a Federal Council, chaired by the Director General, whose members are the legal representatives of the Regional and Provincial Agencies for the Protection of the Environment (ARPA & APPA), with the participation of a representative of the State-Regions Conference.

The precision of the data and technical surveys provided by the Agency's specialists – characteristics that have distinguished the institutional publications issued formerly by ANPA -, although with a change of look and name, will now be improved on and updated by **APAT**, with environmental information marked by authoritativeness and transparency.

… et extra
processit longe flammantia moenia mundi
atque omne immensum peragravit mente animoque,
unde refert nobis victor quid possit oriri,
quid nequeat, finita potestas denique cuique
*quanam sit ratione atque alte terminus haerens**

Lucrezio- De rerum natura
(I, vv.72-77)

*"…and he passed far beyond the flaming walls of the world
and traversed throughout in mind and spirit the immeasurable universe;
whence he returns a conqueror to tell us what can,
what cannot come into being; in short on what principle
each thing has its power defined, its deepset boundary mark."

Presentation

Environmental protection initiatives are strongly interlinked with environmental information in most governmental and other contexts. This is not surprising since policy makers need to base their decisions on sound and verifiable knowledge for the choice, implementation and control of environmental measures also for the purpose of appropriately informing the general public and of increasing its overall level of awareness. This in turn will facilitate the responsible participation of citizens in environmental prevention and remediation programmes.
However, although a full consensus exists on the essential role of appropriate information for environmental policies, activities up to now have mostly produced numerous legislative acts and programmes. There is still much to do at operational level to improve environmental monitoring and observation capacity, and to transform acquired knowledge into effective information tools.
These considerations were also the focus of the international conference on "Bridging the Gap", totally devoted to the question of environmental information, held in London in 1998, promoted by the environmental organisations and agencies of European countries and by the European Environment Agency.
Within an international context where the challenges regarding the environmental information sector are still rather important, we may say that our country – thanks also to APAT – has recently made substantial progress. This is shown, for example, by that authoritative document, "Environmental Performance Review" of Italy, recently prepared by the OECD, which expresses particularly positive views on the contribution provided by the Agency System (APAT-ARPA-APPA) in improving observation and information capacities.
The Yearbook on Environmental Data is one of the best objective proofs of the progress achieved by our country in this sector. This is not so much, or not only, due to the document itself, but rather to the process that led to its drafting, marking the start of the regular diffusion of objective and solid environmental information on the technical and scientific level, considering the institution undertaking the initiative, as well as effective on a communication level, thanks to the adoption of the most advanced reporting techniques available internationally.
Last April, during the press conference presenting the Zero Version of the Yearbook (Towards the First Yearbook on Environmental Data), I emphasised the importance of the information diffusion process that was being launched and broke the news about the activation of an important environmental information programme entrusted to APAT, of which the Yearbook was the weightiest central component.
Little more than six months have gone by since then, and the drafting of the 2002 edition has already been completed and, in its present summary version, can be diffused to a wide and heterogeneous public.
It can be stated that all the commitments made have been fulfilled, and that we are now on the right track to deal with the growing demand for environmental information, whether from institutional bodies or private citizens.
As in the case of the Yearbook, I shall always be ready to give advice and directives to ensure that the best human and instrumental resources are employed to give an adequate response to expectations.

Hon. Altero MATTEOLI
Minister of the Environment
& Territorial Protection

Introduction to the 2002 edition of the yearbook on environmental data

The 2002 edition of the Yearbook on Environmental Data, as several times announced, marks the start of the regular and organic diffusion of information on environmental conditions in Italy.
This is the outcome of a complex process of preparing tools for data acquisition and reporting mechanism, promoted by APAT and implemented with the fundamental contribution of the Agency System of the Regions and Autonomous Provinces, especially in the framework of the Italian Topic Centres (CTN) project, as well as with the collaboration of numerous technical and scientific organisations (IPR – Main Reference Institutions) operating as partners of the CTNs.
The salient steps in this process have included the "White Paper"[1] on environmental know-how and information in Italy and "Towards the Yearbook on Environmental Data"[2].
With respect to the latter, the 2002 edition of the Yearbook – the real number 1 of the series – marks an improvement both in content and in editorial form.
In terms of content, the *environmental themes have* been expanded and *production sectors* have been explicitly introduced, providing objective data and trends on the main "prime or *driving* causes" behind environmental pressures. The current edition also includes a chapter devoted to *environmental controls*, intended to become – although still in a rather embryonic state – one of the response factors in dealing with environmental impact.
A significant improvement of the metadata (indicator characterisation) has been obtained by introducing an information quality level for each indicator.
On the whole, about 160 indicators are populated and represented, in many cases with both territorial subdivisions and with historical sets, against the 100 or so present in the Zero Version of Report.
Although the optimum has not yet been reached for an objective and far-ranging representation of environmental conditions, we may deem that the consolidation process for the set of indicators selected for the Yearbook – already at a satisfactory stage – will be completed within the next two or three editions.
Subsequently, although it will be possible to include new indicators to monitor issues which have not yet emerged, the Yearbook will be based on specific indicators, which will thus become familiar even to those not involved in technical work, as has already happened with GDP, the inflation rate, etc., classical indicators belonging to the socio-economic sector.
In terms of its editorial form, significant innovations have been made to this Yearbook edition.
First of all, a further effort has been made to improve the harmonisation level and the effectiveness of the communication tools (graphs, tables, theme sheets) used to describe the indicators.
To promote the widest possible diffusion of the information, it has been considered appropriate to produce three different versions of the document.
An unabridged version in Italian, containing all the indicators selected for the 2002 edition, in order to provide an exhaustive "photograph" of objective environmental conditions and trends, both in terms of quality or status, and of *pressures*, *drivers, impacts* and *responses*, according to the DPSIR[3]·scheme.
This Italian version represents, therefore, the full Yearbook on environmental data, of which a reduced number of printed copies will be produced, but which will be made available on the Internet site www.sinanet.apat.it.
There are also two other shorter volumes, one in Italian and one in English. These volumes present a targeted selection from the 160 Yearbook indicators, with the aim of providing a summary, as accurate and effective as possible, of environmental conditions in Italy, with the advantage of more rapid communication. The selection of synthesis indicators favours those more immediately understood by non-specialists. Thus, wherever possible, the indicators selected are those with a well-defined "objective value", such as in the case of per capita waste production, or the limitation of climate-changing gas emissions within a determined timeframe.
20,000 copies of the shorter Italian version will be printed, for widespread diffusion, starting from the central and peripheral offices of the public administration.

[1] "Il monitoraggio dello stato dell'ambiente in Italia. Esigenze e disponibilità di elementi conoscitivi", (The monitoring of the state of the environment in Italy.) Serie Stato dell'ambiente 7/2000.
[2] "Verso l'Annuario dei dati Ambientali" (Towards the Yearbook on Environmental Data), State of the Environment Series, 5/2001.
[3] for details on the *DPSIR*, see the structure paragraph of the Yearbook *Summary*.

The English version is destined for readers outside Italy, with the aim of beginning regular communications at supra-national level with regard to our environmental conditions, putting an end to the practice of seeing environmental reporting on Italy in English (with a consequently wide international readership), produced only by external and/or international organisations, sometimes causing inconveniences with regard to the quality and completeness of the information provided.
To complete our efforts to promote the widest possible diffusion and understanding of such information, a multimedial version of the Yearbook has been produced, currently available only through the site www.sinanet.apat.it.
Finally, it is a duty and a pleasure for me to mention that the Zero Version of the Yearbook and the preparation of this first full edition have been carried out during the phase in which ANPA was led by Prof. Renato Angelo Ricci in his capacity as ANPA's Government Commissioner who also gave the highest priority to such endeavour.

Giorgio CESARI
APAT Director General

Contributors

The preparation of the Yearbook belongs to the activities planned – in the sector of publishing data and information on objective environmental conditions and trends – by the National Agency for the Protection of the Environment, which has recently become APAT (Agenzia per la Protezione dell'Ambiente e dei servizi Tecnici - Agency for the protection of the environment and for technical services), incorporating part of the existing National Technical Services Department.
This activity has been carried out by the Department of Environmental Status, Controls and Information Systems [Dipartimento Stato dell'Ambiente, Controlli e Sistemi Informativi (AMB)], with operational contributions and consultation provided by other technical units of the Agency more directly involved in environmental reporting activities, by the ARPA / APPA Agencies, through the Italian Topic Centres (Centri Tematici Nazionali - CTNs), and by the Main Reference Institutions (IPRs) that collaborate with the CTN.

Numerous contributions have also been provided, not only by the single sectoral specialists, but by central and peripheral administrations, as well as by technical and scientific structures.

In particular, as far as the former are concerned, mention must be made of all the Departments of the Ministry of the Environment and Territorial Protection (in the text also called Ministry of the Environment), the Ministry of Production Activities, the Ministry for Cultural Assets & Activities, the Ministry of Infrastructure & Transport, the Ministry of Agricultural & Forestry Policies, the Ministry of 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 Harbour Offices, the Regions, the Provinces, the PMP, Local Authorities; for public and private technical and scientific bodies and organisations, ICRAM, l'ISTAT, the Health Institute, Basin Authorities, the Water Magistracies, the National Research Council (IIA, 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, Database ITHACA, the National Register of Organisations EMAS, ODYSSEE, TELEATLAS. Qui bisognerebbe omogeneizzare la lista: Nome dell'istituzione in italiano e abbreviazione con la traduzione in inglese corretta (presa da ogni sito web relativo), in parentesi

Contributors are specifically detailed in the unabridged version of the "Environmental Data Yearbook -Edition 2002".

Warm thanks are due to all those, single specialists or organisations 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.

It is hoped that all those who have contributed appear explicitly 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 all, the information produced may attain ever higher levels.

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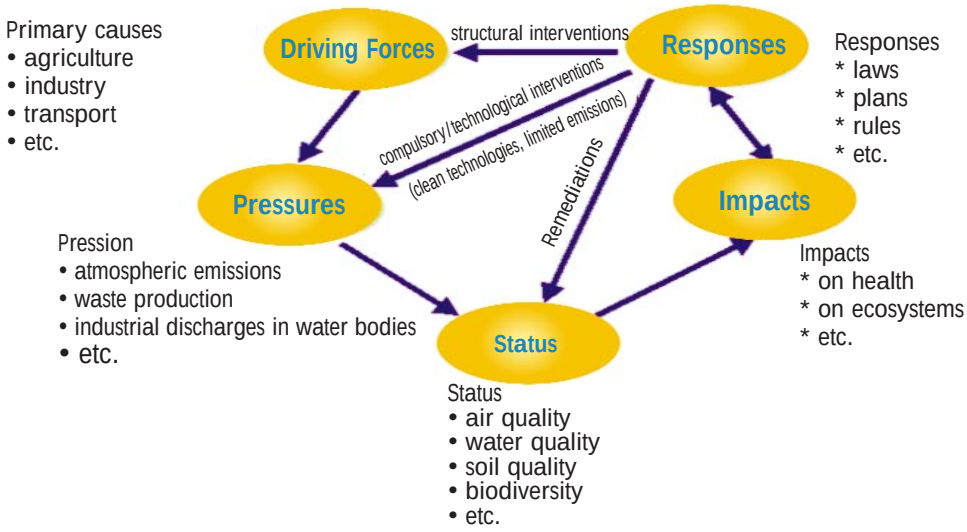
Structure of the Yearbook *Summary*

As in the unabridged version, in the *Summary* the complex scenario of environmental information is divided into twelve chapters (in the unabridged version 16 chapters) and an appendix.
The first ten chapters refer to the same number of SINAnet *thematic areas*, chapter 11 deals with *production sectors*, chapter 12 presents a highly schematic picture of *ispection* activities in the environmental field.
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 status 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-changing gas emissions, for which a limitation 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 unabridged version of the Yearbook. In particular, the picture is organised according to theme areas and topics. Indicators are provided for each topic, together with descriptive information. This includes the name, aim, position on the *DPSIR* chart, level of spatial and time coverage. The indicators selected for the *Summary* are highlighted.
The *DPSIR*, developed by the European Agency for the Environment on the basis of an earlier chart (PSR) prepared by the OECD(Organisation for Economic Co-operation & Development), has been adopted by APAT to build the environmental data system. As shown in the following figure, the *DPSIR* framework organises related environmental data and information in five categories showing the relations of cause and effect.

DPSIR Model
Data Categories & Cause & Effect Relations



The priority aim is the *status,* i.e. the set of physical, chemical and biological qualities of environmental resources (air, water, soil, etc.). The *status* is altered by *pressures*, comprising whatever tends to degrade environmental status (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, directives, 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 – utilising new technologies to abate emissions;
- act on status through safeguarding and/or remediation interventions;
- limit impacts through compensating interventions, such as – for example – barriers to abate the noise produced by vehicles.

1. Atmosphere

Introduction

Air pollution is defined as any change in the composition of the atmosphere due to the presence of one or more substances, in such a quantity and with such characteristics as to alter normal environmental conditions and constitute a direct or indirect danger for human health, for ecosystems and material assets. Pollutant substances released to the atmosphere are largely produced by human activity (industrial activities, thermo-electric power plants, central heating, transport), and to a lesser extent are of natural origin (fine dust, volcanic exhalations, decomposition of organic material, fires).
Problems related to the atmosphere involve different spatial and temporal scales. On the one hand, air quality in an urban environment has strictly local importance and is characterised by diffusion processes lasting a few hours or days. On the other hand, emissions of acidifying substances have cross-boundary effects, and their extent is therefore generally continental, while substances that contribute to climate change and to variations in the stratospheric ozone layer have global relevance, with a time duration of the order of years or decades. Indicators relating to the atmospheric environment are organised on two levels: emissions (pressure indicators) and air quality (status indicators). Estimating processes are used to quantify emissions, their sectorial distribution and temporal development. Data concerning pollutant levels at ground level, on the other hand, are provided by air quality monitoring systems, managed by various control organisations, mostly in the public domain.

Emissions

Substances released into the atmospheric environment contribute to the following phenomena: climate change, stratospheric ozone depletion, acidification, photochemical smog, air quality. Emissions are evaluated by appropriate estimating methodologies, based on emission factors and activity indicators. As far as greenhouse gases are concerned, the reference methodology is indicated by the IPCC (*Intergovernmental Panel on Climate Change*). For other pollutants, other than gases with a greenhouse effect, the methodology used is the one indicated by the CORINAIR Project (*COoRdination-INformation-AIR*) of the European Environment Agency, using SNAP97 (*Selected Nomenclature for Air Pollution*) nomenclature for emission sources.
Analysis of national emissions, sectoral distribution and temporal and spatial trends are a key element in establishing environmental priorities, identifying targets and the related policies to be adopted, on both a national and local scale. Owing to this, the selected indicators answer criteria of traceability, reliability and easy reading and are relevant to the main problems concerning the atmosphere.

INDICATOR: **Greenhouse Gas Emissions (CO_2, CH_4, N_2O, HFCS, PFCS, SF_6): *trend* & sectoral breakdown**

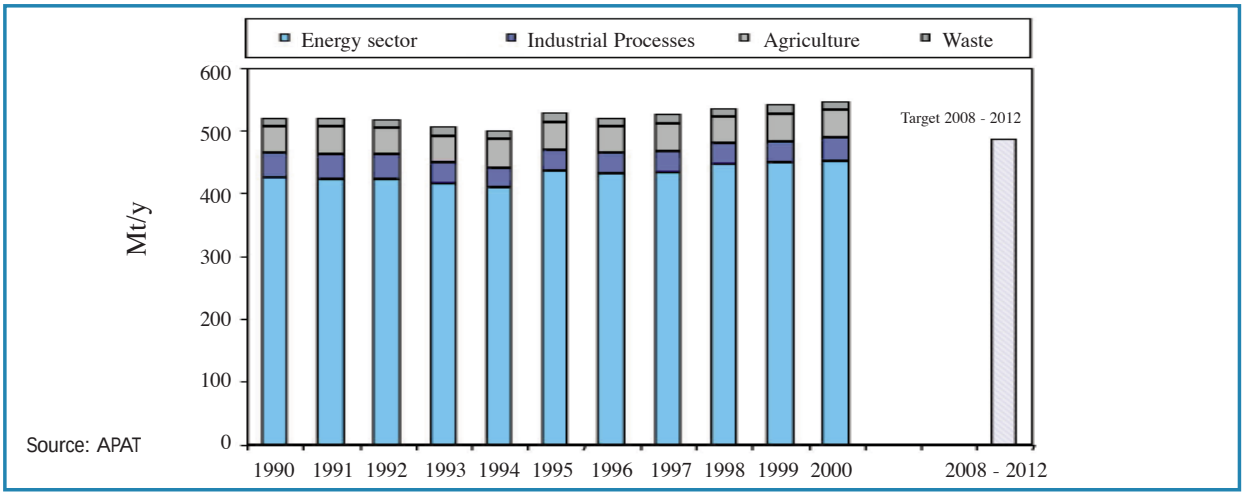
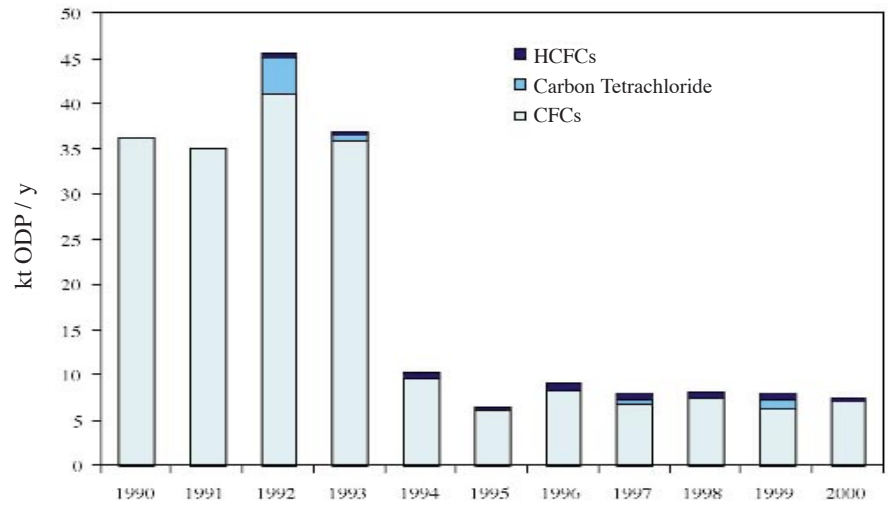


Figure 1.1: National Greenhouse Gases Emissions in CO_2 equivalents (millions of tonnes/year)

In the framework of the Convention on Climate Change, and in particular of the Kyoto Protocol, Italy has undertaken to reduce overall national emissions of greenhouse gases by 6.5% as compared with the base year, over the period 2008-2012. The base year for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) is 1990, while for fluorinated gases it is 1995. The total emissions of greenhouse gases considered by the Kyoto Protocol, in terms of CO_2 equivalent, are 5% higher in 2000 than the base year. The trend of emissions is strictly related to energy consumption.

***INDICATOR*: Production of Stratospheric Ozone Depleting Substances (CFCs, CCl_4, HCFCs)**

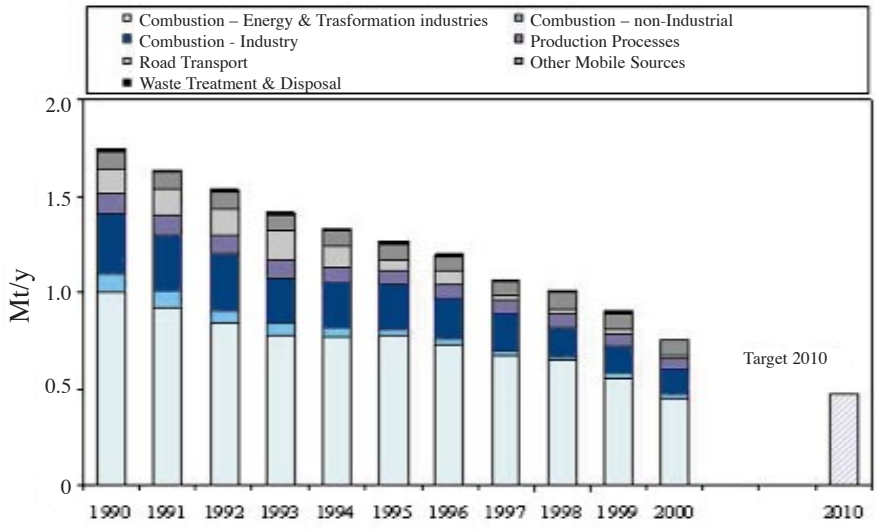


Source: APAT

Figure 1.2: National Production of Stratospheric Ozone Depleting Substances, in terms of ODP - *Ozone Depleting Potential* (thousands of tonnes / year)

The Montreal Protocol binds the parties to stabilise, reduce and then outlaw the production and consumption of substances harmful for the ozone layer, according to established targets and milestone dates.
In Italy, Act 549 dated 28/12/1993, and its subsequent amendments and integrations, establishes the procedures for reducing and ceasing to use substances harmful for the ozone layer. In particular, the marketing, import and export of ozone layer depleting substances must cease within 31 December 2008.

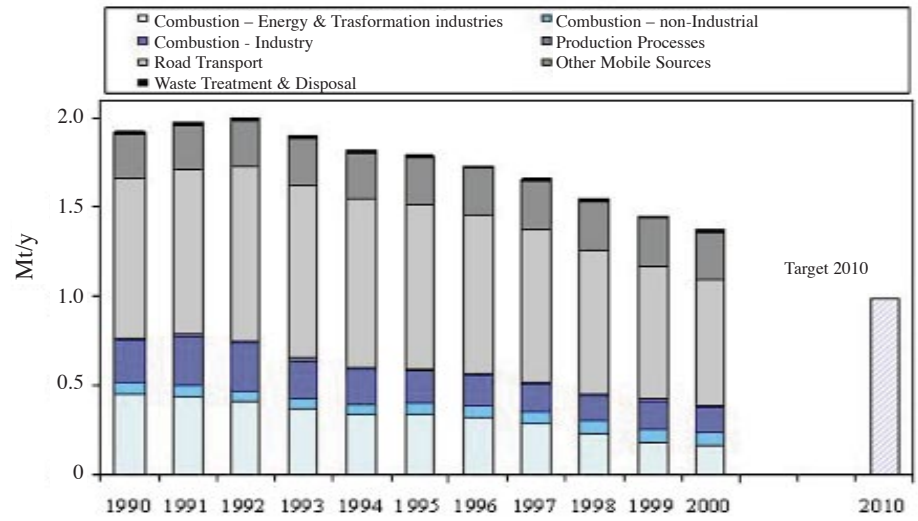
***INDICATOR*: Emissions of Acidifying Substances (SO_x, NO_x, NH_3): *trend* and sectoral breakdown**



Source: APAT

Figure 1.3: National Emissions of Sulphur Dioxide (SO_2) (millions of tonnes / year)

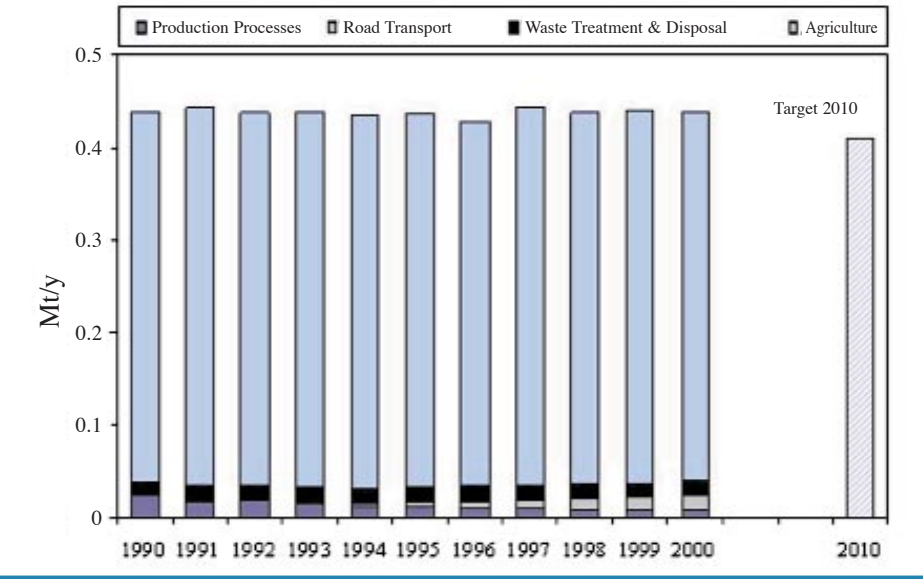
In the framework of European Directive 2001/81/CE, concerning national ceilings for some atmospheric pollutants, Italy has undertaken to reduce national emissions of sulphur dioxide to 0.475 Mt within 2010. This means a reduction of 37.4% compared to 2000. National emissions of sulphur dioxide decreased by 49.2% between 1980 and 1990, and by 56.6% between 1990 and 2000.



Source: APAT

Figure 1.4: National Emissions of Nitrogen Oxides (NO_x) (millions of tonnes/year)

In the framework of European Directive 2001/81/CE, concerning national ceilings for some atmospheric pollutants, Italy has undertaken to reduce national emissions of nitrogen oxides to 0.990 Mt within 2010. This means a reduction of 27.8% compared to 2000. National emissions of nitrogen oxides increased by 25.9% between 1980 and 1992 (when they reached a peak), and decreased by 31.2% between 1992 and 2000.



Source: APAT

Figure 1.5: National Emissions of Ammonia (NH_3) (millions of tonnes/year)

In the framework of European Directive 2001/81/CE, concerning national ceilings for some atmospheric pollutants, Italy has undertaken to reduce ammonia emissions to 0.419 Mt within 2010, which means a reduction of 4.3% compared to 2000.

INDICATOR: Emissions of Tropospheric Ozone Precursors (NOx and NMVOC): *trend* & sectoral breakdown

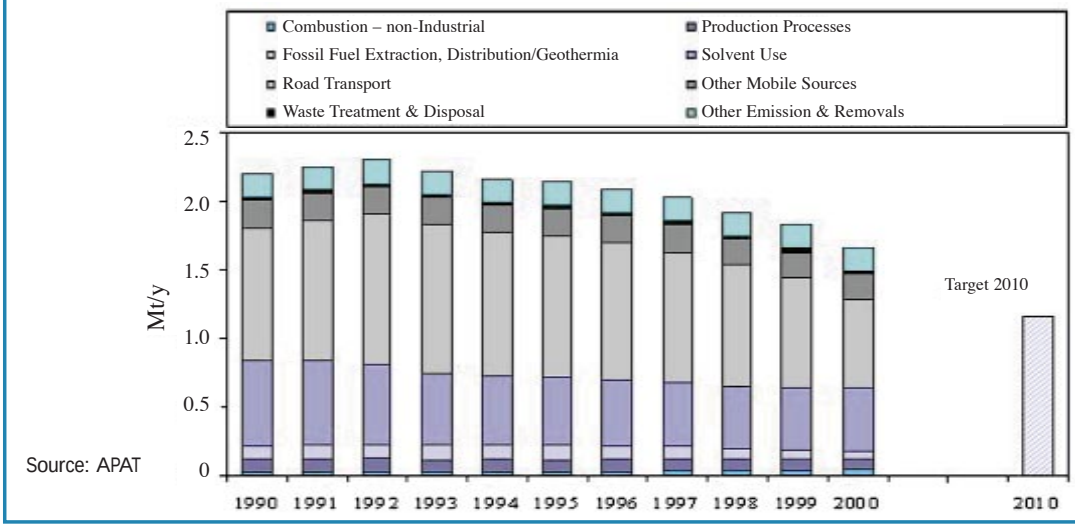


Figure 1.6: National Emissions of Non-Methane Volatile Organic Compounds (NMVOC) (millions of tonnes/year)

In the framework of European Directive 2001/81/CE, concerning national ceilings for some atmospheric pollutants, Italy has undertaken to reduce national emissions of non-methane volatile organic compounds to 1.159 Mt within 2010, signifying a reduction of 23.3% compared to 2000. NMVOC emissions increased in Italy by 5.5% between 1980 and 1992 (when they reached a peak), and decreased by 29.5% between 1992 and 2000.

Air Quality

The indicators relating to the theme of air quality have been prepared for the Yearbook on Environmental Data based on the data recorded by air quality monitoring systems and collected by APAT through the SINAnet, and are deemed to be the most significant for the purpose of assessing the situation as compared to the quality targets indicated by the regulations. Of the latter, particularly important is the MD dated 2 April 2002 concerning sulphur dioxide, nitrogen oxides, fine particulate, carbon monoxide and benzene, as well as the MD dated 16.5.96 concerning ozone. This Summary provides several figures illustrating status as of 2001 and the time trend over the past years, for an indicator representing each of the four components (NO_2, ozone, PM10 and benzene) which are critical for achieving the quality targets.
For a proper interpretation of the figures, it should be emphasised that while the histograms have been prepared using all the available data for 2001, the time trend graphs have been prepared on data from a homogenous sub-body of stations year by year, so as to ensure a significant comparison between one year and another.

INDICATOR: Nitrogen oxide concentrations in the air (NOx, NO_2)

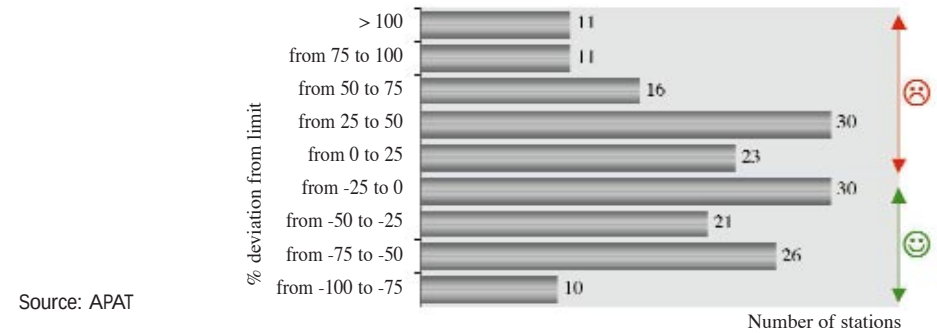


Figure 1.7: Annual average for mean hourly concentrations of NO_2: distribution of the percentage deviation from the health protection limit value to be reached by 1/1/2010 (MD 60/02). Negative percentage values indicate that the limit has been observed – All stations, year 2001

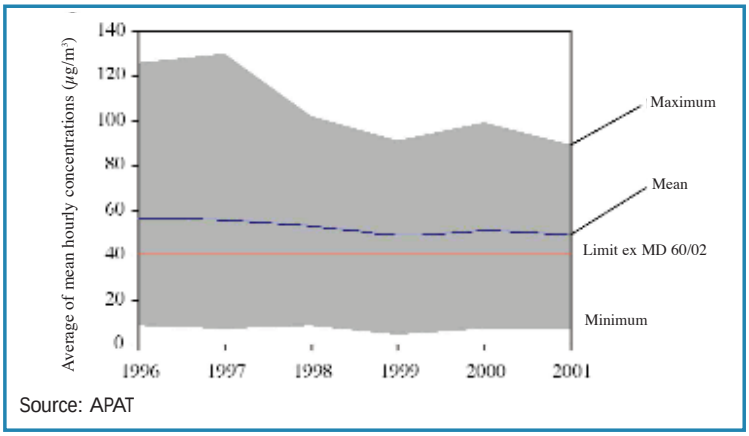


Figure 1.8: Annual average of mean hourly concentrations of NO_2: distribution of values (grey area) and mean value (blue line) out of 49 stations with indicator available for the whole period, compared with the limit value for health protection, in force from 1/1/2010 (red line)

The main sources of nitrogen oxides (NO_x, NO_2) are civil and industrial heating plants, motor vehicles, power stations and a wide range of industrial processes (glass, lime, cement, etc.). Nitrogen oxides contribute to eutrophication phenomena, photochemical smog (these are precursors forming secondary pollutants such as tropospheric ozone and secondary fine particulate) and acid rain.

For average annual concentrations, MD 60 prescribes the limit value of 40 µg/m³ for health protection, to be reached by 1st January 2010. As an indicator, the percentage deviation has been calculated between the annual average and the limit value. Figure 1.7 shows indicator distribution on all stations with available data for 2001. About half the stations recorded an annual average over the limit value. Figure 1.8 illustrates the indicator's time trend on a homogenous sample of 49 stations with indicator available from 1996 to 2001. Maximum values of the distribution appear to be decreasing.

INDICATOR: Ozone concentrations at ground level (O_3)

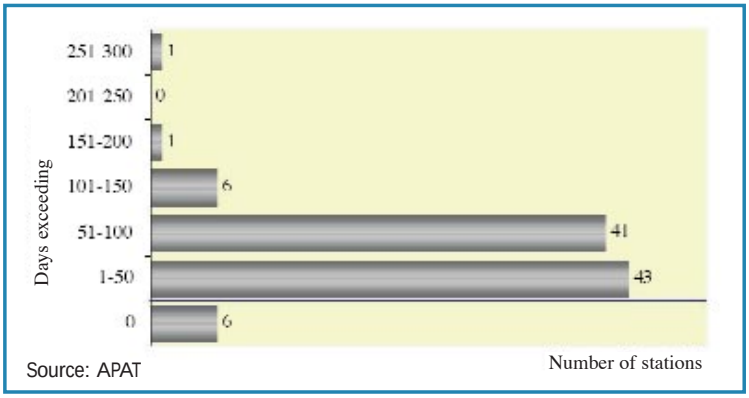


Figure 1.9: Distribution of the number of days on which the health protection level was exceeded (110 µg/m³, average over 8 hours). Stations below the blue line reported no excess. All stations, year 2001

Tropospheric ozone is originally both anthropical and natural and is a secondary pollutant, i.e. not released directly by one or more sources, but produced by the effect of solar radiation on primary pollutants such as nitrogen oxides (NO_x) and volatile organic compounds (COV), produced largely by combustion engines and the use of organic solvents. As a whole, these phenomena, leading to high ozone concentrations, are known as "photochemical smog". Photochemical pollution is also a transboundary phenomenon. Indeed, under certain meteorological and emission conditions, photochemical pollutants are formed and transported for hundreds or thousands of kilometers.

Presently, quality targets are fixed by MD dated 16/5/96. The proposed indicator is the number of days on which the health protection level (110 µg/m³ for an average of 8 hours) is exceeded. Figure 1.9 shows indicator distribution for all stations with available data for 2001. Most stations record a number of days exceeding of between 1 and 100. Figure 1.10 illustrates the indicator's time trend with a homogenous sample of 19 stations with indicator available from 1996 to 2001. Maximum values of the distribution appear to be increasing. It should be considered however that ozone level trends are masked by the strong impact of meteo-climatic factors, which vary from year to year.

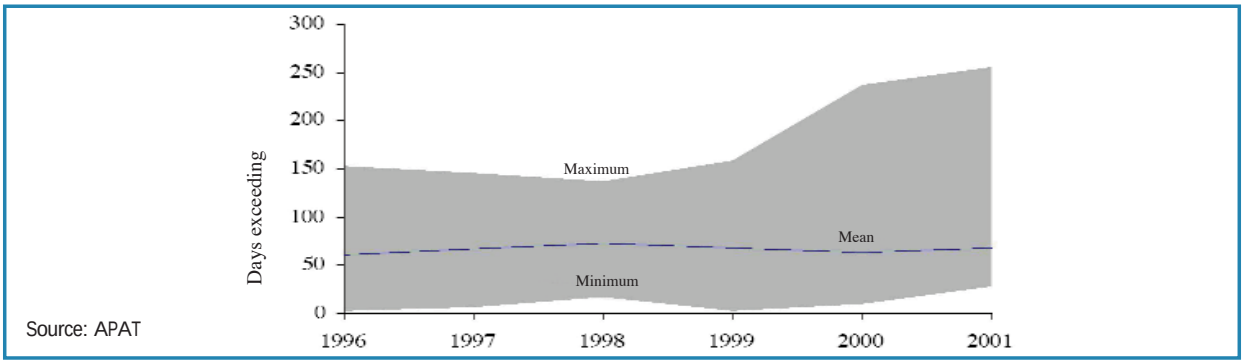


Figure 1.10: Days on which the health protection level (110 μg/m³ as average over 8 hours) was exceeded. Distribution of values (grey area) and mean value (blue line) for 19 stations with indicator available for the whole period.

INDICATOR: Fine particulate (PM_{10}) concentrations in the air

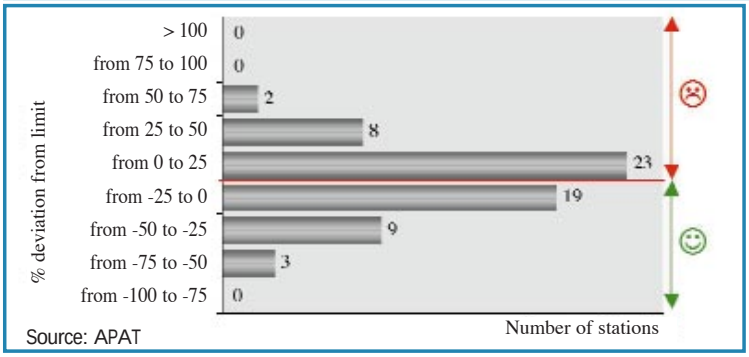


Figure 1.11: Annual average of mean daily concentrations of PM_{10}: distribution of percentage deviation from the limit value (health protection, MD 60/02). Negative percentage values indicate that the limit has been observed – All stations, year 2001.

The main sources of PM_{10} can be divided into two categories: natural and anthropic sources. The former substantially include soil and building erosion by meteorological elements. The latter, on the other hand, include a wide range of emission sources, of which the most important is motor vehicle traffic, heating plants and some industrial processes. A consistent portion is also of secondary origin, i.e. deriving from the chemical transformation and condensation processes of gaseous components. Fine particulate is monitored for its serious health and toxicological effects involving both its physical (particle diameter) and chemical (specific aerosol components) characteristics.

Health protection limit values are indicated by the recent MD 60 dated 2/4/02, which assimilates European Directive 1999/30. The limit value for annual average concentrations, to be achieved by 1/1/2005, is 40 μg/m³. Figure 1.11 shows the percentage deviaton of annual values from the limit value, for all stations with available data for 2001. Half the stations record values over the limit. It should be emphasised that indicator values for single monitoring stations are considerably influenced by the type of instruments used for monitoring PM_{10}.

INDICATOR: Air concentrations of benzene (C_6H_6)

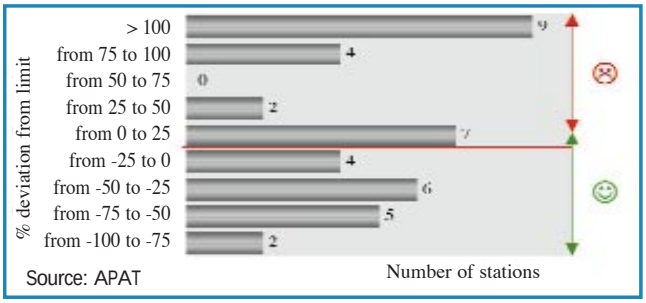


Figure 1.12: Annual average of mean daily concentrations of C_6H_6: distribution of the percentage deviation from the limit value (health protection, MD 60/02). Negative percentage values indicate that the limit has been observed – All stations, year 2001

The main sources of benzene (C_6H_6) are petrol-driven motor vehicles (discharge gases and vapours), fuel stockage and distribution plants, combustion processes using petrol-derived fuels, and the use of solvents containing benzene. The regulatory scenario has only recently indicated the need to provide monitoring networks with automatic benzene monitoring instruments.
The limit value for health protection, indicated by the recent MD 60 dated 2/4/02, assimilating European Directive 2000/69, is 5 μg/m³ for a mean annual value, to be reached by 1/1/2010. Figure 1.12 shows the percentage difference of annual values from the limit value, for all stations with data available for 2001. Over half the stations record values above the limit.

2. Biosphere

Introduction

Biosphere represents a set of interactions between the soil, rocks, water, air and the living organisms they contain, constituting a complex system – the terrestrial ecosystem – in a dynamic balance with Earth's other components. In tackling problems, a reductive approach (i.e. investigating a single part of the system, while keeping surrounding conditions constant) cannot be adopted, and holistic investigation methods are required, aimed at understanding the whole.
Given the strong inter-relations existing both within and with other topic areas, the biosphere-related indicators presented consequently concern different themes that are only apparently distant and unrelated.
In particular, these indicators have been selected in an attempt to represent the main problems connected with the preservation of biodiversity, with the institution of parks and protected areas, and with the safeguarding of forests and the countryside.
The availability of a good database and the ability to represent effectively the impacts of environmental management decisions are two further criteria adopted for the selection.

INDICATOR: Overall Number of Animal Species Threatened

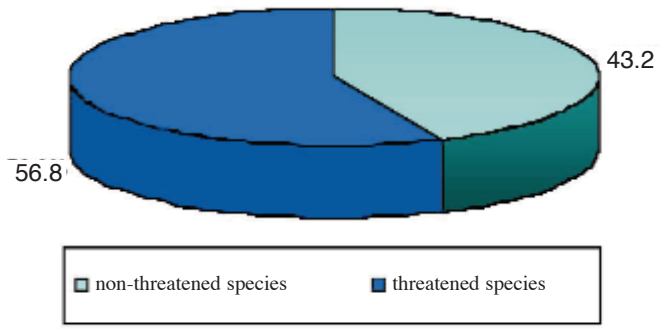
Table 2.1: Proportion of Vertebrates Included in Red Lists Considering All Categories of Threats

Class	Amphibians	Reptiles	Birds	Mammals
n° species present in Italy	38	58	250	126
n° species threatened	31	31	122	61
% species threatened	81.6	53.4	48.8	48.4

Source: prepared by APAT on data from Bulgarini F., Calvario E., Fraticelli F., Petretti F., Sarrocco S. (eds.), 1998. *Libro rosso degli animali d'Italia: vertebrati*. WWF Italia, Roma; Ministry of the Environment –Nature Conservation Department, 1998. *Checklist delle specie della fauna italiana - fascicolo 110 – vertebrati*; Brichetti P., 1997. *L'avifauna nidificante*. In: Brichetti P. & Gariboldi A. Manuale pratico di ornitologia – Ed agricole, Bologna: 259-267; Calvario E., Gustin M., Sarrocco S., Gallo-Orsi U., Bulgarini F., Fraticelli F., 1999. *"Nuova Lista Rossa degli Uccelli Nidificanti in Italia"*. LIPU & WWF (by) - Riv. Ital. Orn., Milano, 69 (1): 3-43.

Table 2.1 shows the particularly high level of threat to which vertebrates are subject in Italy. The conservation problem appears to be particularly serious for amphibians, probably owing to the deterioration and disappearance of the wetlands with which they are mainly connected for their biological cycle.

INDICATOR: Overall Number of Vegetal Species Threatened

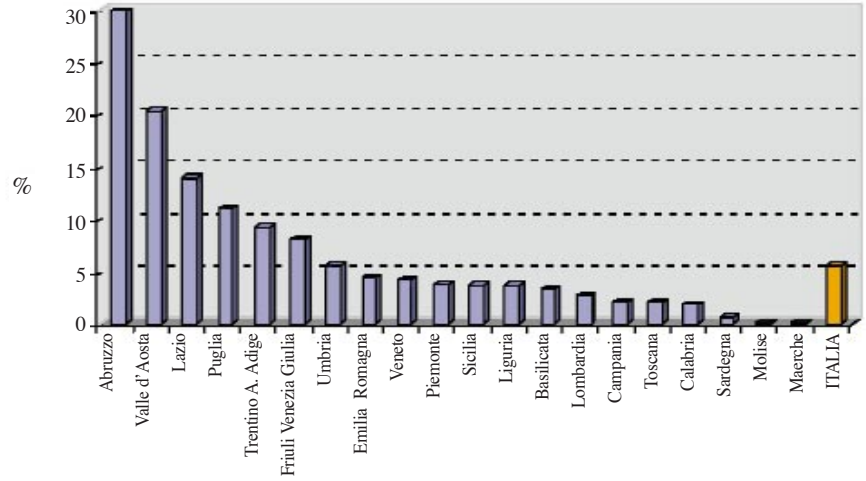


Source: Pignatti S., 1982. "*Flora d'Italia*"; WWF Italia - Min. Ambiente SCN, 1997. *"Libro Rosso delle Piante d'Italia"*.

FIGURE 2.1: Percentage Split of Italian Tracheophytes (*Tracheophyta*) according to IUCN threatened categories

More than half the Tracheophytes (Pteridophytes, Gymnosperms & Angiosperms) of the Italian flora are threatened. The danger is particularly high for Pteridophytes (89.6% of species threatened), to be related to the advanced state of degradation of the wetlands in which they vegetate. The Gymnosperms are also subject to considerable threat (63.3%), whereas the Angiosperms are in the same position as Tracheophytes as a whole (56.1%).

***INDICATOR:* Special Protected Areas (SPA)**

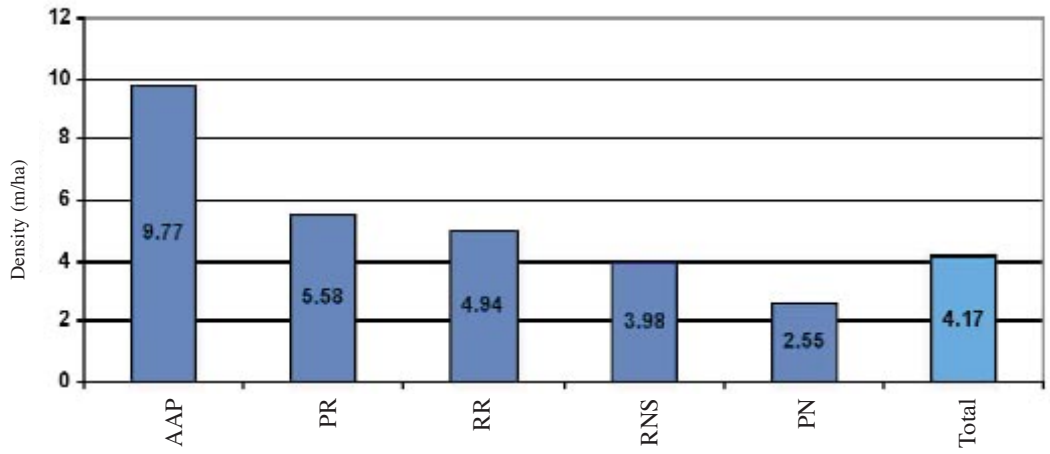


Source: Prepared by APAT on Data from the Ministry of the Environment

Figure 2.2: Special Protection Areas as a Percentage of Total Regional Surface Areas. (2000)

The Special Protection Areas were set up following the issue of the Birds Directive (Dir.79/409/EEC), relating to the conservation of wild birds deemed worthy of protection. Italy has set up a total of 335 SPAs covering a total of over 1,600,000 hectares (5.6% of national territory). Only six regions are over the national average (Abruzzo, Valle d'Aosta, Lazio, Puglia, Trentino Alto Adige and Friuli Venezia Giulia), while Umbria is at the same level. From 1997 to 2000 there was a 107% increase in SPAs, leading to a positive assessment of the institutional response to the requirements of the European Union, although the target fixed by the Directive has not yet been reached.

***INDICATOR:* Pressure from Communication Infrastructures on Protected Areas**



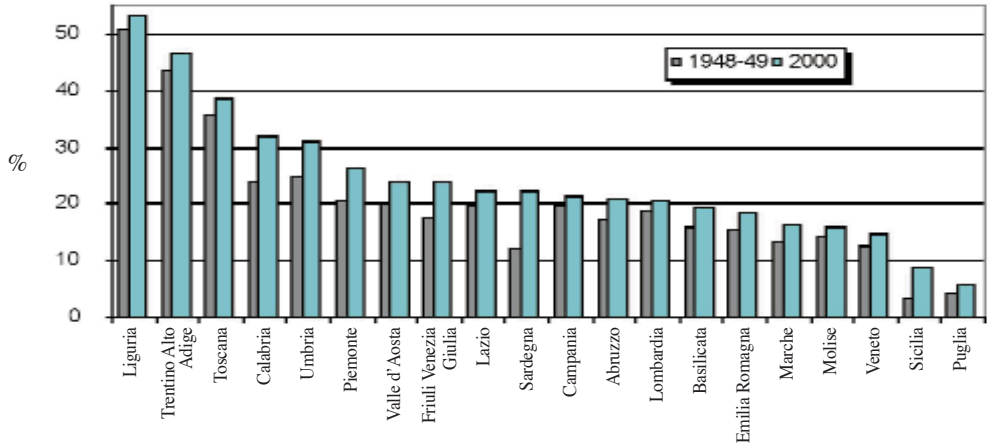
Source: ISTAT,1997; prepared by APAT on data from the Official List of Protected Areas (2001); TELEATLAS, 1999

Figure 2.3: Density of Communications Infrastructures per Typology of Protected Area

With reference to the classification indicated in the Official List of Protected Areas (III Updating 2001), the graph shows that the "Other Protected Areas" (AAP) is the category with the greatest infrastructure density as compared to "National Parks" (PN), which shows a decidedly low pressure value. Contrary to expectations, this latter value is even lower than that of the "State Nature Reserves" (RNS). This probably has to do with the often small size of the reserves, which put a value on road systems. Similarly, the high value for "Other Protected Areas" (AAP) can be explai-

ned by their reduced size. Intermediate values are found for “Regional Parks” (PR) and “Regional Reserves” (RR).

INDICATOR: **Forest Coverage: status & variations**

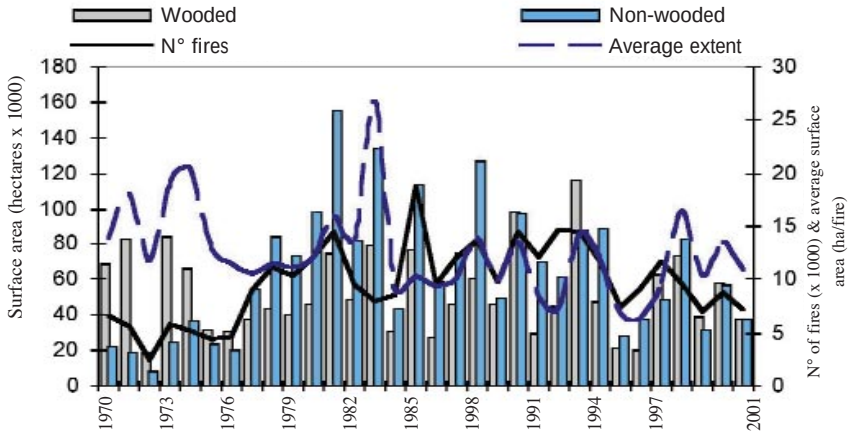


Source: Prepared by APAT on ISTAT data

Figure 2.4: Regional Forested Area Index. Values 1948/49-2000

The regional forested area index, meaning the ratio of forest coverage to regional territory, has seen a general increase from the post-war period to the present. The national average has risen from 18.6% in 1948/49 to 22.7% in 2000, demonstrating a gradual, though continual, increase in Italian forest areas.

INDICATOR: **Extent of Forest Fires**



Source: State Corps of Foresters – archivio Servizio Anticendi Boschivi

Figure 2.5: Forest fires in Italy: average area and annual number of fires events. Period 1970 - 2001

An overall examination of the data from 1970 to 2001 shows a fluctuating trend for this phenomenon, with peak years and subsequent attenuation. It should be observed, however, that there was a critical period in the mid ’eighties, followed by years in which the phenomenon remained at a relatively high level, with a slight falling off in the last few years.

ENVIRONMENTAL DATA YEARBOOK - SUMMARY

3. Hydrosphere

Introduction

The Hydrosphere covers two-thirds of the Earth's surface. Water is an essential element in the life of mankind and is the vehicle adopted by all ecosystems for exchanging substances and energy, through the water cycle that develops between the Earth's surface and the atmosphere.
Water performs a fundamental task in modelling the landscape through continuous geomorphologic action, and is an important climate factor, regulating rainfall and marine currents by means of its phase changes.
In the water cycle, water as a resource is subject to changes of composition due to natural causes and to the effect of anthropical activities, giving rise to ever greater and often irreversible pollution phenomena.
Water resource status is described through a selected set of indicators relating to three environmental themes: the quality of water bodies, the pollution of water resources, and water uses.
The indicators refer to inland surface water, coastal marine water and ground-water. This summary refers only to the first two water body types.

The Quality of Water Bodies

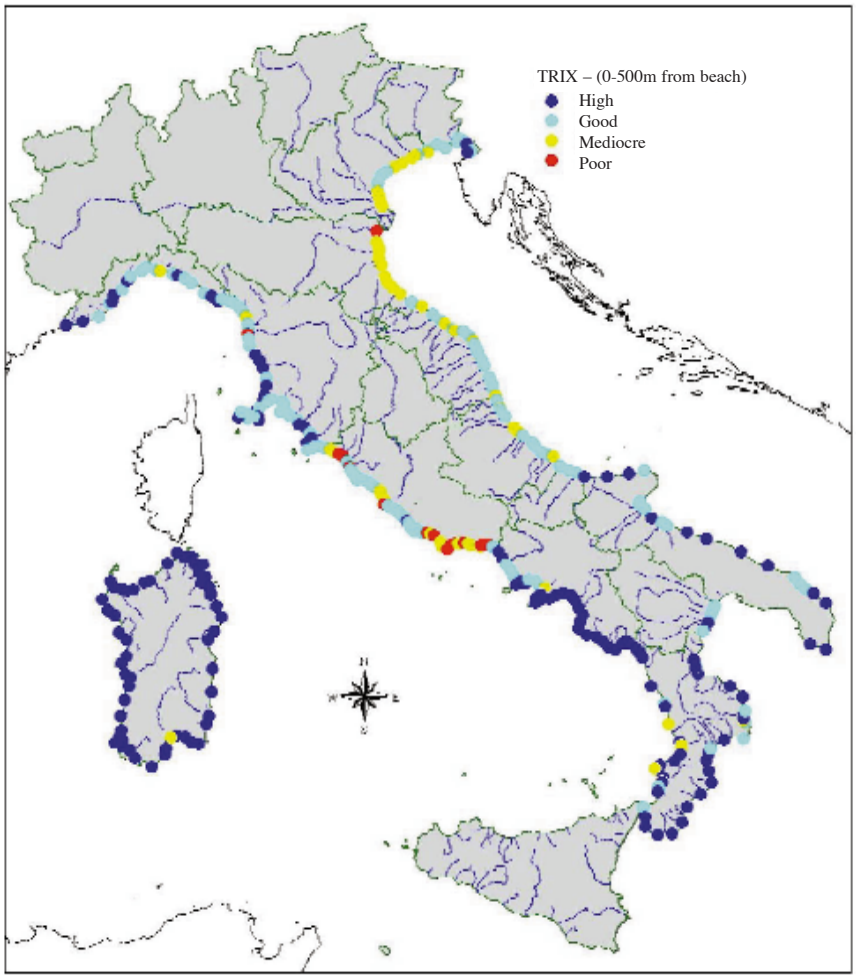
Quality of Marine-Coastal Waters

Knowledge and assessment of the quality of marine coastal waters is an essential condition for the proper management of marine resources, particularly for Italy, with 8000 km of coast, densely populated and greatly impacted by economic (industry and transport) and socio-cultural (tourism) activities.
Coastal waters are the main interface between pressure factors located on the coast or in the immediate inland and the great ocean spaces, towards which the rivers first and then sea currents carry and diffuse the related effects. Moreover, it is in this restricted stretch of sea that the most complex marine ecosystems develop (prairies of *Posidonia*, coralligenous, etc.), there the most fundamental stages of the processes that regulate ocean life take place (reproduction areas, deep water upwelling, etc.) and, definitively, there is the greatest level of biodiversity: all this makes these waters particularly important and sensitive to change.

Quality of Surface Waters

The quality status of water bodies can be assessed both on the basis of their specific final use (waters suitable for fish shellfish, drinking water and bathing water) and by an evaluation of their ecological status (SECA). The assessment of the quality of water according to their final use, specially in the case of drinking and bathing uses, allows us to evaluate the required measure to improve compliance. The Ecological Quality status of rivers defines the condition of a water body capable of recovering its natural condition by itself and of sustaining extended and well –structures animal and vegetal communities. Good ecological status allows any use of such water with reduced treatment.

INDICATOR: **TRIX Trophic Index**



Source: prepared by APAT (CTN_AIM) on Si.Di.Mar data. (Ministry of the Environment and land Protection)

Figure 3.1: TRIX, coastal water quality classes, on 2-year averages 1997-98 up to 500 m from the beach

The trophic status (quantity of phytoplancton biomass and nutrients) of coastal sea waters, caused by nutrients carried down from river basins, is shown by the TRIX index.

The TRIX index value for the whole coastal stretch (Figure 3.1) demonstrates that locations with the highest trophic status (poor status) are mainly concentrated along the Tyrrhenian coasts, the intermediate ones (good or mediocre) being located along the Tyrrhenian and Adriatic coasts. In proportion to the stations, however, the Adriatic regions are those on the whole showing the highest percentage values tending towards eutrophy, with over 80% of the stations ranging from good to mediocre status. On the Tyrrhenian coast, on the other hand, although with a few poor cases (10% in the first 2-year period), almost half its stations show a high status. In the case of the Ionian Basin and the Sardinian coasts, all sites show low trophic conditions and consequently a high trophic status.

In detail, only two regions, Emilia Romagna and Lazio, show decidedly high TRIX values – over 6 – corresponding to poor status. In the case of Emilia Romagna, the cause is a well-known phenomenon of eutrophy, whereas for Lazio further investigations and data validation are deemed necessary.

The remaining part of the Italian coast seems to enjoy a *good* or *high* trophic status, with the exception of areas with particular problems, such as river deltas and coastal strips with major urban and/or industrial agglomerations: Genoa, Viareggio, Leghorn, Piombino, the Gulf of Naples, Pescara, Ancona, Ravenna, Cagliari.

INDICATOR: *Sea-Bathing Status*

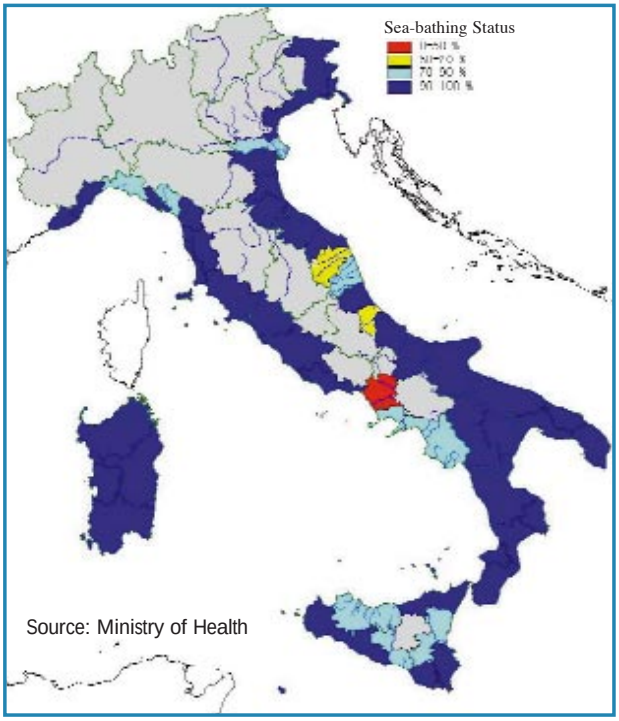


Figure 3.2: Sea-Bathing status (% of suitable locations of those monitored) in the coastal provinces at the end of the 2000 bathing season

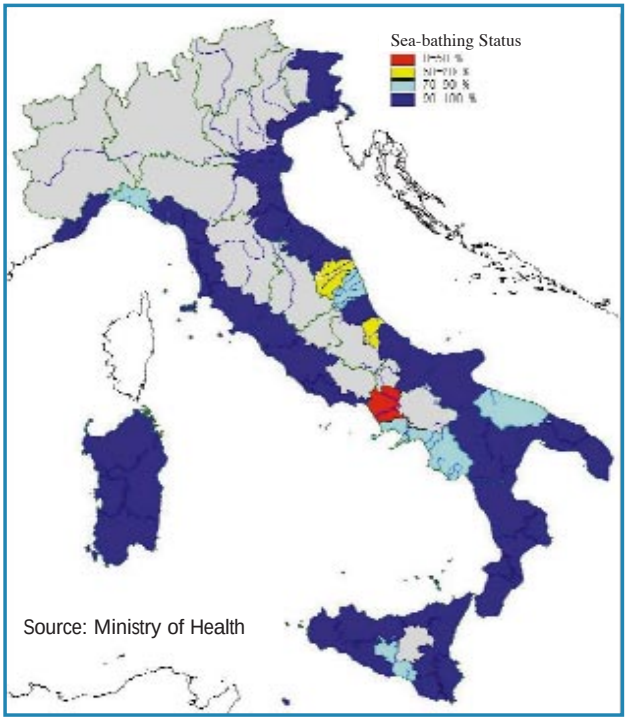


Figure 3.3: Sea-Bathing status (% of suitable locations of those monitored) in the coastal provinces at the end of the 2001 bathing season

According to regulations (PD 470/82), at the end of each bathing season, the suitability of the bathing is determined for the next season. As a rule, this depends on water quality, especially from a micro-biological point of view, and is in all cases a direct consequence of the presence of more or less widespread and persistent pollution phenomena.

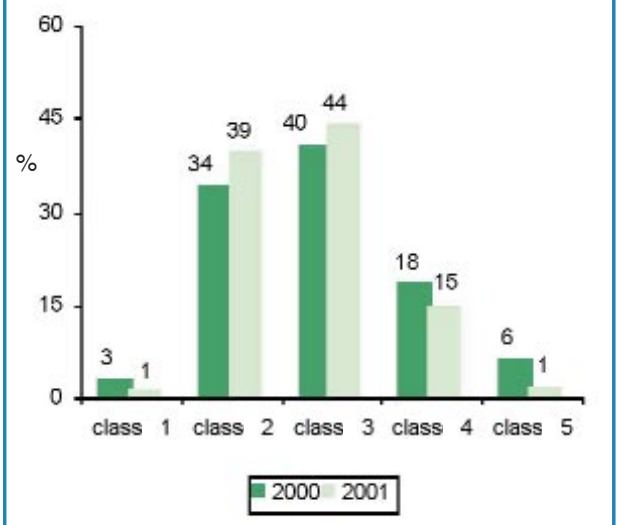
The bathing suitability of the sampling areas (points) aims at safeguarding bathers' health, and any decrease is a sure sign of the degradation of water resources from the point of view of utilisation (recreational, touristic, bathing, economy) and of the impact of related human activities.

The impacts highlighted by this indicator relate only to sea-bathing waters and can be noted only in some areas in which the water quality (TRIX and IQB – Index Batteriological Quality) is found to be insufficient. This means that there is no necessary relation between environmental conditions and health protection, and – at the same time – poor environmental quality does not necessarily indicate any immediate risk for public health.

Indeed, this is so in cases of major environmental degradation such as the Caserta coastal area, in some areas of the province of Salerno and in the neighbourhood of Pescara (-3.3). Better sea-bathing status, although always with some problems, can be found in the Gulf of Naples around Genoa, in the province of Bari, in some areas of Sicily (Gela,.) and in some stretches of the Marches coastal strip (provinces of Macerata and Ascoli Piceno).

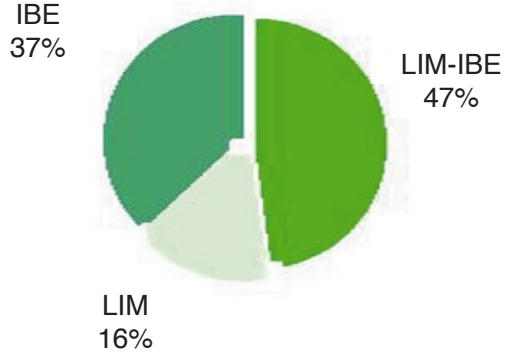
As a rule, it may be stated that most of the Italian coastline enjoys excellent sea-bathing status, with 90% suitability in almost 84% of the municipalities and 70% sea-bathing in 94% of the municipalities.

INDICATOR: Ecological Status of Water Bodies (SECA)



Source: prepared by APAT (CTN_AIM)

FIGURE 3.4: percentage distribution of SECA in the respective quality classes



Source: prepared by APAT (CTN_AIM)

FIGURE 3.5: percentage distribution of SECA, LIM and IBE indices for 2001

The Ecological Status of rivers is determined by integrating the Pollution Level by Macrodeterminand (LIM) – represented by Dissolved Oxygen, BOD_5, COD, NH_4, NO_3, Total Phosphorus, *other Phosphates, Escherichia coli* – with the Extended Biotic Index for Macroinvertebrates (IBE).

The environmental target fixed by national regulations is to achieve "good" waterbody quality status within 2016.

SECA defines five classes of decreasing quality: class1 = high, class 2 = good, class 3 = moderate, class 4 = poor, class 5 = bad.

In 2001, data was processed from the following north Italian regions: Valle d'Aosta, Lombardia, Veneto, Friuli Venezia Giulia, Liguria, the autonomous provinces of Trent and Bolzano and, in central Italy, Abruzzo, Emilia Romagna, Lazio, Marche, Molise, Tuscany and Umbria.

The summary provides only data from Northern and Central Italy, which is the most relevant from a statistical point a view.

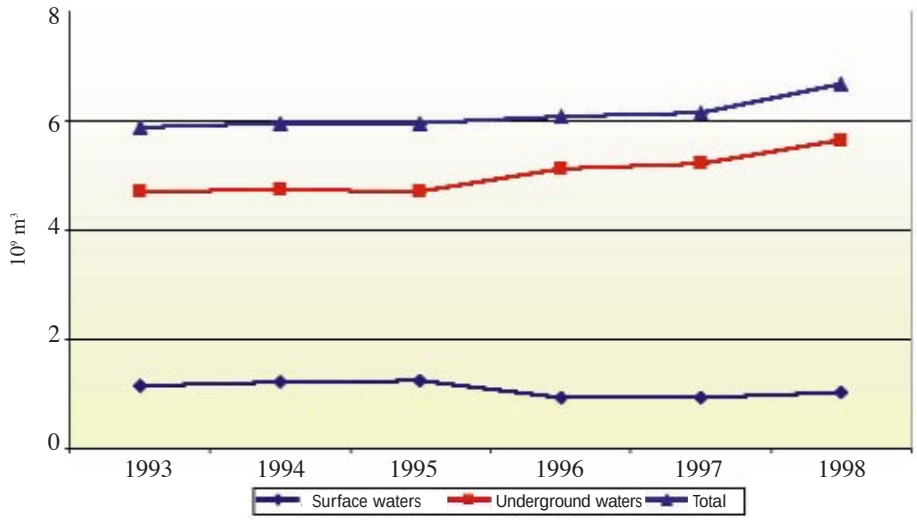
The SECA index has been calculated only where it was technically possible to do so: on 356 stations relating to 115 waterbodies referring to the main national water basins.

According to 2001 data, the Ecological Status of Rivers in Northern/Central Italy shows good and moderate status in 79% of monitored rivers (SECA class 2 & 3) while 15% of monitored sites show a poor status (SECA Class 4) and only 1% shows high or bad.

Figure 3.5 shows the percentage distribution of the SECA, LIM and IBE indices for 2001. It can be noted that the IBE (biological quality status referring to macro-invertebrates) is the index that has had most impact in determining the SECA class, with 37 % as compared to LIM with only 16%, whereas for the remaining 47% LIM and IBE are identical.

Water Resources for Sustainable Uses

***INDICATOR*: Water Abstraction for Drinking Purposes**



Source: Prepared by APAT on data from the Health Ministry, Prevention Department

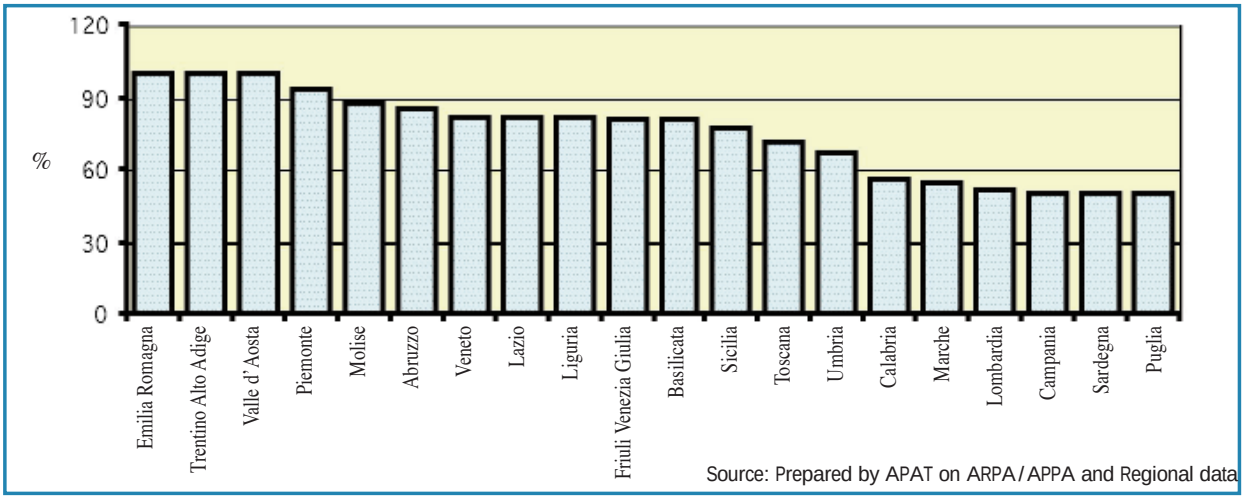
Figure 3.6: Source of Drinking Water Supply 1993 – 1998.

The indicator selected for this topic gives a measure of the quantitative impact of the abstraction of surface and groundwater for drinking purposes. The indicator is of prime national importance for the excessive abstraction of groundwater for drinking purposes (Figure 3.6).
Excessive abstraction of groundwater leads to over-exploitation of the water-bed with possible salinisation consequences for the latter in coastal areas.

Pollution of Water Resources

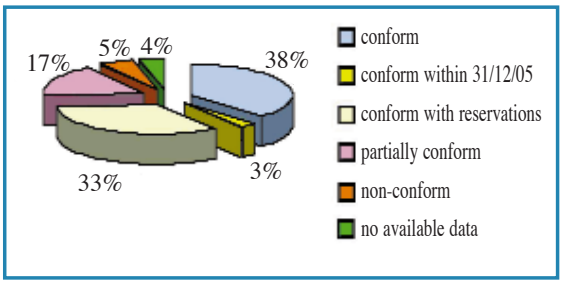
Pollution of water resources owing to civil, agricultural and industrial activities is the main pressure on the resources' quality status.
Among the most important measures for containing and abating such pressures, the development of sewers and waste water treatment must be considered..

***INDICATOR*: Waste water treatment: compliance of urban waste water sewer systems**

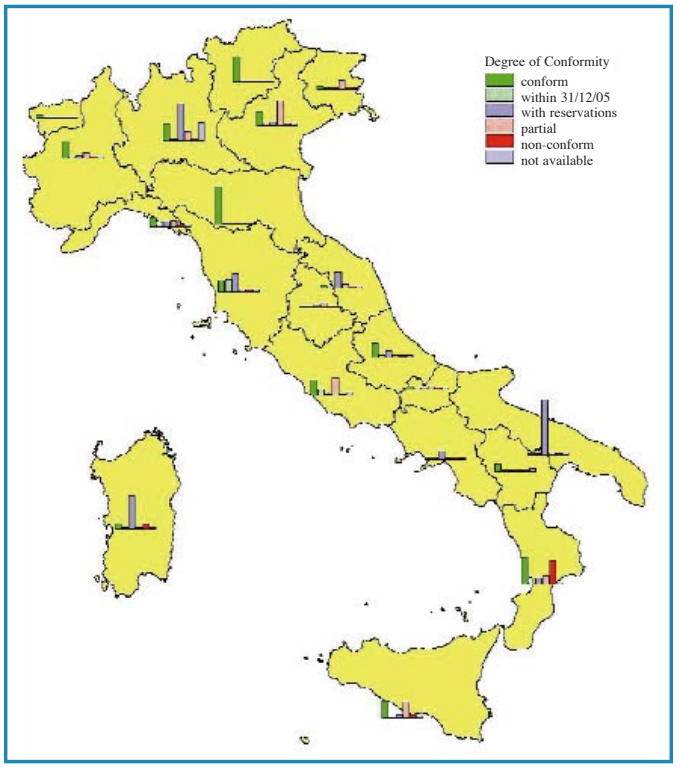


Source: Prepared by APAT on ARPA/APPA and Regional data

Figure 3.7: Integrated Index for urban waste water sewer systems - National Data



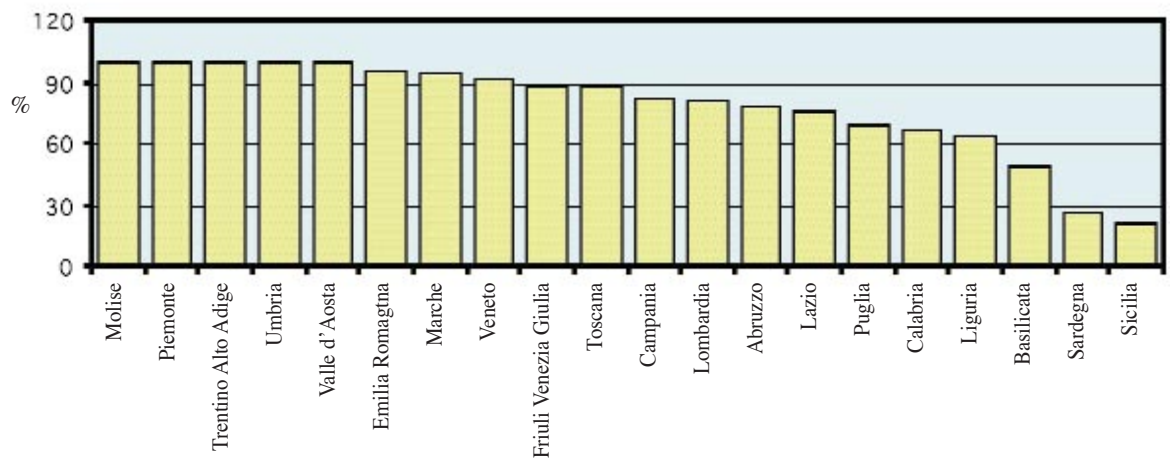
Source: Prepared by APAT on ARPA/APPA and Regional data



Figures 3.8 – 3.9: Degree of sewer compliance for agglomerates with over 15,000 inhabitant equivalents - National Data

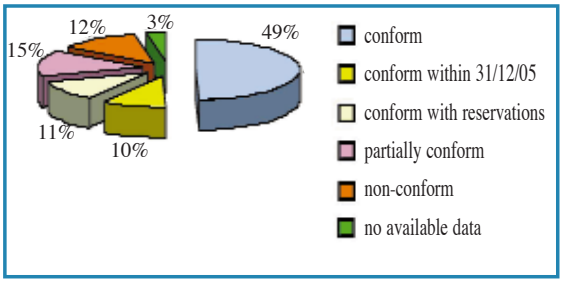
The indicator estimates compliance with regulatory requirements for existing urban waste water sewer systems in Italy. To date, information is available for agglomerates with over 15,000 inhabitant equivalents, since current regulations make their adaptation mandatory within 31 December 2000.
In order to assess the "conformity of the urban waste water sewer system" of agglomerates according to regulations, the information utilised concerns the existence/absence of the sewer system and the degree of coverage.
In particular, an agglomerate is deemed: **compliant**, when its sewer system is capable of covering 90% of over; **compliant at the deadline of 31/12/2005**, when adaptation works have been planned that can be carried out in the coming 3 years; **partially compliant**, when its sewer system coverage is less than 90%; **compliant with reservations**, when its sewer system coverage has not been defined; **not compliant**, when it has no sewer system; **data unavailable**, in the absence of any information about the system.
The inventory takes into account 730 agglomerates with over 15,000 inhabitant equivalents served by sewer systems (Figures 3.8-3.9). The examination of available data shows that 661 agglomerates (91%) have sewer systems. Information about coverage is incomplete: 241 agglomerates (33%) provide no information. Among the set of agglomerates that provided information (420), 275 equal to 38% have a compliant system, 145 (20%), are partially compliant or compliant and only 20 of them (3%) are compliant with respect to the 31/12/2005 deadline.
According to the integrated index value for each region (Figure 3.7), 8 regions out of 20 show values ranging from 60 to 80%; 6 regions have an index equal or slightly over 50%. Only 3 regions (Valle D'Aosta, Trentino Alto Adige, Emilia Romagna) show a complete score.
However, the presented inventory is still on-going and does not therefore provide a complete national picture.

***INDICATOR*: Waste water treatment: compliance of urban waste water treatment systems**

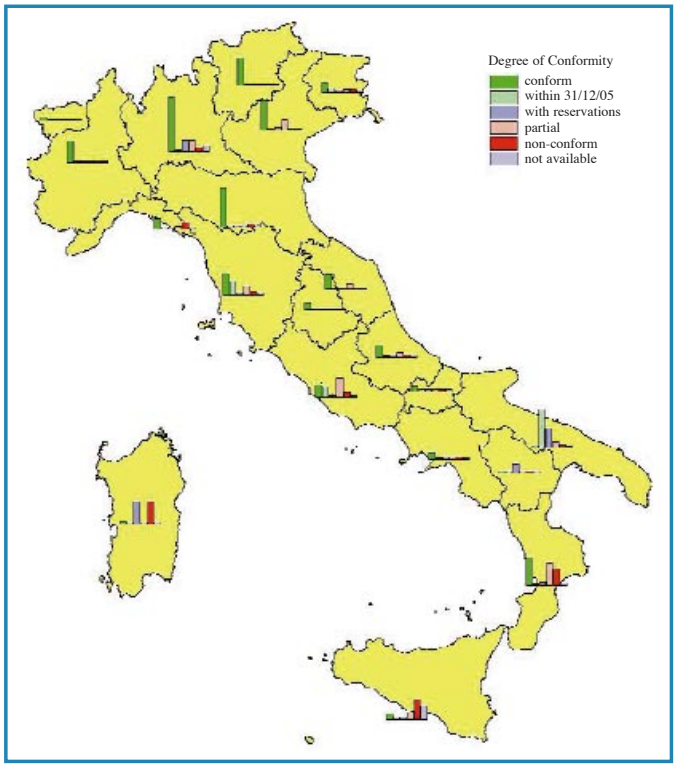


Source: Prepared by APAT on ARPA/APPA and Regional Data

Figure 3.10 Integrated Index for Urban Waste Water Purification Systems. National Data.



Source: Prepared by APAT on ARPA/APPA and Regional data



Figures 3.11 -3.12: Degree of Compliance of Wastewater Treatmant. Systems for Agglomerates with over 15,000 Inhabitant equiv - National Data

In order to assess the "compliance of the urban waste water treatment system" of an agglomerate according to regulations, the information utilised concerns the existence/absence of secondary treatment (or more advanced for discharges in sensitive areas), and the emission values of plants, in terms of pollutant concentration and percentage reduction. Such values, relating to BOD_5, COD, TDS parameters (and, for plants in sensitive areas, also total N and P), are compared with the standards indicated respectively in Tables 1 and 2 of Annex 5 to D.L.152/99 and amendments.

In particular, a built-up area is deemed: **compliant**, when its waste water treatment plant is provided with secondary treatment (or more advanced if in a sensitive area), with emission values within the limits established by law; **com-**

pliant at the deadline of 31/12/2005, when adaptation works have been planned that can be carried out in the next 3 years; **partially compliant**, when its waste water treatment plant is equipped with secondary treatment (or more advanced if in a sensitive area), with emission values within the limits established by law, but not covering the entire requirements of the area itself; **compliant with reservations**, when its waste water treatment plant is equipped with secondary treatment (or more advanced if in a sensitive area), but with emission values that have not been defined; **not compliant**, when the plant is not provided with secondary treatment (or more advanced if in a sensitive area), or else is provided with the said treatment, but with emission values not within the limits established by law; **data unavailable**, in the absence of any information about the purifier.
In order to summarise all the information relating to the compliance of the infrastructures to legal requirements, an integrated index has been adopted, expressing in percentages for each region the compliance of the sewer system serving agglomerate with over 15,000 inhabitant equivalents. In order to construct the index, the various conformity classes have been weighted.

The following table indicates the weights assigned to each class:

Classes	Weight
Compliant	1
Compliant at the deadline of 31/12/2005	0.80
Compliant with reservations	0.50
Partially compliant	0.75
Not compliant	0
Data unavailable	0

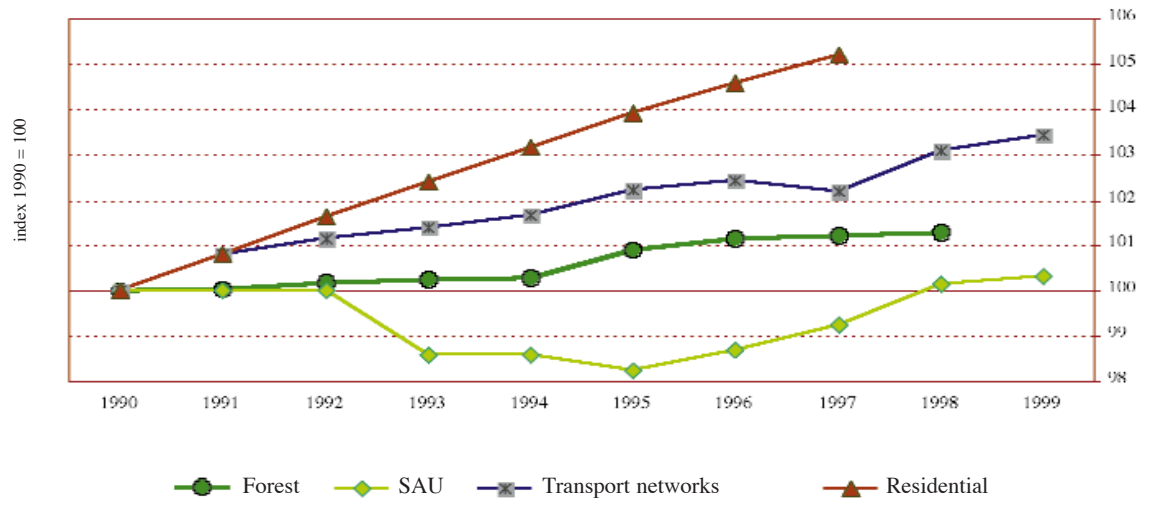
With regard to the waste water treatment system compliance index, so far – following a similar methodological approach – the waste water treatment systems serving 730 agglomerates with over 15,000 inhabitant equivalents have been surveyed (Figures 3.10-3.11). An examination of the available results shows that 361 agglomerates (49%) are provided with conforming treatment systems, i.e. capable of ensuring waste water treatment needs. For 107 agglomerates (15%), the treatment level satisfies only part of waste water treatment needs, while for 91 areas (12%) it is wholly insufficient. Only 72 agglomerates (10%) have communicated the date within which the waste water treatment system will be adapted to regulatory requirements. Lastly, 77 agglomerates (11%) are compliant with reservations, since the related emission values are not available.
With reference to the values given by the integrated compliance index for each region (Figure 3.12), 6 regions out of 20 have values ranging between 50 and 80%, while 7 regions have a compliance index of over 80%. Only 5 regions (Piedmont, Valle D'Aosta, Trentino Alto Adige, Umbria and Molise) achieve full marks.

4. Geosphere

Introduction

The recent document by the European Commission on soil protection – COM (2002)179 – highlights the major problems involving European soils, which are similar, even with the peculiarity and enormous diversity of our territory, to those in Italy: erosion - especially owing to water, local and diffuse contamination, soil loss owing to impermeabilisation, surface and depth compaction from use of machinery, loss of organic matter, decreasing biodiversity, salinisation, hydrogeological risk as shown by landslides and flooding.
The European document strongly advocates the need for a soil monitoring network, capable of providing reliable and comparable data, also with a view to creating and updating the indicators describing soil quality, the degree of contamination and degradation, and land use.
Without such a network, only those indicators presented for this theme can be constructed. These indicators, assessed together with linked indicators indicated in the chapters on anthropogenic risk and industrial risk, as well as in the paragraph on agriculture in the production sectors chapter, attempt however to provide a sufficiently clear picture of the current situation.
Soil protection law targets are currently rather generic, both at European and national levels, and may be summarised as follows: the Common Agricultural Policy (CAP), aiming at less intensive agriculture, with a more balanced use of organic and inorganic fertilizers and phytosanitary products, towards more sustainable land use, avoiding excessive soil exploitation and loss of impermeabilisation due to urban areas and infrastructures, closer monitoring of erosion and desertification phenomena, and the need to remedy local and diffuse contamination.

INDICATOR: **Land Use**

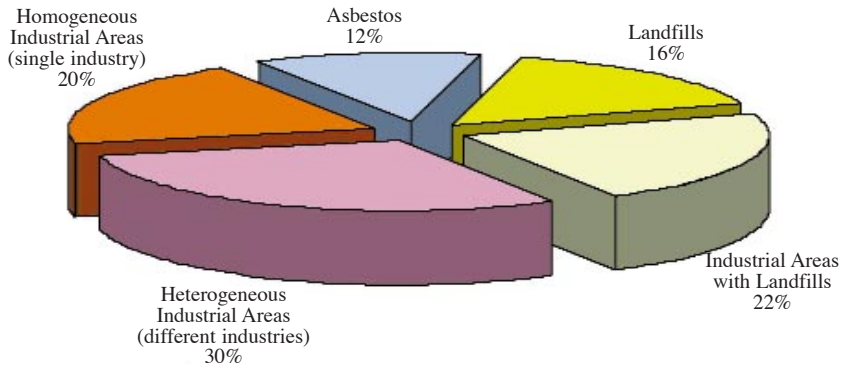


Source: Prepared by APAT on ISTAT data

Figure 4.1: Land Use Evolution (Utilised Agricultural Surface Area (SAU), forests, transport networks, residential) from 1990 (index 100) to 1999

One measurable performance is the evolution of land use through the measurement of surface areas destined for intensive agriculture, surface areas impermeabilised by the expansion of urban centres, road and railway infrastructures. Such *trends* (figure 4.1) show a clear picture of the increase in surface areas dedicated to urbanisation and infrastructures.

INDICATOR: Contaminated Sites of National Interest



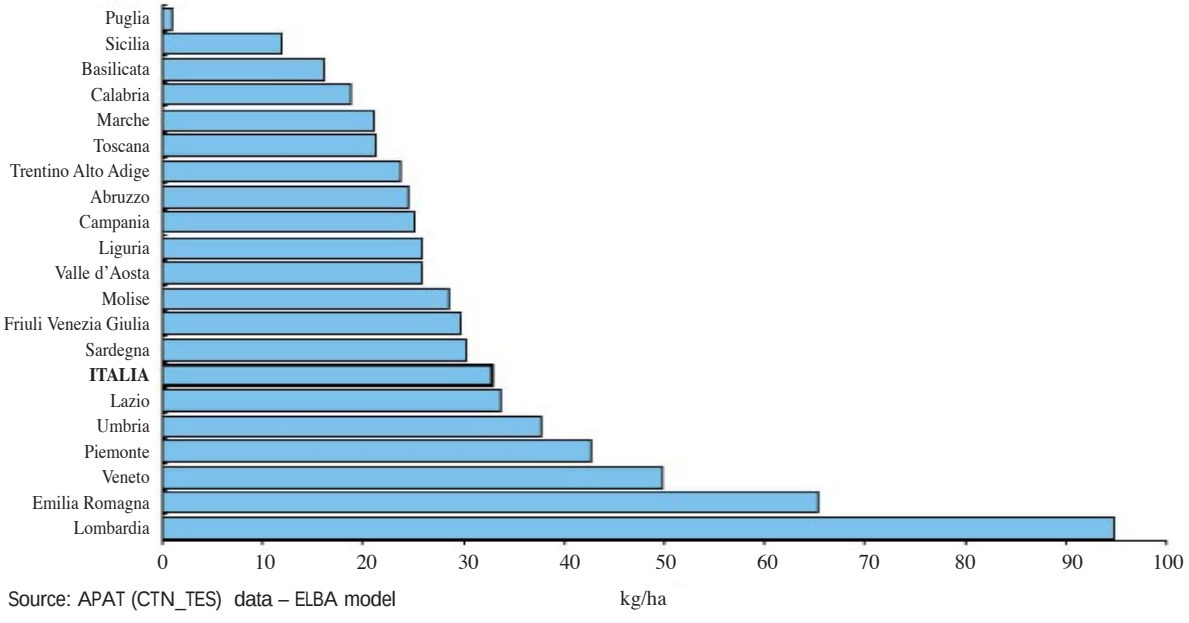
Source: APAT (CTN_TES) on data from the Ministry of the Environment, the Regions and ARPA/APPA

Figure 4.2: Sites of National Interest – Split per Typology

The Regional Inventories set up by MD 471/99 provide – for the time being – incomplete results concerning the number and characteristics of contaminated and remediated sites. Important information on this theme is however provided by the data for contaminated sites of national interest, covered by MD n° 468 dated 18 September 2001, (National Environmental Remediation and Restoration of Polluted Sites), recently assimilated by Act n° 179 dated 31 July 2002 (Environmental Regulations).
In Figure 4.2, the sites are subdivided according to their main characteristics. A net predominance of industrial areas can be noted, part abandoned and part active, as compared to discharges and to areas contaminated by asbestos. Among the industrial areas, the mainly heterogeneous predominate, comprising different kinds of production activities, over areas with a single industry and those characterised by a considerable number of landfills. This data agrees largely with European indications, which identify "*brownfields*" as one of the major environmental soil problems.
At cost level, limiting considerations to the 41 sites included in MD 468/2001, the overall estimate for remediation costs amounts to € 3,149.30 millions, as compared to overall funding provided by various Acts – including both capital and interest – of € 547.34 millions, i.e. 17.4% of required expenditure.

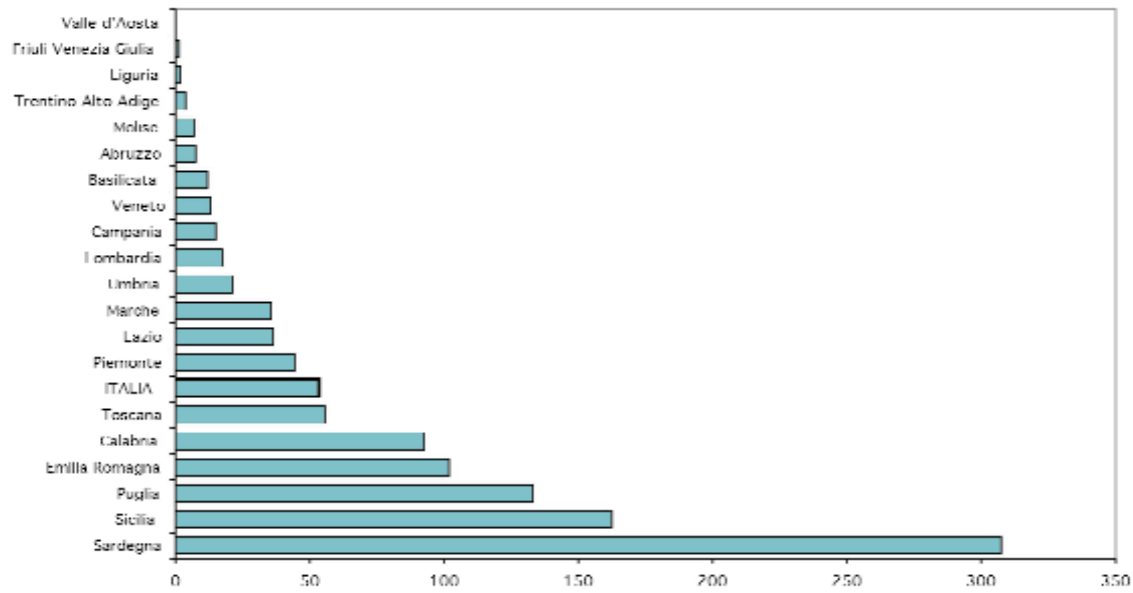
INDICATOR: Areas Used for Crops with Low Environmental Impact

INDICATOR: Livestock and manure



Source: APAT (CTN_TES) data – ELBA model

Figure 4.3: Nitrogen Surplus in kg/ha of SAU, year 1998

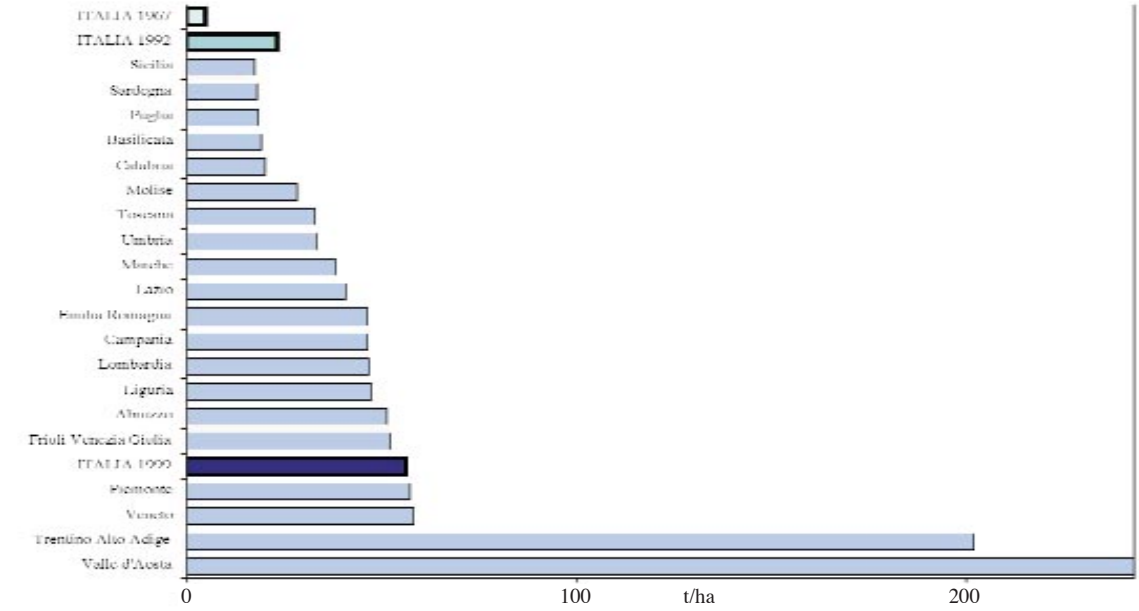


Source: Biobank data

Figure 4.4: Areas used for Biological Agriculture per region, year 2000

With regard to soil quality and diffuse contamination, data concerning the content of heavy metals in the soil is still incomplete and difficult to assess. On the other hand, it is interesting to assess the data on nitrogen surplus (Figure 4.3), indicating an unbalanced organic and inorganic fertilization, and on biological agriculture (Figure 4.4), certainly the most effective response to this problem, as well as to all contamination problems generally speaking. Other indicators not shown here, such as sales of phytosanitary products and fertilizers, and areas used for intensive agriculture, confirm the intensive characteristics of Italian agriculture, although positive signs are beginning to emerge from an environmental point of view.

INDICATOR: Soil Compaction Risk Related to the Number & Size of Agricultural Machinery



Source: Prepared by APAT (CTN_TES) on ISTAT data

Figure 4.5: Weight Summatory per Region, year 1999 (t/ha of SAU)

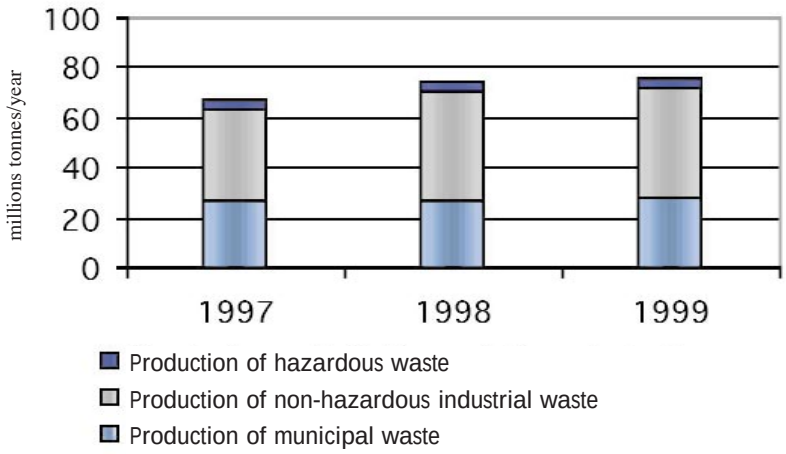
Physical soil degradation can be effectively represented by actual erosion risk and areas susceptible to desertification. It may also be interesting to assess compaction risk through an indirect estimate of the weight of agricultural machinery. Figure 4.5 shows the weight summatory for operating machinery in tonnes per hectare of SAU. This weight summatory has greatly increased from 1967 to 1999. Regional data, excluding Trentino Alto Adige and Valle d'Aosta, where the value is largely influenced by the small SAU surface areas, shows very high weight summatory for Piedmont and Veneto, but in particular highlights the fact that, for almost all regions, the 1999 values are higher than the national average for 1992.

5. Waste

Introduction

For years, waste has on the whole been the subject of much attention from political decision-makers and the public, since waste is in continuous growth giving rise to increasing pressure on the state of the environment. On September 10th 2002, the European Community instituted the VIth Environmental Action Program (EAP) - Decision n° 1600/2002/CE -, which sets out major priorities and objectives for EU environmental policy over the next 10 years, identifying natural resources and waste as one of the four priority areas.
At national level, the waste sector is governed by Legis. D. 22/97 and its subsequent amendments and integrations, together with the decrees of implementation already published and the environmental annexes to the budgets for 1999, 2001 and 2002. The decree restates the fundamental principles of the Community strategy (prevention, recovery of material and energy, and final disposal) and disciplines the whole waste cycle. Great emphasis is laid on the availability of information for the purpose of planning and control.
The National Waste Inventory has been instituted pursuant to art. 11 Legis. D. 22/97, subsequently disciplined by implementation decree n° 372/98. The aim is to ensure a complete and constantly updated information system through a data collection system based on a compulsory declaration (MUD), as per Act 70/94.
Much of what is established therein is a concrete reality today. In particular, the works of the national section of the Italian Waste Inventory and Italian Topic Centre (CTN), in their first three years of activity, have put into operation I.T. tools for the processing and management of data from the Environmental Declaration Forms [Modello Unico di Dichiarazione ambientale MUD], have set up I.T. standards for the recovery of the said data and have defined a core set of indicators for the waste sector, divided into three topics: generation, management and packaging.
The indicators presented here have been extracted from this set and selected for their meaningfulness and the availability of data and time series.

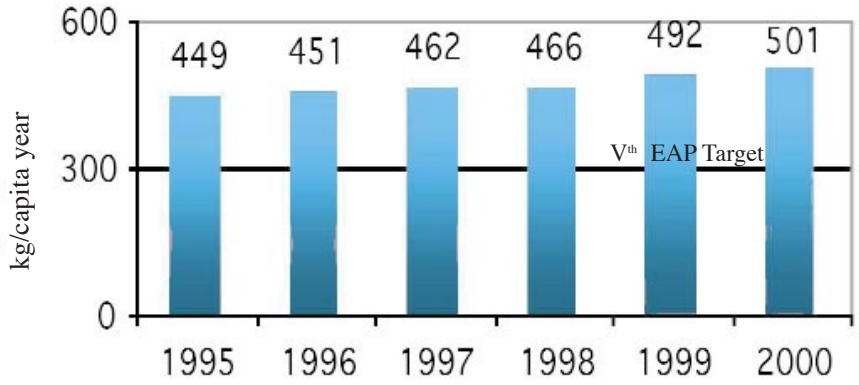
INDICATOR: Total generation of waste by main categories



Source: APAT - ARPA National & Regional Sections of the Waste Inventory

Figure 5.1: Generation of total waste by main categories – Years 1997- 1999

The total quantity of waste generated in 1999, amounting to 77,019,804 tonnes, is 2.9% higher than for the previous year, amounting to 74,822,641 tonnes. The increase of more than 2 million tonnes is due mainly to the generation of municipal waste, rising from 26,845,726 tonnes in 1998 to 28,363,914 tonnes in 1999. For industrial waste, the increase is more contained, 48,655,890 tonnes in 1999 compared to 47,976,915 tonnes in 1998. Generation of hazardous waste, on the other hand, decreases from 4,057,673 tonnes in 1998 to 3,811, 319 tonnes in 1999.

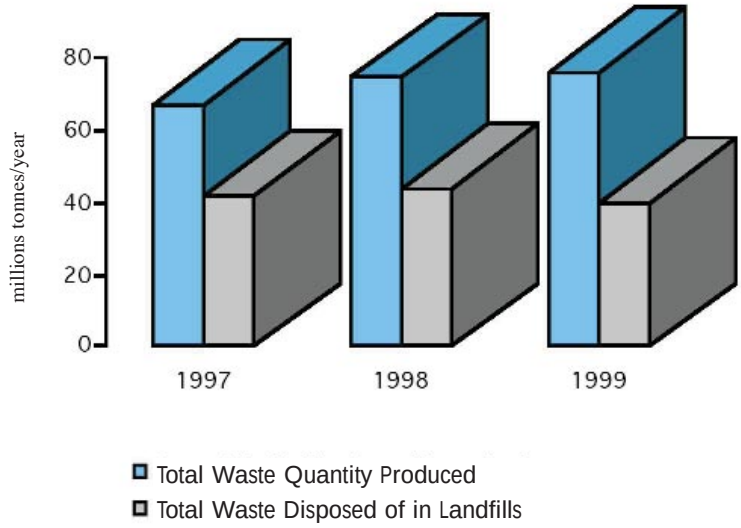


Source: APAT - ARPA National & Regional Sections of the Waste Inventory

Figure 5.2: Quantity of municipal waste generated *per capita* (kg/capita year)

The value of municipal waste generation for 2000, amounting to 28,958,545 tonnes, is almost the same as the 1999 value, 28,363,914 tonnes, with a per capita value of about 500 kg/capita year.
Although far from the targets fixed by the Vth EAP, the trend shows the growing attention paid to preventing waste generation, in line with current legislation.

***INDICATOR:* Waste landfilled, total and by main category**

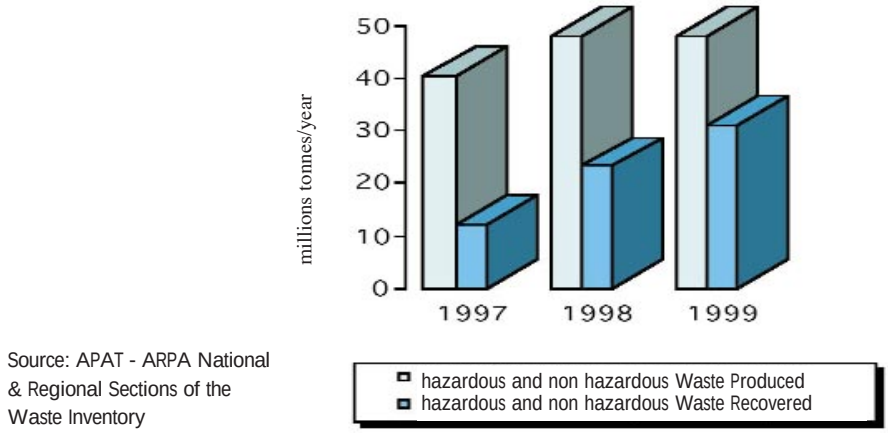


Source: APAT - ARPA National & Regional Sections of the Waste Inventory

Figure 5.3: Landfilled Waste compared to the total waste generated – Years 1997-1999

As compared to previous years, 1999 shows a decrease in landfill disposal, falling from a total value of 43,154,656 tonnes of landfilled waste in 1998, to 38,914,691 tonnes in 1999. The trend is thus in line with the target established by national and European standards, aimed at minimising recourse to final disposal.

INDICATOR: Industrial waste recovery

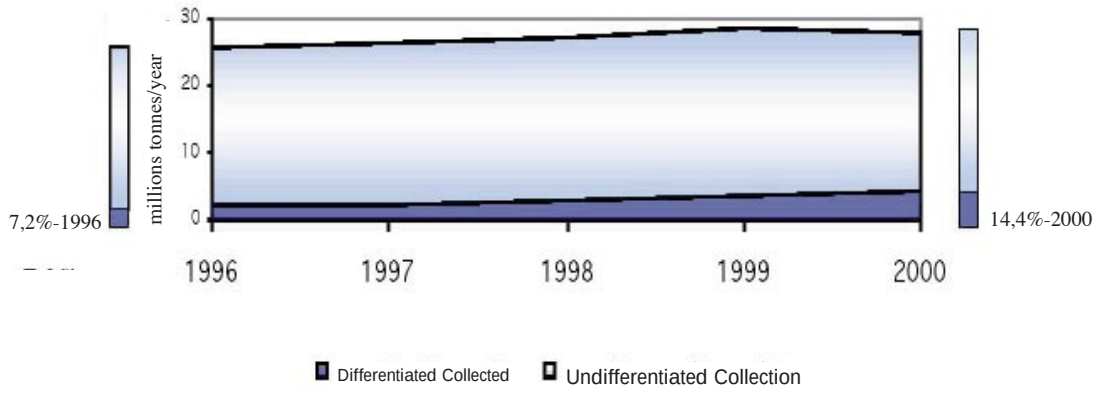


Source: APAT - ARPA National & Regional Sections of the Waste Inventory

Figure 5.4: Industrial waste recovered compared to the quantity generated – Years 1997-1999

The quantity of hazardous and non hazardous industrial waste recovered in 1999, amounting to 30,416,725 tonnes, continues the rising trend: as compared to the 1997 value of 12,293,069 tonnes, it shows an increase of about 150%. This is the result of the application of D.M. 5/02/98 on simplified procedures for the recovery of industrial non-hazardous waste.

INDICATOR: Municipal waste fractions collected separately



Source: APAT - ARPA National & Regional Sections of the Waste Inventory

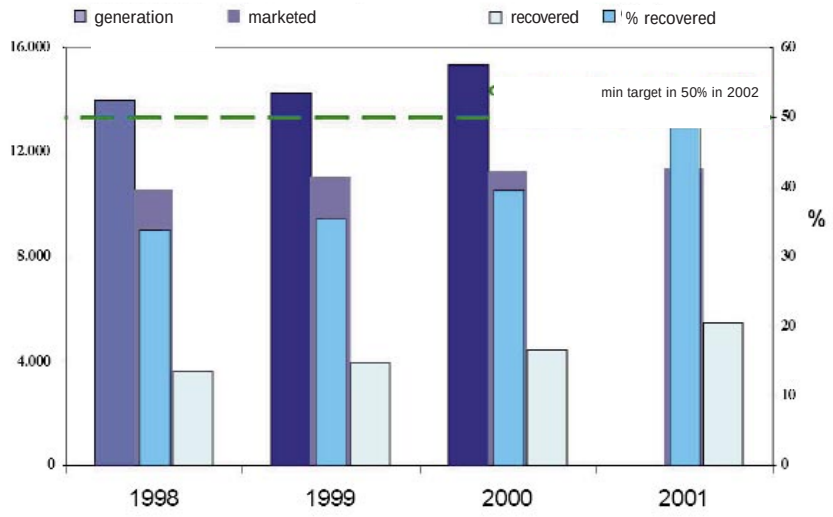
Figure 5.5: Municipal waste fractions collected separately over total municipal waste

The municipal waste fractions collected separately in 2000 equal 14.4% of waste generation, confirming the up trend of previous years (in 1996 this indicator was 7.2%). The national average is still far from the 25% target fixed by Legis. D. 22/97 art.24 subsection 1, for 2001. Indeed, although the northern regions are close to reaching the target, with an average of 24.4% (excluding Lombardy and Veneto where the target has already been reached), the central-southern regions are slow in aligning themselves. In particular, the central regions show an average of 11.4%, except for Tuscany with a percentage of 21.4%, whereas in the south the average decreases to a value of 2.4%.

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

***INDICATOR*: Packaging marketed, total and by material category**

***INDICATOR*: Packaging recovery by material category**



Source: General Prevention & Management Plan 2002 CONAI – Spinning Consortiums

Figure 5.6: Total quantity of packaging & recovery percentage quantities x 1000 tonnes

The total generation of packaging for 2000, amounting to 15,346,000 tonnes, shows an increase of 7.8% over the 14,235,000 tonnes for 1999, and of 21.8% over the 12,595,000 tonnes for 1993.
Packaging marketed in 2001, with a value of 11,178,000 tonnes, is little higher than the previous year's value of 11,168,000 tonnes. As far as packaging recovery is concerned, on the other hand, the 2001 figure was 49%, which is in line with the minimum target of 50% for 2002 (Legis. D. 22/97, art. 37, subsection 1).

6. Ionising Radiations

Introduction

Ionising radiations are emissions of particles and/or energy coming from unstable elements, known as radionuclides, both present in nature and produced artificially. They are 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, such damage is repaired by the organism's normal defence mechanisms, but in some cases, also according to the degree and period of exposure, the cells involved may be transformed, giving rise to health effects for the exposed persons. Certain effects, termed "*deterministic*", are encountered above very high exposure thresholds, causing loss of functionality of tissues and organs. Other effects, in the range of exposure received in almost all cases, are "*stochastic*", that is not certain, but affected by higher or lower probability of occurrence. They are divided into "*somatic*" stochastic effects, which may affect the exposed individual and "*genetic*" stochastic effects which may affect the descendants of the exposed individual. In order to quantify the risk caused by exposure to ionising radiations, a specific quantity is used, known as the "*Effective Dose*", which can be classified as an impact indicator, expressing the probability of adverse effects on the persons exposed.
Besides the effective dose, another indicator is also described, the "*Activity Concentration of Radon Indoors*", qualified as a status indicator, since radon is the main source of exposure to ionising radiations.

INDICATOR: Mean Individual Effective Dose in One Year

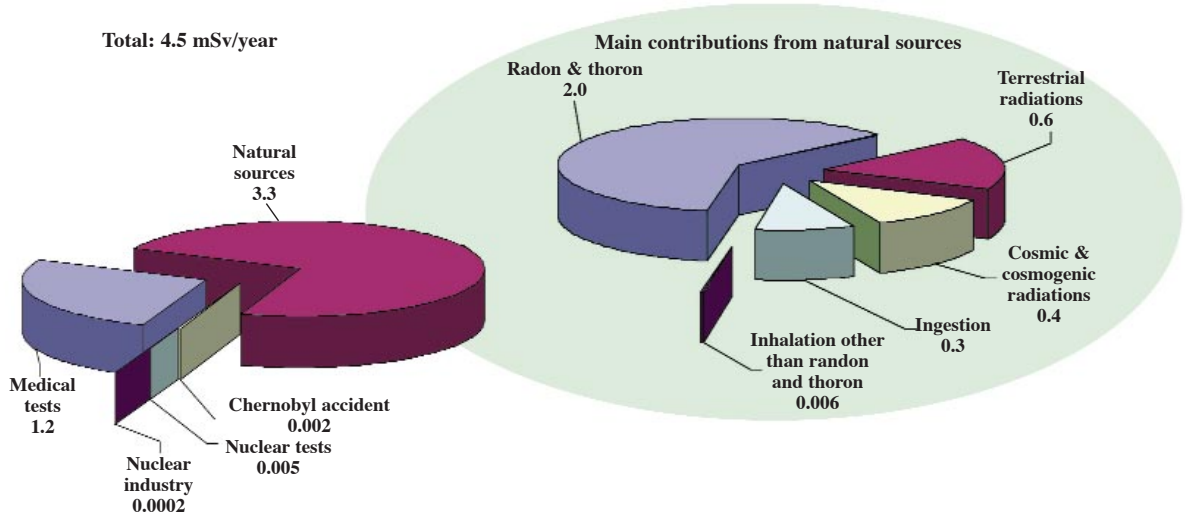


Figure 6.1: Estimate of Contributions to the Mean Individual Effective Dose in One Year for the Italian Population (milliSievert/year)

The indicator represents the impact of the main sources of radiation on the Italian population. The derived unit of measure is the Sievert (Sv). Figure 6 shows the estimated main contributions to the effective dose. The values indicated refer to averages for the entire population. Higher values, for individuals or groups, are possible in particular cases, such as the presence of high concentrations of radon in dwellings or work places, or exposure caused by Naturally Occurring Radioactive Materials (NORM) in some particular working activities. The contribution of natural sources to the effective dose is about 73% of the total.

INDICATOR: Activity Concentration of Radon Indoors

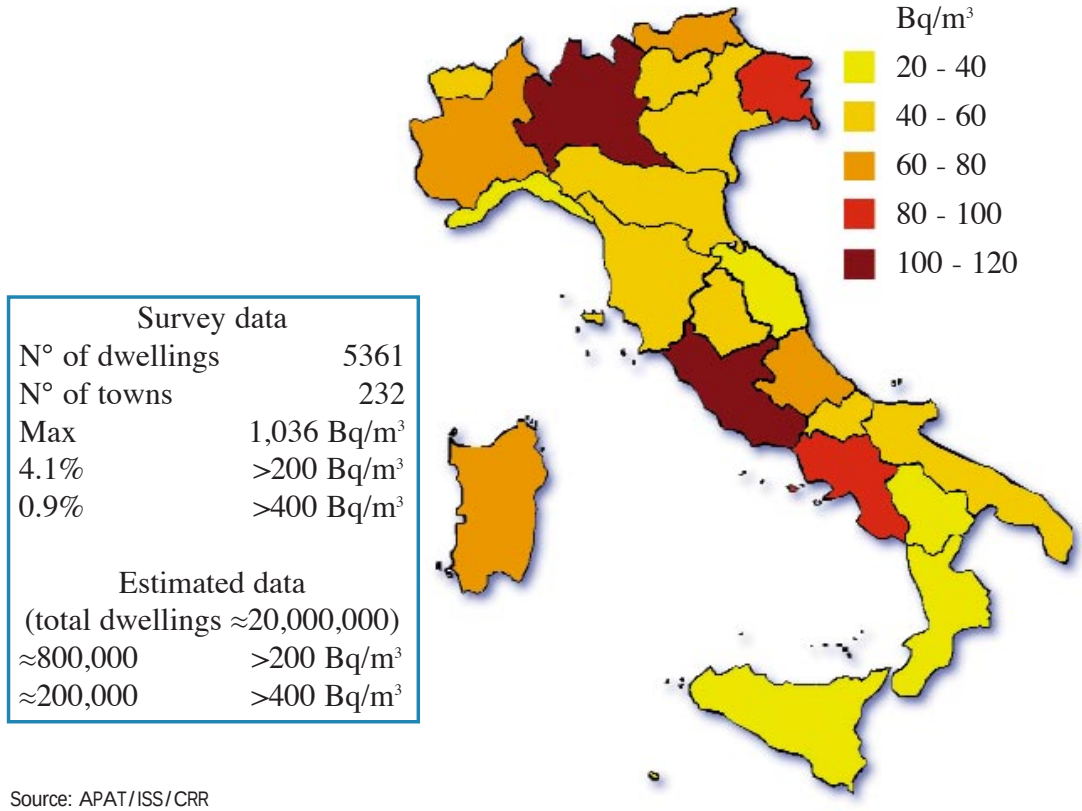


Figure 6.2: Mean Annual Activity Concentration of Rn-222 in Dwellings in the Italian Regions and Autonomous Provinces (the choice of intervals is by way of example) (1989-1997)

Radon is a natural radioactive gas emitted mainly by the soil and building materials, that accumulates in indoor environments. It contributes for about half of the total effective dose. Exposure to radon is associated with increased risk of lung cancer. Figure 6.2 shows the results of a survey carried out on a statistically representative sample to determine mean radon concentration in dwellings (where people stay longest) in all Italian Regions. European regulations fix radon concentration values for dwellings, defined as "*action levels*", above which remedial actions are recommended to reduce the associated risk. The said values are 400 Bq/m³ for existing buildings and 200 Bq/m³ for new buildings (as design parameter). In Italy, it is estimated that about 800,000 dwellings have concentrations of over 200 Bq/m³ and about 200,000 have concentrations of over 400 Bq/m³.

7. Non-Ionising Radiations

Introduction

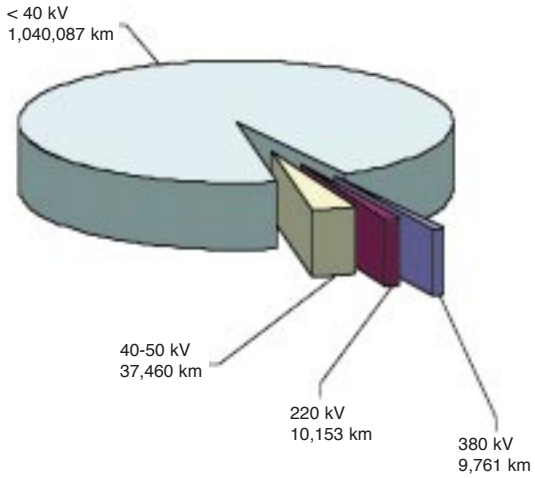
Non-ionising radiations are defined as those whose energy is insufficient to ionise matter, unlike ionising radiations. They can nevertheless produce biological effects, such as heating. This kind of radiation is produced both by natural sources, such as the earth, the atmosphere, and the sun, and by artificial sources, such as power production/distribution/utilisation systems, electric household appliances, broadcasting and telecommunication installations.

The electromagnetic fields caused by telecommunications and power lines have frequencies ranging from 0 to 300 GHz, and in detail: power production/distribution/utilisation systems have a frequency level of between 0 and 300 Hz and are commonly called ELF (extremely low frequency fields); broadcasting and telecommunication systems are known as RF (radio frequency or high frequency fields) and their frequency ranges from 100 kHz to 300 GHz.

Four indicators have been considered: *"Power Line length, Divided by Voltage and by Regional Surface Area"* and *"Density of Broadcasting and Telecommunication Systems and Sites and Global Power Over the National Territory"*, classifiable as prime cause indicators, representing primary sources of pressure on the environment due to electromagnetic fields; "*Number of Preliminary Evaluations and Inspection Activities on RF Field Sources"* and *"Broadcasting and Telecommunication Sites Found to Exceed Limits and Remediation Status"* classifiable as impact/response indicators, quantifying respectively the activities of the inspection authorities (ARPA/APPA) and of the competent organism.

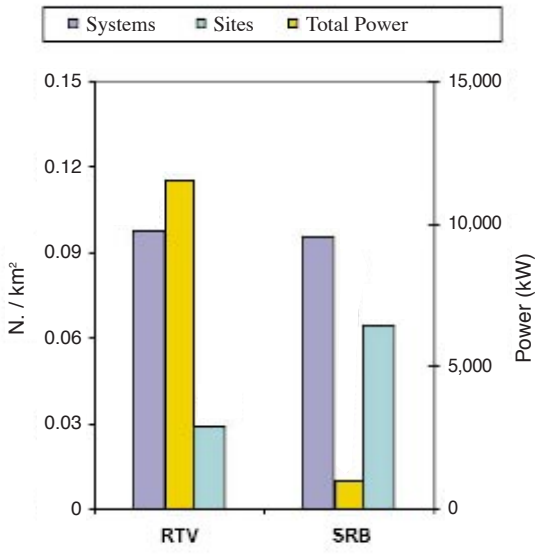
INDICATOR: **Power Line length, divided by voltage and by regional surface area**

INDICATOR: **Density of broadcasting and telecommunication systems and sites and global power over the National territory**



Source: ENEL

Figure 7.1: Length of ENEL power lines, diversified per voltage



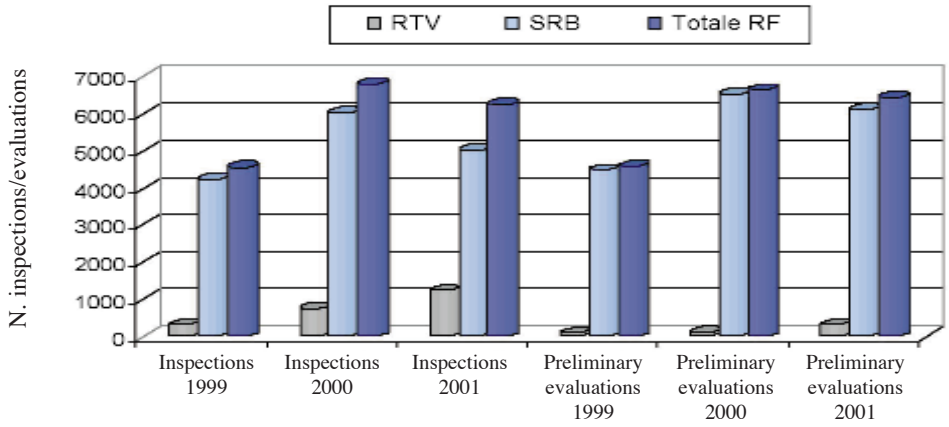
Source: APAT-NIR (Non-Ionizing Radiations Observatory)/ARPA/APPA

Figure 7.2: Density of broadcasting and telecommunication systems and sites and global power over National territory

The indicators represent quantitatively the two main sources of non-ionising radiation in Italy. To define power line extent, Figure 7.1 gives the length of the lines (km) divided according to operating voltage. Figure 7.2 shows density

(N° of installations & sites per km²) and global power (kW) of broadcasting (RTV) and telecommunication (SRB) systems.

INDICATOR: **Number of Preliminary Evaluations and Inspection Activities on RF field Sources**

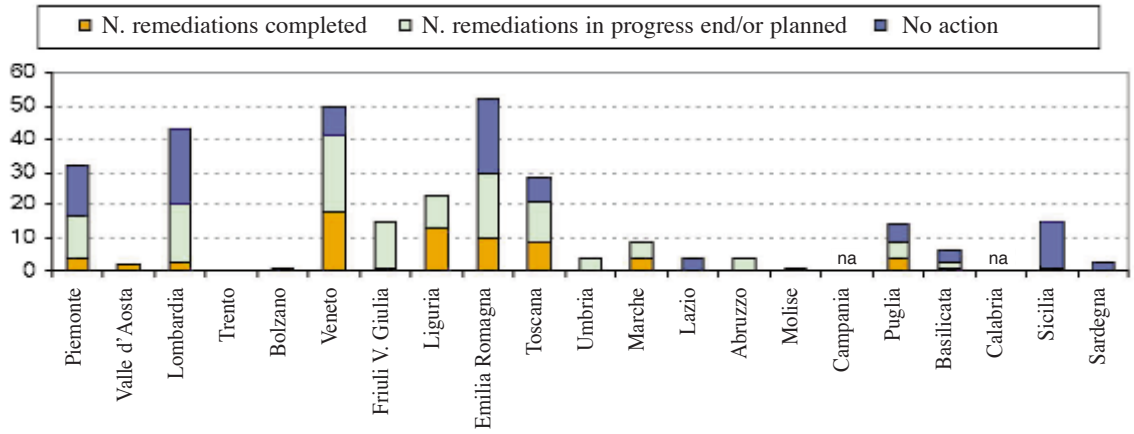


Source: APAT-NIR (Non-Ionizing Radiations Observatory) / ARPA / APPA

Figure 7.3: Evaluations & Inspections for RF (radiofrequency) Plants in Italy

The indicator describes ARPA / APPA activities in terms of preliminary evaluations and inspection activities (by models and instrumental) on high frequency sources (RF), both for broadcasting (RTV) and telecommunication (SRB), in order to ensure that the limits fixed by legislation (M.D. 381/98) are observed. Figure 7.3 represents activity for the three-year period 1999-2001. The graph shows that preliminary evaluations and inspection activities on RTV systems are, on the average, respectively 3% and 13% of the same activities on SRB sites.

INDICATOR: **Broadcasting and Telecommunication Sites Found to Exceed Limits and Remediation Status**



Source: APAT-NIR (Non-Ionizing Radiations Observatory) / ARPA / APPA

Figure 7.4: Exceeding Limits Status & Remediation Status for Broadcasting Plants (RTV)

The indicator quantifies situations in which ARPA / APPA inspections have ascertained that the limits fixed by current regulations have been exceeded and the status of activities to reduce the related RTV plants to conformity. In figure 7.4, the total height of the columns represents the total number of sites found to have exceeded the limits, whereas the portions represent remediation status. No data is available for the Campania and Calabria Regions, while, in the Autonomous Province of Trent, ispection activities have ascertained no exceeding of limits. The data for Sardinia Region is updated to 2000.

8. Noise

Introduction

Framework Law n. 447/95 defines acoustic pollution as "the introduction of noise into the dwelling or outside environment to the extent of causing annoyance or disturbing during rest and human activities, danger for human health, deterioration of ecosystems, material assets, monuments, the dwelling or the outside environment, or to the extent of interfering with the legitimate exploitation of the environments themselves".
This kind of pollution is a major environmental problem, particularly in urban areas, despite the fact that it is often deemed less important than other forms of pollution, and gives rise to increasing reaction from the population exposed to it, who consider noise as one of the main causes in the degradation of the quality of living.
The following two indicators are presented below: *"Inspected Sources and Percentage of these with at Least one Limit Exceeded"*, classifiable as a status indicator, capable of providing a qualitative and quantitative evaluation of noise pollution and *"Actuation Status of Municipal Noise Classification Plans"*, classifiable as a response indicator for assessing the putting into effects of the National law as regard the activities of the administrations in prevention and protection from environmental noise.

INDICATOR: Inspected Sources and Percentage of these with at Least one Limit Exceeded

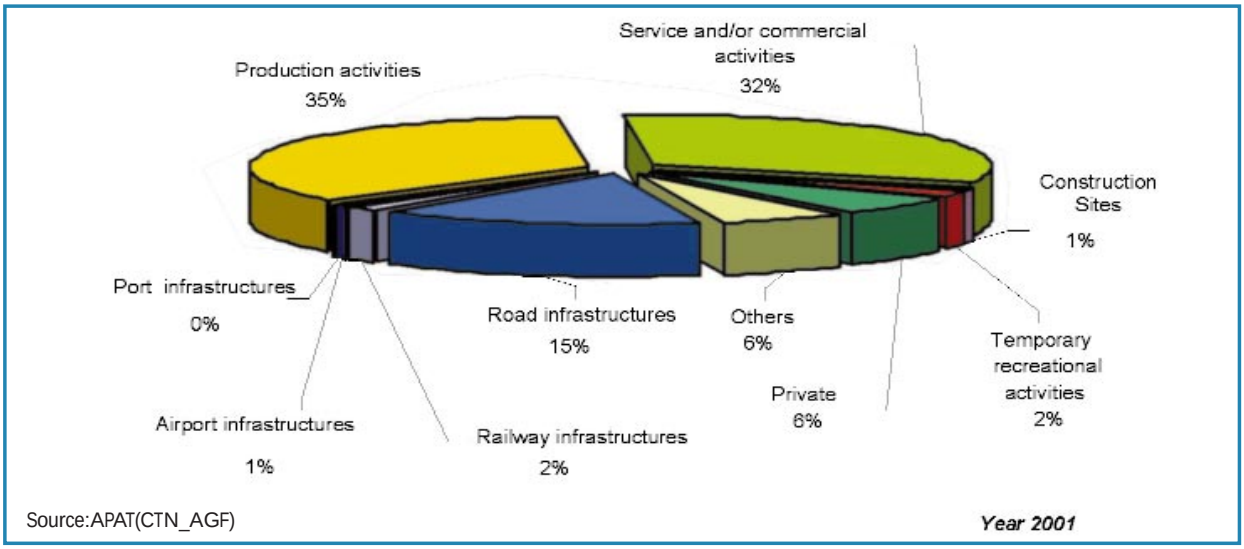
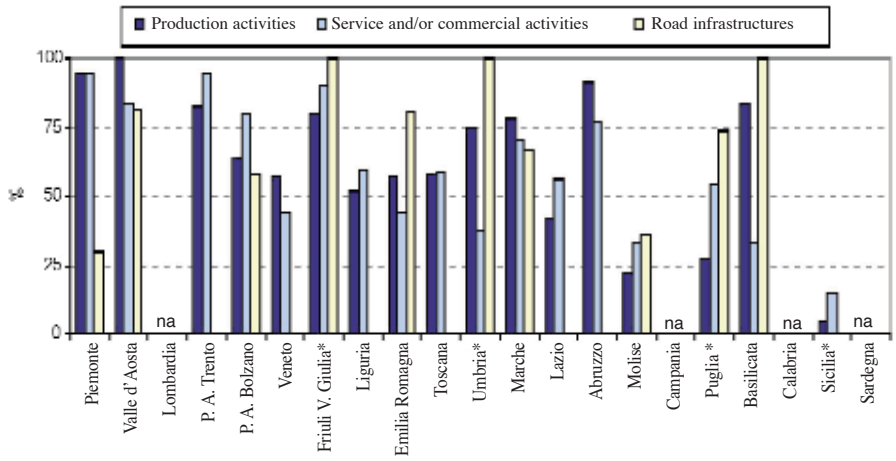


Figure 8.1: Inspected Sources divided by Activity/Infrastructure Typology

The indicator illustrates ARPA/APPA inspection activities concerning the observance of the established limits for the outside environment and/or in dwellings, according to the various source typologies (production activities, service and/or commercial activities, construction sites, temporary recreational activities, roads, railways, etc.) and, in particular, shows the percentage of inspected sources found to exceed at least one limit;.
Figure 8.1 shows the percentage of inspected sources in 2001 divided per typology; production, service and/or commercial activities (67% of total) and road infrastructures (15%) are prevalent.
It should be noted that the iplementation decree by the L. 447/95 concerning noise produced by road infrastructures has not yet been issued. Moreover, most inspection activities were the result of requests made by citizens and/or administrations.
As already pointed out in other studies, although road traffic is recognised as the main and most widespread source of noise in the urban context, for the population it does not constitute the principal cause of disturbance from noise, as shown by an analysis of requests for intervention forwarded to the inspection authorities.

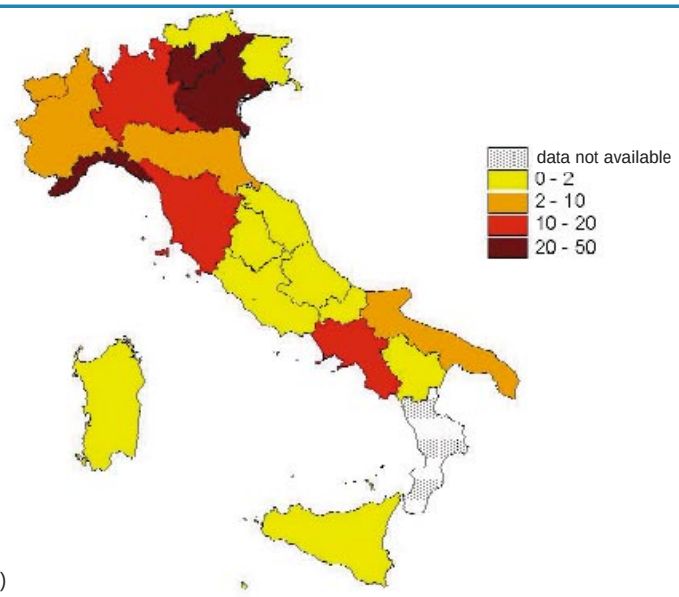


Source: APAT (CTN_AGF)

Figure 8.2: Percentage of Inspected Sources Found to Exceed at Least One Limit

Figure 8.2 shows the percentages relating to the three main source typologies inspected, found to have exceeded at least one limit, divided per region.

***INDICATOR:* Actuation Status of Municipal Noise Classification Plans**



Source: APAT (CTN_AGF)

Figure 8.3: Percentage of Classified Municipalities Compared to Total Municipalities for each Region / Autonomous Province (for Campania and Sardinia data updated to 2000)

The indicator shows the number of municipalities that have adopted noise classification, compared to the total number of municipalities for the Regions and Autonomous Provinces.
Act n° 447/95 obliges municipalities to divide their territory into homogenous areas according to prevalent and effective use destination, assigning to each area one of the six classifications indicated by the implementation decree (DPCM 14/11/97).
Figure 8.3 shows the percentage of classified municipalities out of the total number of municipalities for each Region and Autonomous Province.
National data show that about 11% of Italian municipalities have adopted noise classification.

9. Anthropogenic Risk

Introduction

Industrial Risk

The indicators selected for this Summary, representing the geographical distribution and concentration of establishments with major-accident hazards throughout the country, are a compromise between the need for detail and efficacious information.

An efficient major-accident hazards control system requires an adequate information system for the establishments involved, so that data can be collected and managed concerning hazardous substances used, activities performed, safety measures adopted, possible accident scenarios and associated areas of damage. Correlated to the vulnerability characteristics of the neighbourhood, such data will make it possible to evaluate risks, which can be used for land-use planning, public information and emergency management.

While waiting for an overall risk "map" to be made available, the following have been chosen as territorial pressure indicators, which, although partial, are meaningful:

- the number of establishments/storage facilities with major-accident hazards in the various territories (regions, provinces, municipalities, industrial areas);
- the number of municipalities having concentrations of establishments/storage facilities with major-accident hazards .

The following figures show the indicators selected for the whole of Italy.

The data is taken from the Report of the Ministry of the Environment/Department IAR – ANPA/Industrial Activity Risk Sector, with the contribution of the regional Agencies, "Mappatura del Rischio Industriale in Italia" [Plotting Industrial Risk in Italy] (RTI/TEC-IND/2-02-Aprile 2002) and covers the period 2000-2001.

***INDICATOR*: Establishments with major-accident hazards**

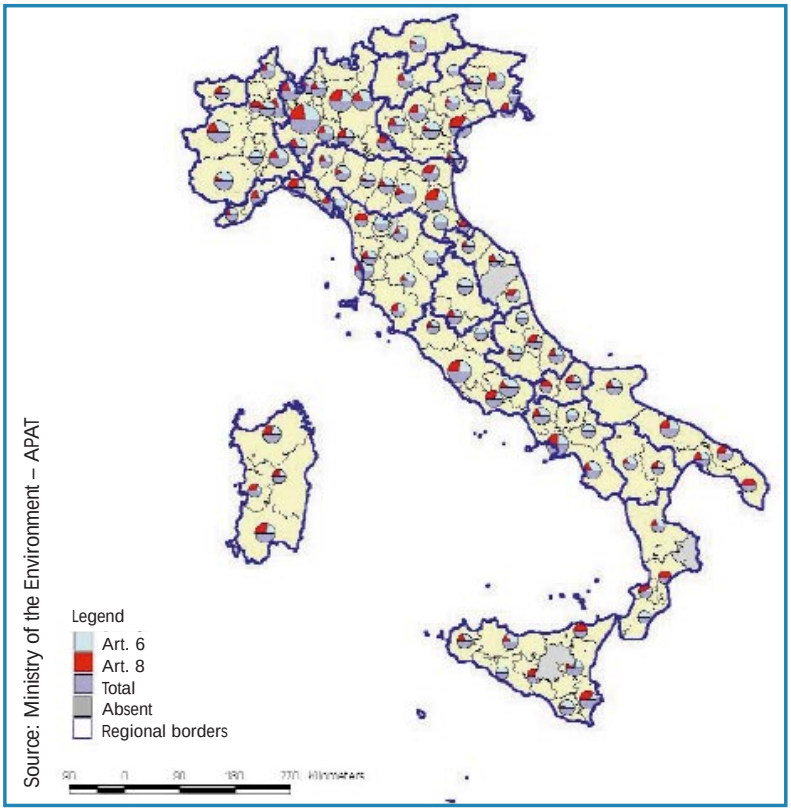


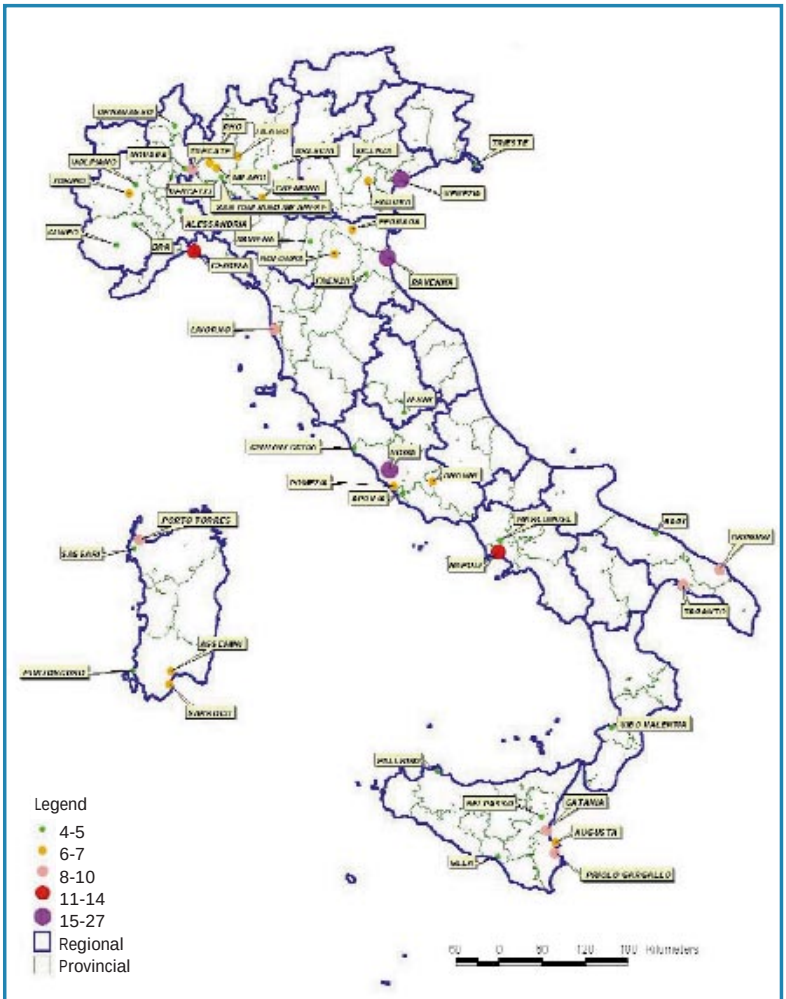
Figura 9.1 shows the distribution of establishments subject to D.L 334/99 (articles 6 & 7: adoption of safety management system; article 8: presentation of safety report to the competent authorities), with reference to data available to the Ministry of the Environment as at 31 December 2001.

It shows that the total number of establishments with major-accident hazards in Italy as at 31 December 2001 is 1136, with a reduction of about 7% over the data for 1999 and referring to the last period in which P.D. 175/88 (Seveso I) was in force. Since it also includes the establishments subject to article 5 subsection 3 of D.L. 334/99 (those required – amongst other matters – to present the so-called "relazione" [report] to the regions), the total number should increase by about 10%, according to APAT's preliminary estimate, based

Figure 9.1: Provincial Distribution of establishments subject to art. 6/7 & art. 8 of D.L. 334/99 (31/12/2001)

on provisional data collected from the regions and regional Environmental Protection Agencies.
As far as the distribution of *notifying* establishments (art. 6 & art.8) is concerned, more than 22% of the total for Italy are concentrated in Lombardy, particularly in the provinces of Milan, Bergamo, Brescia and Varese.
Regions with a high number of industries with major-accident hazards also include Piedmont (about 11% of the total), Emilia Romagna (10%) and Veneto (8%).Here particular concentrations are highlighted in Trecate (in Novarese), Porto Marghera, Ferrara and Ravenna, corresponding to the traditional refining and/or petrochemicals sites, and in the provinces of Turin, Alessandria and Bologna.
In the South, the regions with the greatest number of notifying activities are Sicily (6%), Campania (6%), Puglia (4.5%) and Sardinia (4.2%), owing to the oil and petrochemical establishments in the areas of Gela, Priolo, Brindisi, Porto Torres and Sarroch and to the concentration of industrial activities in the provinces of Naples and Bari.
Other provinces with a high number of establishments with major-accident hazards include Leghorn – already included among the areas with high concentration of major-accidents hazards establishments, Rome and Frosinone.
Currently no works subject to articles 6 & 8 have been ascertained in the provinces of Prato, Macerata, Crotone and Enna.

INDICATOR: Municipalities with 4 or More establishments with major-accident hazards



Source: Ministry for the Environment – APAT

Figura 9.2 shows the location of the 50 municipalities identified throughout Italy possessing 4 or more establishments with major-accident hazards , subject to arts. 6/7 & 8 of D.L. 334/99, indicating the number of establishments at risk in each municipal territory.
14 regions are found with municipalities possessing 4 or more establishments , particularly in the north (Piedmont and Lombardy) and, in the south, wherever there are chemical and petrochemical sites (Sicily, Sardinia, Puglia).
Among municipalities with a high number of establishments are Ravenna, Venice and Rome (over 20), followed by Genoa and Naples (over 10); concentrations are also found in the municipalities of Trecate, Brindisi, Porto Torres, Taranto, Catania, Augusta-Priolo, Leghorn.
The 4 establishments' threshold value was selected for practical purposes and does not signify any specific regulatory orientation for the related administrations.

Figure 9.2: National Distribution of Municipalities with 4 or More establishments with major-accident hazards subject to arts. 6/7 & of D.L. 334/99 (31/12/2001)

10. Natural Risk

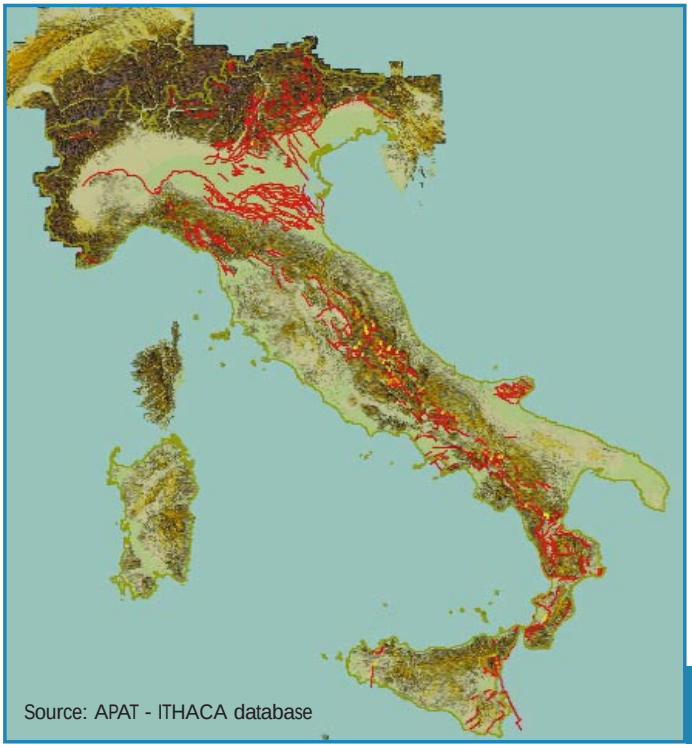
Introduction

The aspect of the Earth's surface is the result of the modelling action of a combined set of "natural" phenomena of both endogenous and exogenous origin, which may occur with great intensity over a very short period (from few seconds to weeks), or else are long-term (from months to many years/centuries).
The first case includes *tectonic movements*, linked to seismic and volcanic phenomena, and events generally defined as *hydrogeological risk*, caused as a rule by extreme meteorological phenomena, especially flooding, landslides, avalanches and coastal erosion.
The second case includes other morphogenetic mechanisms such as eustatic movements (climatic oscillation-induced sea level variations), subsidence (related sediment diagenesis) and isostatic motions (tectonic activity-induced). Variations related to such phenomena only seldom can be observed on an annual scale.
Not all the above phenomena are dealt with specifically in this document. For emergencies due to hydrogeological events, such as floods, landslides and avalanches, no illustrative data is given for single events, or statistical data. These major sources of natural danger, to which must be added coastal erosion, which involves to a greater or lesser extent most Italian beaches, subsidence, striking wide areas of the alluvial plains, eustatic and isostatic movements, will be dealt with in detail in the next editions of the Yearbook. In this edition, under the paragraph Hydrogeological Risk, illustrations are given of the work performed by APAT in monitoring events funded by the Ministry for the Environment in accordance with L.D 180/98 and subsequent amendments and integrations.

Tectonic Movements

The surface of the Earth's crust is subject to continuous morphological variations, partly linked directly to climate and to erosion and sedimentation processes, and partly caused by the differential movements of the crust itself, regulated by the planet's internal dynamics. These movements, which may be either vertical or horizontal, occur along fault lines, extending for tens or even hundreds of kilometers. The deformations caused by tectonic activities are often associated with two important sources of environmental danger: earthquakes and volcanism.

INDICATOR: Surface Faults (Active Faults)

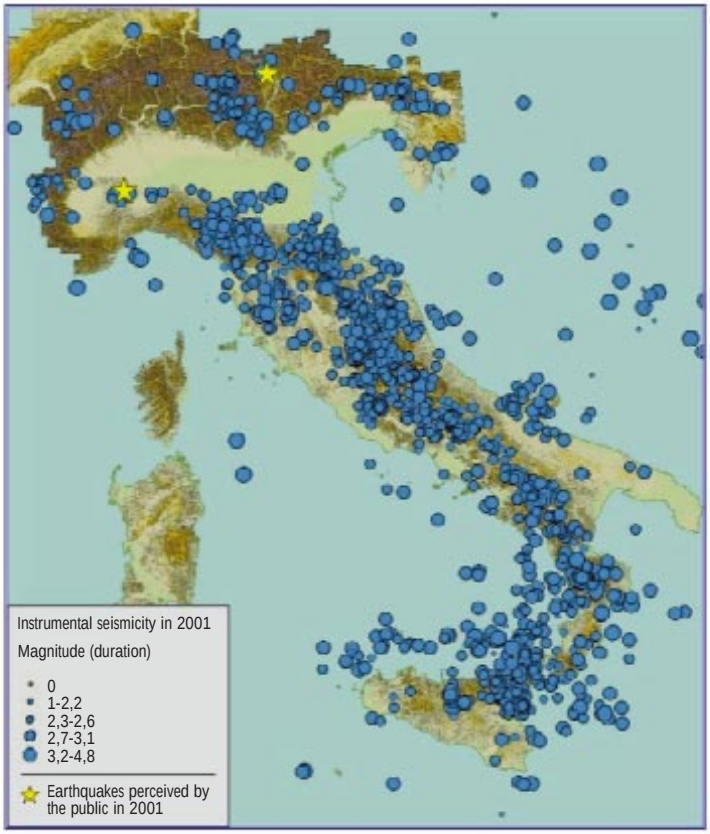


Source: APAT - ITHACA database

For proper territorial planning with regard to the evaluation of earthquake danger, a proper understanding is needed of the evolution of the natural environment, paying special attention to areas possessing capable faults (deemed capable of producing significant effects on the ground, in terms of seismicity and deformation). For rapid consultation of all the data available and regularly updated on active tectonic areas, the ITHACA I.T. system has been created (ITHACA = *ITaly HAzard from CApable faults*). This database, currently being developed by APAT, comprises data both from cartography and from mixed numerical and alphanumerical tables on *active* and capable Italian faults. A specimen of the cartographic data collected in shown in Figure 10.1.

Figure 10.1: Map of Capable Faults (in red) and Location of palaeoseismic Sites (in yellow).

INDICATOR: Seismic Events



Source: APAT – ITHACA database

Figure 10.2: Map of Italian Seismicity in 2001

Seismicity studies on Italian territory aim mainly at defining the maximum expected magnitude, return times and local effects, in order to estimate the risk level and establish appropriate mitigating measures.
As shown in Figure 10.2, during 2001, besides numerous seismic events recorded only by the monitoring system managed by the National Institute of Geophysics and Volcanology [Istituto Nazionale di Geofisica e Vulcanologia (INGV)], two stronger seismic events occurred, which were felt by the public: the event of July 17th mainly involving the Alto Adige (local magnitude 5.2), causing much damage and 2 deaths, and the event on July 19th in the Monferrato area, with a much lower local magnitude (4.0).

Hydrogeological Risk

Nowadays the question of hydrogeological risk draws the attention of specialists, politicians and the public especially owing to the particular gravity with which certain events (floods, landslides, avalanches) happen in Italy. It is well-known that the concept of hydrogeological risk in an area is a function of the probability of an event of a given intensity occurring within a determined interval (hazard) and of the vulnerability of the area itself, in terms of the safety of persons, the security of infrastructures and of the environmental and cultural patrimony.
The main "structural" provisions for Soil Protection, and thus for the prevention and mitigation of damage, are indicated in Act 183/89, setting up the Basin Authority, with its task of organising soil protection and of disciplining the water resources in a territorial context identified with the hydrographic basin, and in LD 180/98, published with the aim of accelerating the procedures foreseen by Act 183/89 by means of special intervention capable of identifying and rapidly resolving problems relating to known situations of hydrogeological risk.
The criteria adopted for selecting the indicators are: suitability for representing the phenomenon on a national scale, and the effective availability of data. Three indicators have thus been chosen, specifically linked to the actuation of DL 180/98 and subsequent amendments and integrations.

INDICATOR: Areas with Very High Hydrogeological Risk, Identified by Special Plans

TABLE:10.1: Regional Summary of Areas with Veryttigh Hydrogeological Risk, identified in the plans

REGION	LANDSLIDE risk Areas n.	FLOOD risk Areas n.	AVALANCHE risk Areas n.	TOTAL n.
Italy	**6,689**	**2,446**	**37**	**9,172**
Campania	1,984	338	0	2,322
Lazio	1,624	144	0	1,768
Toscania	395	1,213	0	1,608
Abruzzo	1,005	26	0	1,031
Liguria	42	410	0	452
Siciliy	391	52	0	443
Molise	240	7	0	247
Puglia	206	0	0	206
Marche	124	69	4	197
Basilicata	180	1	0	181
Lombardy	100	32	7	139
Emilia Romagna	106	24	0	130
Calabria	95	11	0	106
Trentino Alto Adige	77	0	22	99
Umbria	33	45	0	78
Veneto	52	15	3	70
Sardinia	6	42	0	48
Piedmont	16	8	1	25
Valle d'Aosta	9	4	0	13
Friuli Venezia Giulia	4	5	0	9

Source: Prepared by APAT on Ministry for the Environment data 2001

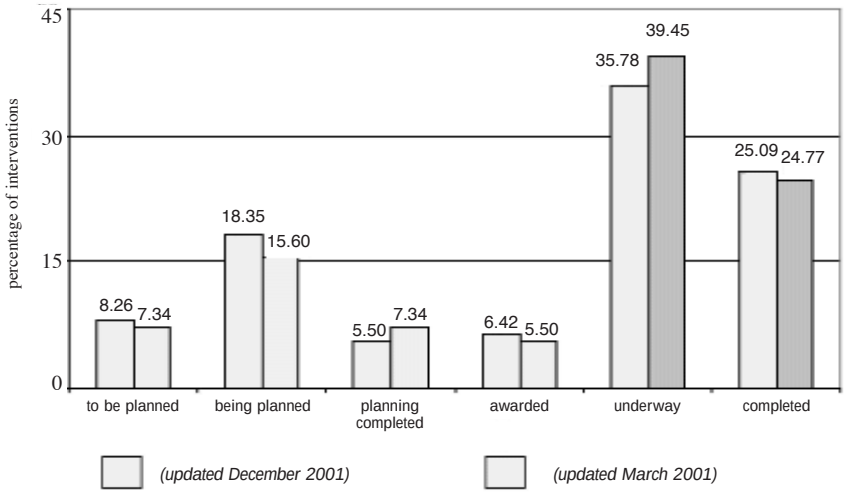
The scope of the indicator is to photograph the actuation status of the Special Plans aimed at removing the highest hydrogeological risk situations and providing indications concerning the distribution and number of areas at risk. The Special Plans, approved by the Basin Authorities, identify and circumscribe the areas with *high* and *very high* hydrogeological risk (R3 and R4 areas), for which the adoption of specific safeguard measures is foreseen.
The data, provided by the Ministry for the Environment and reprocessed by APAT, shows regional distribution (connected with the related Basin Authorities) and annual periodicity. As compared to the data presented in the last edition, 2001 saw the completion of the provisions as per DL 180/98 by all Basin Authorities concerning the approval of the Special Plans. The number of areas with very high hydrogeological risk totals 9,172, and is destined to vary with the progressive preparation of the Plans and Project Plans for Hydrogeological arrangements (PAI).

INDICATOR: Adoption of Partial Hydrogeological Arrangement Plans

The eventual adoption by the Basin Authorities of the Partial Hydrogeological Arrangement Plans [Piani Stralcio di Assetto Idrogeologico (PAI)], provided for by art.1 subsection 1 of DL 180/98, through which the Italian areas subject to measures will be safeguarded from hydrogeological risk, will provide a complete picture of criticality, interventions planned and the financial resources required for soil protection.
As compared to the data presented in the last edition, a positive trend in the indicator can be noted, connected with the PAI being adopted by a further three Basin Authorities (basins of Basilicata, Lao and Calabria).

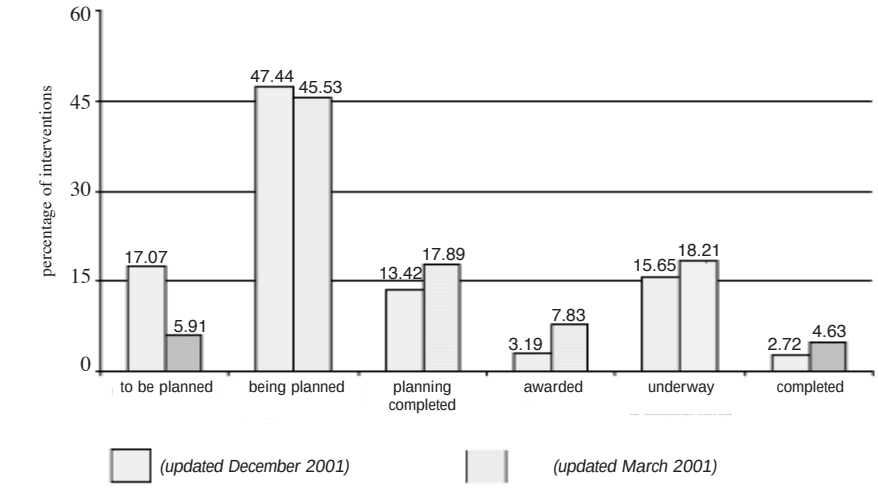
INDICATOR: Progress Status for Interventions to Reduce Hydrogeological Risk, funded in accordance with DL 180/98 and subsequent amendments and integrations

DL 180/98 and subsequent amendments and integrations (art. 1 subsection 2) defines urgent intervention plans to reduce hydrogeological risk in areas where territorial vulnerability is linked to greatest danger for persons, goods and the environment, giving priority to those relating to areas where a state of emergency has been declared. The interventions contained in the plans refer to areas included in the Special Plans.
Act 267/98, assimilating DL 180/98, foresees, in article 2-bis, that APAT will be involved in the preparatory activities for urgent interventions to reduce hydrogeological risk.
The scope of this indicator is to photograph the progress status of projects funded by the urgent intervention programmes for reducing hydrogeological risk (currently referring to the years 1998 and 1999-2000). The growing number of interventions carried out, of those being currently financed, shows progressive achievement of targets (figures 10.3 and 10.4). The data indicated is drawn from a database that collects and organises information from urgent intervention monitoring activities, carried out by the APAT Interdepartmental Hydrogeological Risk Unit.



Source: APAT

Figure 10.3: Work Progress Status on Urgent Interventions to Reduce Hydrogeological Risk, financed for the year 1998



Source: APAT

Figure 10.4 Work Progress Status on Urgent Interventions to reduce hydrogeological risk, financed for the years 1999-2000

11. Production Sectors

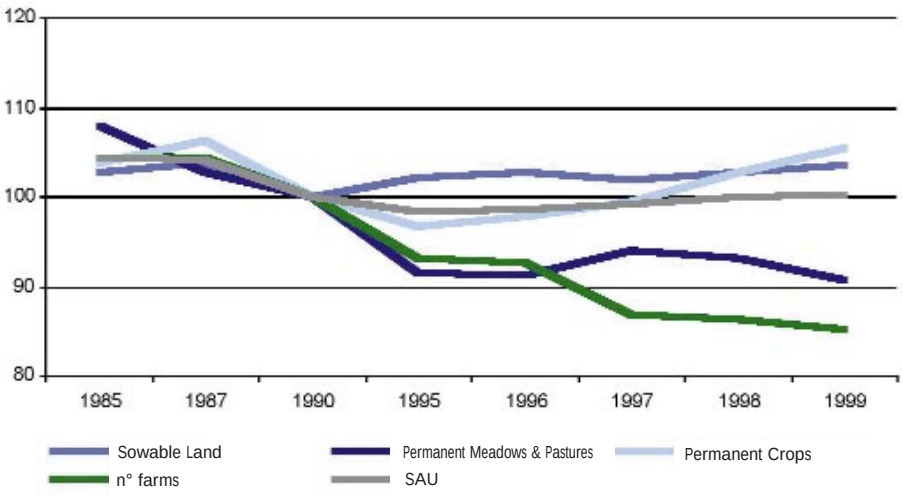
Introduction

Over the past years, the Council of Europe has paid great attention to the main political aims emphasised by the Treaty of Amsterdam, that of sectorial integration and sustainable development.
For the purpose of adopting these indications – also included by the European Environment Agency (to sustain the environmental part of the "Lisbon" strategy communicated at the Barcelona summit in March 2002, the Sixth Environmental Action programme, the "Cardiff Process" of integrating the environment in sectorial policies-, the 2002 version of the Yearbook adds four production sectors relating to: Agriculture, Energy, Transport and Tourism, as well as a chapter on the environmental quality of organisations, firms and products.
Integration is mainly based on the *Driving Forces*, so as to direct policies concerning the symptoms of environmental decline towards their upsteam causes. The decisive principles of sectorial change are the economic parameters directly linked to sectorial activity.
Eco-efficiency, i.e., the way of measuring the degree to which economic growth has become "detached" from environmental impact, is improving in the transport, energy and agricultural sectors, despite the fact that progress is relatively slow and improvements are partially compensated for by growth in the same sectors.

Agriculture

Relations between agriculture and environment have always been extremely complex and, in the last few decades, even controversial. On the one hand, agriculture is undergoing a negative impact from the environment and from various production sources, as for example through the reduction of agricultural areas. On the other hand, it is held largely responsible for the pollution of waters, erosion, soil pollution and acidification, the increase in greenhouse gas emissions, the loss of *habitat*, biological diversity and the simplification of the landscape, as well as for the suffering of stockbred animals.
At the same time, it must be pointed out that agriculture has a positive role and high potential for generating the opposite kind of processes, i.e. capable of reducing pollution and environmental degradation and of providing various options in the strategies to mitigate climate change, while maintaining a sufficient production capacity and providing safe, quality foods.
In order to describe relations between agriculture and the environment, this Summary provides two graphic indicators, whose aggregate indices combine some of the indicators dealt with in detail in the Yearbook.

INDICATOR: **Farms & Agricultural Surface Area Utilised (SAU)**

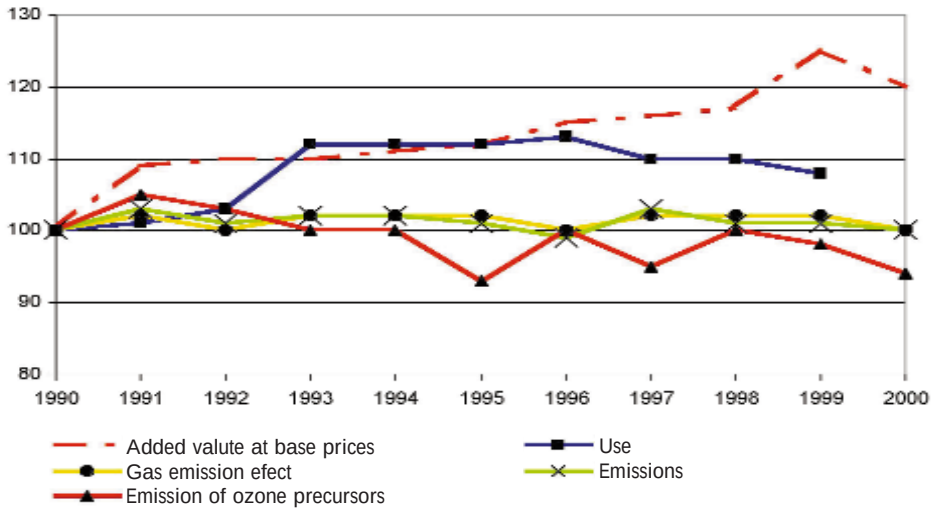


Source: Elaborated by APAT on ISTAT data

Figure 11.1: Distribution of Farms & Agricultural Areas Utilised in Italy (index 1990 = 100)

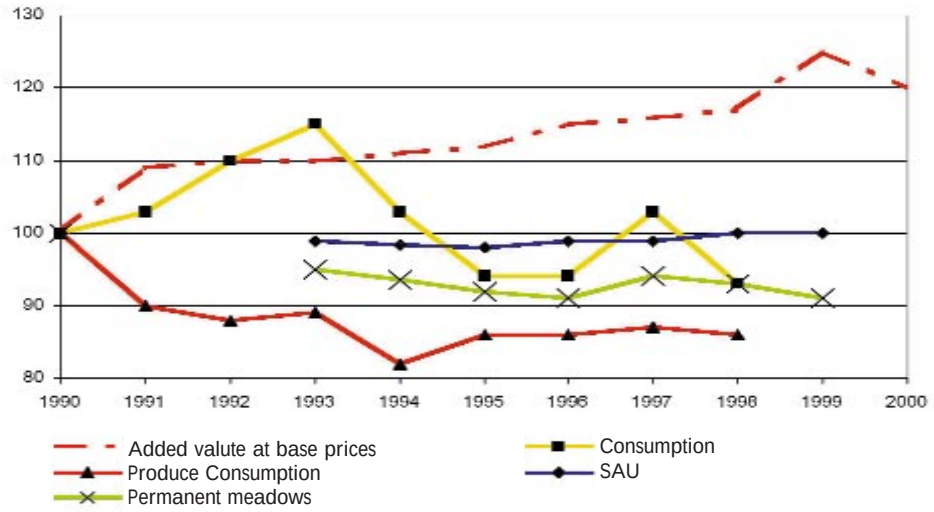
From 1985 to 1995, over 600,000 hectares of SAU (total of sowable land, permanent meadow, pastures and permanent arboricultural crops, family kitchen gardens and chestnut crops) have been subtracted from agricultural production, reducing the sector's capacity to provide agricultural produce for future generations. Some of these have been irreversibly converted to other uses (infrastructures, housing). Part, on the other hand, has been colonised by spontaneous vegetation, especially on permanent meadowland and pastures, mainly located in hilly and mountain areas. This process involves a double assessment: on the one hand, it increases the naturalness of agricultural ecosystems and improves the landscape, while on the other it introduces risks for stability and the frequency of fires events.
The contraction in the number of farms, which has continued even after 1995 when the SAU – on the contrary – showed signs of recovery, highlights an intensification process in agricultural activities, usually correlated to greater environmental impact.

INDICATOR: Eco-efficiency in Agricultur



Source: Elaborated by APAT (CTN_TES) on data from APAT, EUROSTAT, ISTAT

Figure 11.2: Eco-efficiency in Agriculture 1990-1999 in Italy (index 1990 = 100): value added to market price



Source: Elaborated by APAT (CTN_TES) on data from APAT, EUROSTAT, ISTAT

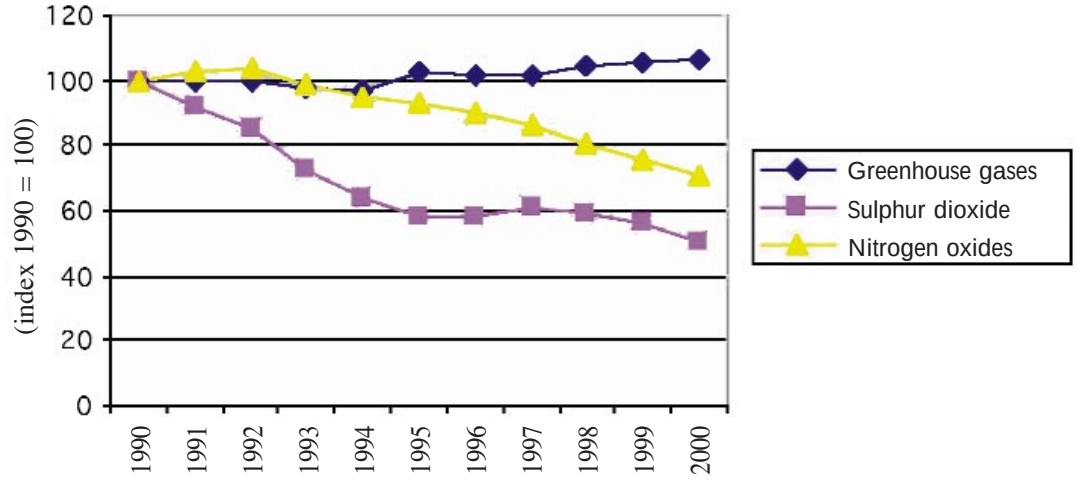
Figure 11.3: Eco-efficiency in Agriculture 1990-1999 in ITALY (index 1990 = 100)

The two figures show a good trend in eco-efficiency for the period 1990-2000, since the progressive increase in economic value is accompanied by a smaller increase – and sometimes even a decrease – in environmental pressure factors.
Greenhouse gas emissions from the agricultural sector (methane and nitrogen oxides) is less than 10% of the national total, and their trend remains almost constant over the years.
Of the acidifying substances, the only significant one for the agricultural sector is ammonia production, covering between 20% and 30% of total national acid emissions. In this case too, values have remained almost constant over the years.
Of the tropospheric ozone precursors, non-methane volatile organic compounds (NMVOC) and nitrogen oxides have been considered. The agricultural sector's contribution to the total production of such gases is very limited (less than 0.5%), and the trend shows a progressive decrease.
Energy consumption, which has increased considerably since the beginning of the 'nineties, has now become stable, with a slight tendency to decrease.
A similar trend has also been found in fertilizer consumption, while phytosanitary products have undergone a drop and have then stabilised. This is occurring with a substantially constant SAU and a progressive decrease in permanent meadows and pastures.
Substantially, while retaining the typical features of highly intensive agriculture, this production sector has shown an increase in eco-efficiency, certainly influenced by the legal and economic provisions at European and national level concerning organic farming.

Energy

In 2000, energy processes contributed for 85.4% to overall greenhouse gas emissions (CO_2, CH_4, N_2O, HFC, PFC, SF_6), for 95.7% to sulphur dioxide emissions (SO_2) and for 98.6% to nitrogen oxide emissions (NO_x). Energy consequently has a determining role in fulfilling the main obligations assumed by Italy at international level for the safeguarding of the environment, and, in particular, the atmosphere.
The constant increase, from 1995, of greenhouse gas emissions from energy sectors (+6.5% in 2000 over 1990), will most probably not allow Italy to fulfil the reduction target fixed by the Kyoto Protocol only by undertaking domestic measures and by the internal *burden-sharing* of the European Union, on the basis of which, at aggregate level, overall national emissions should be reduced by 6.5% within 2008-2012, with reference to 1990 levels. It will therefore be necessary to use credits from international co-operation mechanisms and from interventions in the agricultural and forestry sector, following the procedures set by the Marrakech Conference.
Growth in greenhouse gas emissions from the energy sector corresponds to the various trends for energy process emissions in the different economic sectors: very high growth in the transport sector (+16.9%), slightly more contained for power industries (+11.2%), limited for the residential and service sector, including agriculture (+3.3%) and a significant drop in manufacturing industries (-11.8%).
The sulphur dioxide energy emission trend (-49.9% in 2000 compared to 1990), the decrease being due to the use of cleaner fuels and petrols, has so far guaranteed the fulfilment of the international protocols concerning acidification. At aggregate level, these require Italy to reduce overall national emissions by 30% in 1993 as compared to 1980 levels (Helsinki Protocol), by 65% in 2000 and by 73% in 2005 as compared to 1980 levels (Oslo Protocol) and by 70% in 2010 compared to 1990 levels (Göteborg Protocol). So far, both the target of the Helsinki Protocol, and the one foreseen by the Oslo Protocol for 2000 have been observed.
The nitrogen oxide energy emission trend (-29.0% in 2000 compared to 1990), the decrease being due to the use of devices to abate emissions from stationary plants and more especially from mobile ones, has allowed Italy to fulfil international protocols on acidification, eutrophication and reduction of tropospheric ozone. At aggregate level, these protocols require Italy to stabilise overall national emissions by 1994 as compared to 1987 levels (Sofia Protocol), and by 2010 a 48% reduction over 1990 levels (Göteborg Protocol). So far, Italy has achieved the target fixed by the Sofia protocol (but not the contemporaneous declaration by which Italy, together with other countries, undertook a 30% reduction) and is in line with the target fixed by the Göteborg Protocol for 2010.

INDICATOR: Total Greenhouse Gas Emissions and from Energy Processes

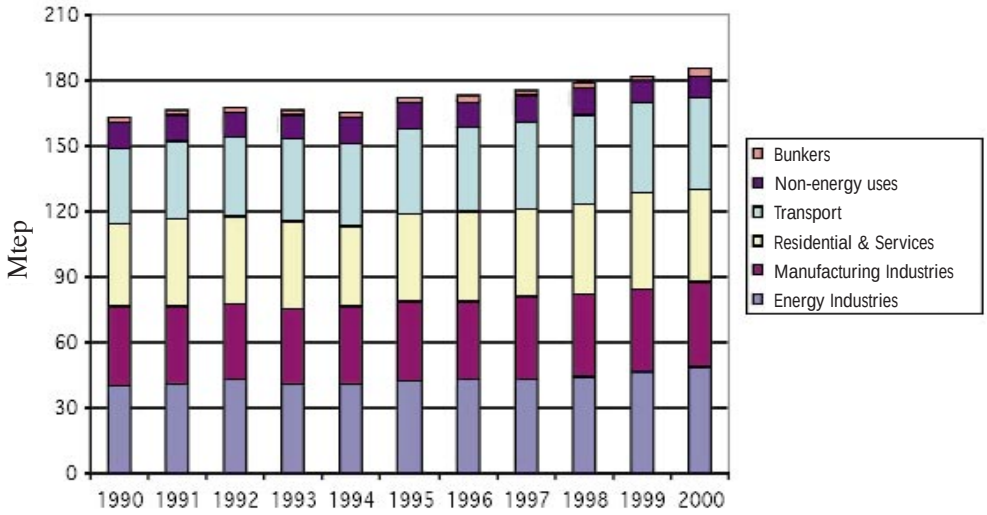


Source: APAT

Figure 11.4: Greenhouse Gas Trends: sulphur dioxide, nitrogen oxides from energy processes, 1990-2000 (index 1990=100)

The emission trends examined correspond to a final energy consumption, stabilised between 1990 and 1993, of about 166.7 Mtep, thus showing significant growth, up to the level reached in 2000 of about 185.2 Mtep (+14.1% over 1990).

INDICATOR: Final Energy Consumption per Economic Sector

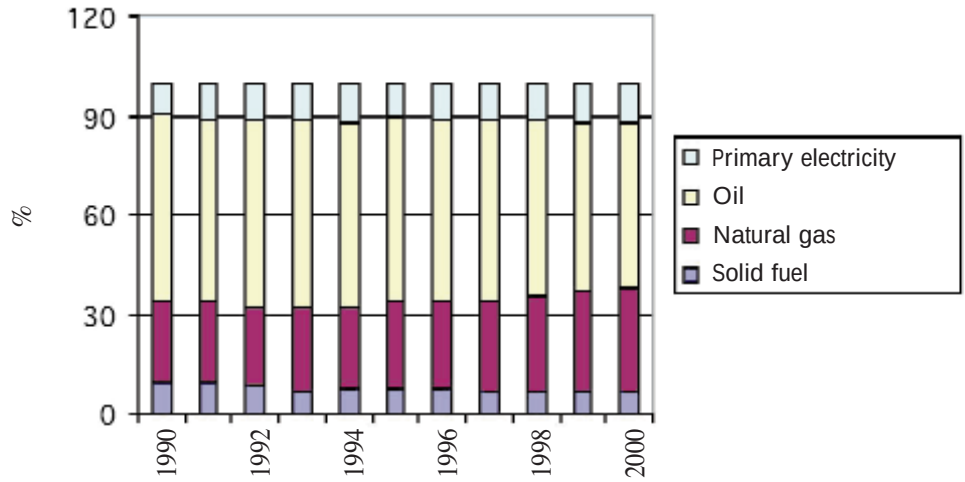


Source: ENEA

Figure 11.5: Final Energy Consumption per Economic Sector

With reference to the distribution of final energy consumption per sector (excluding non-energy uses and bunkers), emphasis should be laid on the growth of the energy (from 24.14% to 26.1%) and transport (from 21.3% to 22.6%) industries, the stationary status of the residential and service sector (constant at 21.3%) and the drop in manufacturing industries (from 24.3% to 23.0%).

INDICATOR: **Final Electric Power Consumptions per Source**

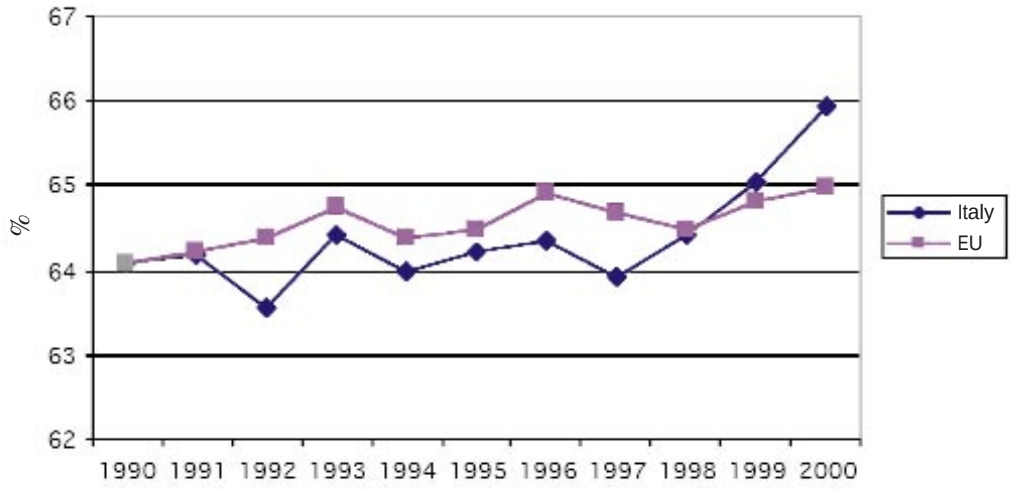


Source: Ministry for Production Activities

Figure 11.6: Total Energy Consumption per Source (percentage shares)

The market share for natural gas compared to total energy consumption grew from 23.9% in 1990 to 31.5% in 2000, the share of solid fuels fell from 9.6% to 7.0%, the share of oil products dropped from 56.6% to 49.3%, whereas primary electricity (imports + production from renewable sources) increased from 9.8% to 12.2%:

INDICATOR: **Ratio of Final Electric Power Consumption & Total Energy Consumption**

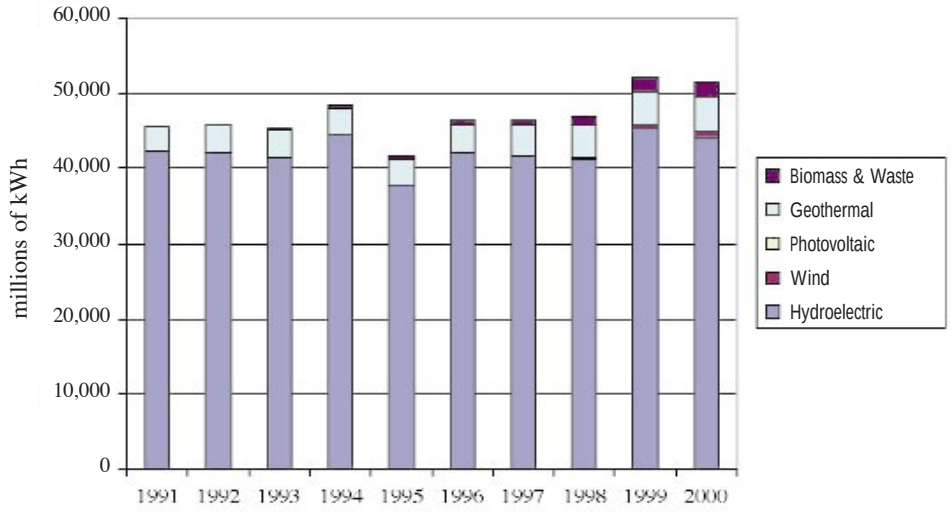


Source: Prepared by ENEA on ODYSSEE data

Figure 11.7 Percentage Ratio of Final and Total Consumption for Italy & Europe

As compared to the increase in total energy consumption, the percentage ratio between final and total energy consumption also shows a growth, particularly over the last few years. This shows increased conversion efficiency, owing to the mitigation policies adopted, particularly for the gross production of electric power from cogeneration plants (+9.7% in 2000 over 1997).

INDICATOR: Gross Production of Electric Power from Renewable Sources



Source: Prepared by APAT on data from the National Grid Management (GRTN)

Figure 11. 8: Gross Production of Electric Power from Renewable Sources

The production of electric power from renewable sources still has a relatively limited weight (18.6% of the total), but with a net growth trend (+23.5% in 2000 over 1995) – especially if the data is freed from fluctuations due to the availability of hydroelectric power – owing to the increase in power production from wind and biomass.

Trasport

Currently, the two dominant trends in the transport sector, i.e. growth rate in mobility demand and the increase in modal imbalance, involve a series of direct and indirect impacts on the environment, such as the consumption of energy resources from non-renewable sources, global warming, atmospheric, noise, water and soil pollution, the consumption and parcelling of land, visual intrusion, damage to historical and artistic patrimony. Such impacts are continually growing, since even the improvements reached in reducing the environmental impact of vehicles and infrastructures have been overtaken by the enormous growth in transport demand.

Over the past decades, mobility status in Italy has featured two fundamental trends: on one side the constant increase in demand for transport, for both passengers and goods, at a rate that often exceeds the increase in Gross Domestic Product; on the other, an extreme imbalance in the national transport system in favour of road freight, with heavy consequences from the point of view of the environmental, social and economic sustainability of the system itself.

The growth in transport volumes is determined by a complex combination of economic, social, demographic, territorial and technological factors, including the increase in available income, technological developments, the decreasing barriers to international trade, decreasing transport costs, perception of the costs, changes in production and consumption models, increased leisure time, changes in life styles, territorial distribution of residential and production settlements, tertiary sector processes and the new organisation of production, limited co-ordination of decisions relating to transport and urban development.

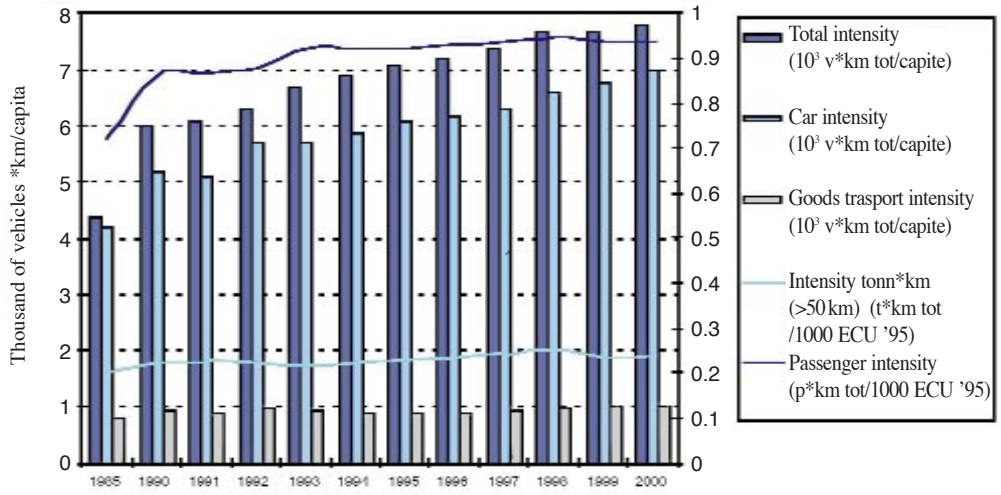
One of the most critical points in the national transport sector is the lack of homogenous services in the various areas of the country. Congestion phenomena occur mainly in the central and northern areas, whereas low levels of accessibility, caused by the insufficient quality of transport services and infrastructure, are to be found in southern Italy.

Urban and metropolitan areas experience high mobility demand, owing to the vast and differentiated presence of residential and production activities, seeing almost 70% of passengers movements throughout the country.

From 1990-2000, the demand for passenger mobility rose from 728 to about 895 billions of passengers per km (+ 23%). This demand has been satisfied increasingly by private transport, which today reaches 82% of the total. During the same period, the increase in demand for transporting freight (more than 50 km) rose from 189 to 230 million tonnes per km (+ 21%); the lack of homogeneity in the data requires a certain caution in making compa-

risons. Moreover this demand is satisfied mostly by road transport, which rose from 123.2 in 1990 to 147.4 million tonnes per km in 2000, totalling 64% of overall goods traffic transported for more than 50 km.

INDICATOR: **Passenger*km per mode, passenger*km per capita & per PIL, vehicles per km; and tonne*km per mode, tonne*km per capita & per PIL, vehicle*km**

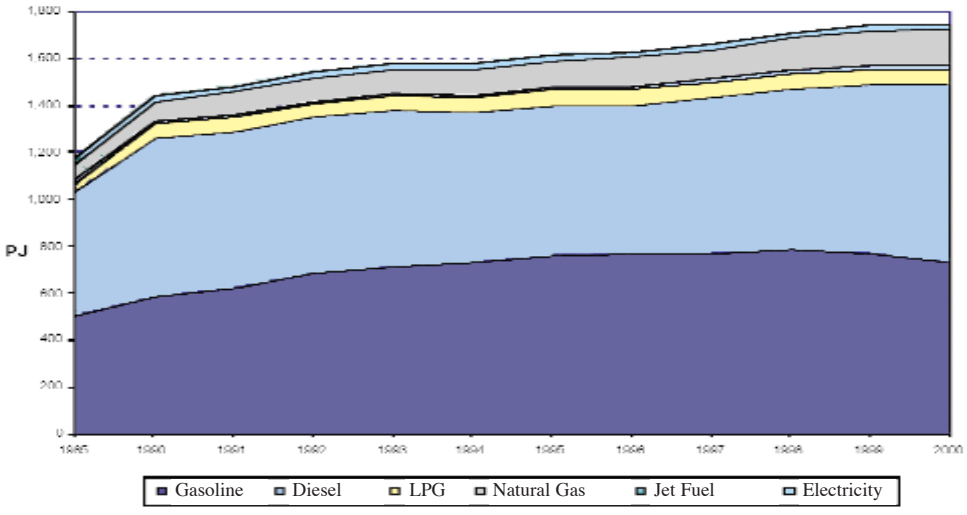


Source: Prepared by APAT on data from the Ministry of Infrastructure & Transport & on ISTAT data

Figure 11.9: Mileage & Total Intensity per Mode

Transport intensity has increased over the past years, and particularly goods transport, per income unit. In the period 1990-2000, passenger-km rose from 0.922 to 0.938 per 1000 ECU '95 of GDP, and from 0.226 to 0.24 tonne*km per 1000 ECU of GDP (at constant 1995 rates). The ratio of passenger mobility to national income showed significant growth during the 'eighties and early 'nineties, tending to stabilise after 1995 with growth in movements largely starting to follow income trends. The ratio of goods freight to income on the other hand shows a slight rise up to 1990, followed by fluctuations, but with slight growth.

INDICATOR: **Final and Primary Energy Consumption by Transport, Share of Total per Mode & Type of Fuel. Percentage of Unleaded Petrol & Alternative Fuels (natural gas and LPG)**



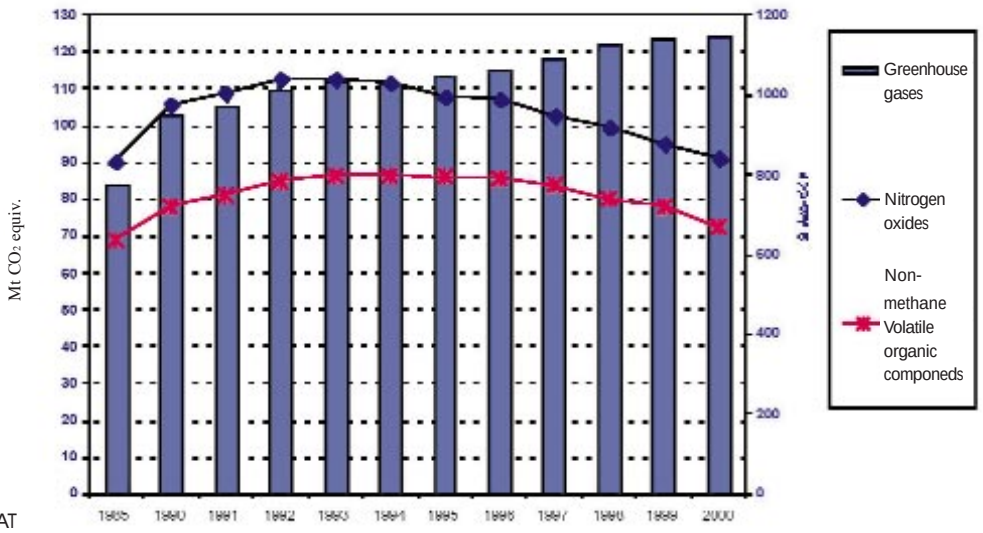
Source: Prepared by APAT on data from the Minstry of Infrastructure & Transport

Figure 11.10: Global Fuel Consumption in Transport (pJ)

In Italy, the transport sector, including bunkers, absorbs the highest share of final energy consumption, amounting to 34.9% in 1999; quite 84.9% of these consumptions can be attributed to road transport. From an examination of the energy sources utilised, emerges an almost total transport dependency on oil product consumption, mainly petrol and diesel fuel. As mentioned above, technological innovations on vehicles seem incapable, by themselves, of solving problems definitively, since the increased efficiency of the single vehicle is insufficient to counterbalance the continual growth in traffic, with the result that for a progressive unit reduction in consumption, total energy consumptions for the transport sector continue to rise.

INDICATOR: Greenhouse Gas Emissions (CO_2, CH_4 ed N_2O)

INDICATOR: Emissions of Main Atmospheric Pollutants (NOx, NMCOV)



Source: APAT

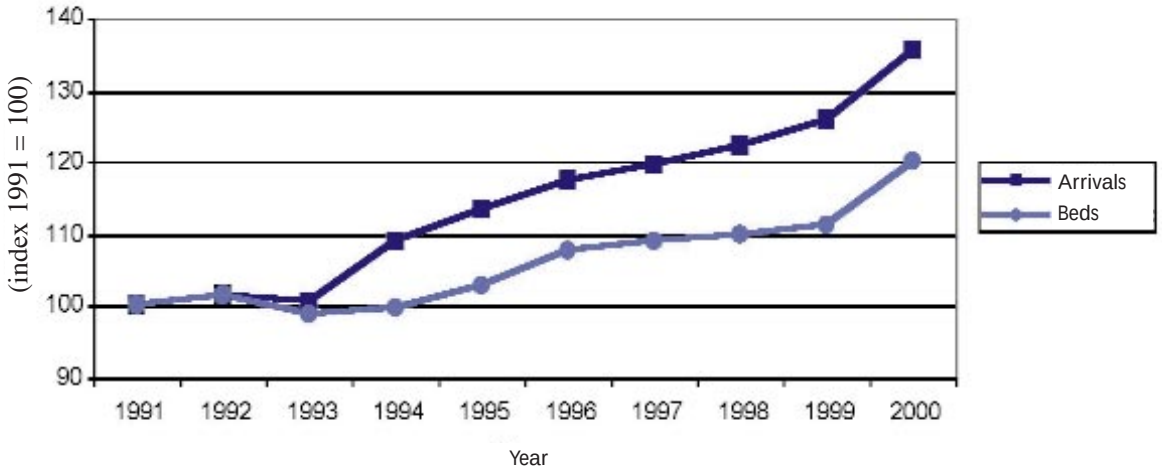
Figure 11.11 : Total Emissions of Greenhouse Gases (Mt), & Acid Rain Precursors, NOx and NMVOC (kt)

In Italy, in line with the trend involving most industrialised countries during the 'nineties, atmospheric emissions of harmful gases are decreasing. This trend embraces two contrasting tendencies: on the one hand, emissions are increasing owing to growth in the country's vehicle park and mileage, while on the other, they are decreasing owing to a renewal of the park itself. In particular, nitrogen oxides and non-methane volatile organic compounds have seen a significant reduction after 1995. Greenhouse gas emissions, being directly linked to fuel consumption, are continually on the increase: in particular, from 1990 to 2000, they increased by about 20%.

Tuurism

Tourism is a sector in rapid expansion. In 2000, the number of arrivals in Italy grew by 7.7%, and the number of presences by 9.9%.
Although holiday-making has changed, with shorter stays split up throughout the year, the seasonal phenomenon is still dominant, with peaks in the summer months and high concentrations in some Italian regions.
As a phenomenon, the related economic benefits of "tourism" cannot be considered without taking into account its connected environmental problems.
The flow of tourists, the means adopted for transporting them, and holiday destinations all have a considerable impact on the environment in terms of atmospheric pollution, use of natural resources, waste production, human presence in sensitive areas, etc.
The "tourism intensity" and "arrivals per transport mode" indicators provide a picture of territorial capacity and the pressures acting on it.

INDICATOR: Tourism Intensity

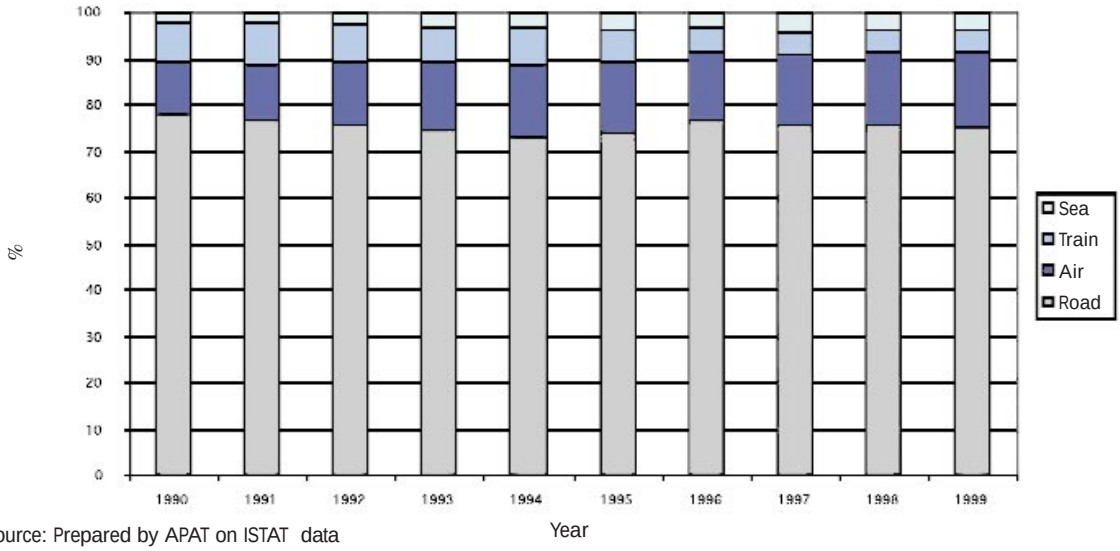


Source: Prepared by APAT on ISTAT data

Figure 11.12: Tourism Intensity

The graph shows how tourist intensity between 1991 and 2000 increased by 20% in terms of beds, whereas arrivals recorded an increase of 35%.
Some regions, such as Valle d'Aosta, Trentino Alto Adige and Veneto, show a much higher ratio of beds per 1000 inhabitants than the national average, indicating high touristic intensity.

INDICATOR: Arrivals per Mode of Transport



Source: Prepared by APAT on ISTAT data

Figure 11.13: Tourist Arrivals According to Means of Transport

The car is the means of transport preferred by most tourists for moving about (75.2%), followed by air journeys with a share of 16%, train journeys (4.8%), and sea journeys (4%).
Air travel has undergone considerable growth over the years (average of 3.9% per year), which can be attributed to the increasingly accessible offers made by travel agencies.
Tourism arrivals by train, on the other hand, saw a considerable fall between 1990 - 1997, although there has been some slight improvement in the past two years.

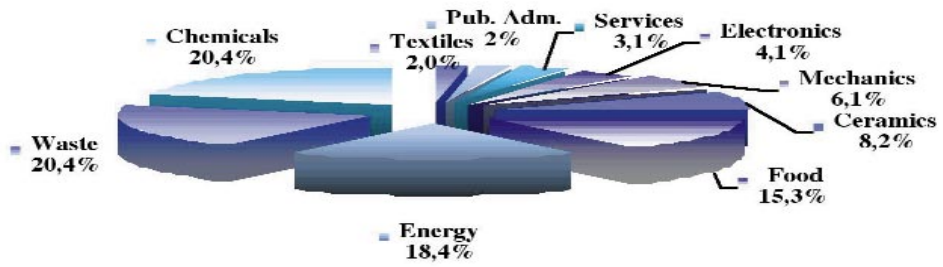
Environmental Quality of Organisations, Firms and Products

The Sixth Environmental Action Programme of the European Community (2000-2006) has identified some elements that are considered important for our future, such as an improved "green market", more precise information and the participation of different stakeholders.
This new approach does not intend to create new tools but instead aims at integrating the present ones (Emas, Ecolabel, IPP etc.) considered successful in terms of improving the environment, in prevention and in communication.
The chapter "Production Sector" chapter illustrates the main characteristic of these tools, their position in the national and European public policies and their state of implementation in Italy.

Environmental quality of organisations and firms

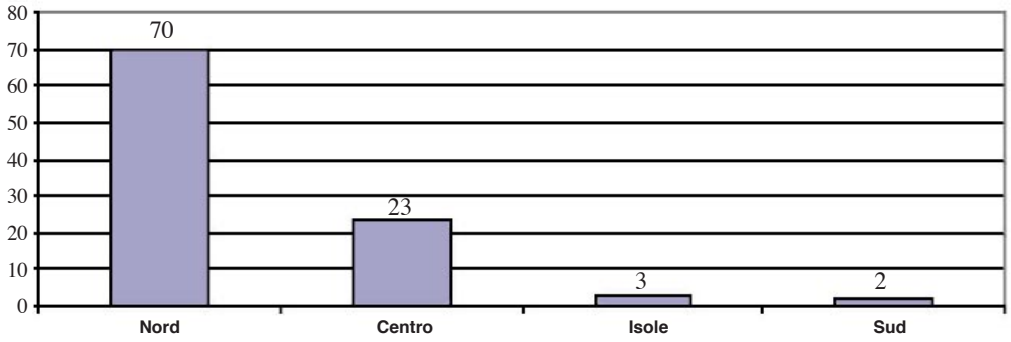
EMAS Regulation (EC) 761/01 is a voluntary scheme for organisations committed to improve their environmental performances through the implementation of an environmental management system, a systematic, objective and periodic evaluation of the efficiency of such system and the active participation of its employees. EMAS also requires the organizations to inform the public and the interested parties about its environmental performance in an open dialogue. The environmental statement shall include all the relevant information concerning the organization, the activities and related impacts, the environmental performances, the established environmental objectives and programme. The environmental statement is validated by an accredited Environmental Verifier and finally sent to the National Competent Body for registration.
The Italian Competent Body "Comitato Ecolabel Ecoaudit - Sezione EMAS Italia", has also the role of accreditation organization for EMAS. The Agency (APAT) has been assigned by law the role of technical support organization for both registration and accreditation activities. In our national procedures, the compliance to the relevant environmental legislation, prerequisite for EMAS registration, is assessed through the Italian Environmental Agency System.
Registered organizations can use the EMAS logo as recognition for the participation to the European scheme.
In the sphere of voluntary systems, a relevant reference for the development of eco-management is also constituted by the international standards of the ISO 14000 series, adopted by the International Organization for Standardization. EN ISO 14001 can be used by any type of organization which intends to improve the environmental performances of its activities, through the implementation of an environmental management system. EN ISO 14001 is recognised also by the new EMAS Regulations, as fulfilling the requirements of the environmental management systems (EMS). Organizations with EN ISO 14001 certificate have already implemented a part of the system and, therefore, are facilitated to achieve an EMAS registration.
In Europe, 3860 organizations are EMAS registered. Out of these, 2533 are located in Germany, 366 in Austria, 212 in Sweden, 205 in Spain, 170 in Denmark, 98 in Italy. The other countries follow with 77 in the United Kingdom, 64 in Norway, 32 in France, 40 in Finland, 27 in the Netherlands, 15 in Belgium, 10 in Greece, 8 in Ireland, 2 in Portugal and 1 in Luxemburg. Countries candidate to EU membership are also implementing EMAS and a total of 11 organizations have been registered (8 in the Czech Republic, 1 in Malta, 1 in the Slovak Republic, 1 in Rumania). Compared to European countries, there was a certain delay in Italy while adopting the national EMAS scheme; therefore it was consequently possible to register the first site only in December 1997. The number of registrations is now rapidly increasing: 12 at the end of '98, 25 at the end of '99, 42 at the end of 2000 and 83 at the end of December 2001. Statistically, the growth rate is approximately 70-80% per year and it is, at today, the highest among all the countries of the European Union.
Out of 98 EMAS registered organizations, 94 belong to the industrial sector, and 4, as provided by the new EMAS Regulation, to other sectors, such as the Municipality of Varese Ligure, the tourist area of Bibione and the Banca Verde of Monte dei Paschi di Siena.

***INDICATOR*: NUMBER OF EMAS REGISTRATIONS**



Source: EMAS organization national register (up date: 30/08/2002)

Figure 11.14: EMAS registration distribution by industrial sector.



Source: EMAS organization national register (up date: 30/08/2002)

Figure11.15: EMAS registration distribution by geographical area.

The number of EMAS registrations can be considered as an indicator of the awareness of companies and organizations which intend to decrease pressures on the environment, and can constitute an important confirmation for citizens and decision-makers on how, and by what means, the national system is moving towards development while safeguarding the environment. It can be viewed, therefore, as a response to the aim to reduce pollution and consumption of environmental resources.

As already mentioned, there are 98 Organizations registered to EMAS. Analysis of the data, updated 31/08/02, underlines the following aspects:

1. 59% are large companies, 23% small companies and 15% middle-sized, while 3% are public administrations and services.
2. The sectors which have mainly adopted EMAS (Fig. 1) are: the chemical sector (20.4%), waste (20.4%), electric energy production (18.4%) and food sector (15%).
3. EMAS is more widespread in the Centre-North (Fig. 2), and in particular in Emilia Romagna, in Lombardia and in Veneto, while there is a low penetration in the South.

The Government has established no objective for this indicator, because the participation is on a voluntary basis

INDICATOR: NUMBER OF ISO 14001 CERTIFICATES

The number of ISO 14001 certificates can be considered as an indicator of awareness of companies and organizations which, through the implementation of an EMS (ISO 14001) intend to decrease the pressure factors derived from their activities, products or services. It is clear that a wide number of EMS can be considered as an increase of awareness towards sustainable development. The number of certificates indicates, instead, how many organizations have achieved these objectives responding to ISO 14001 requirements.

In Italy, there are 1749 ISO 14001 certificates (up date: August 2002), with a high distribution in Lombardia, Veneto, Piemonte and in some region of the south such as Campania.

As this is a voluntary scheme, no prior objectives were established. Database updating is done periodically by SINCERT (Italian Accreditation Body for ISO certification organizations), on the basis of number of awarded certificates.

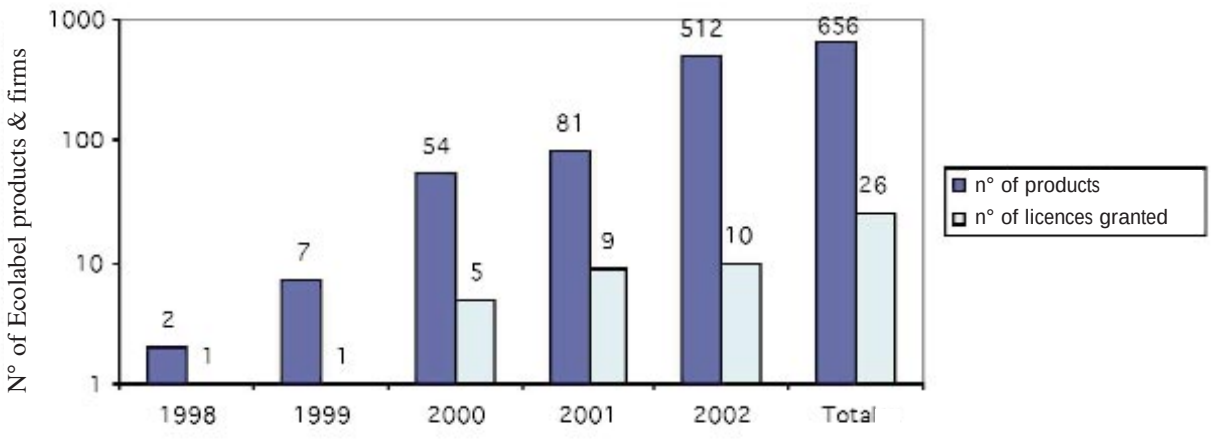
Environmental Quality of Products

The EU Ecolabel is the ecological European label that rewards those products and services that are considered acceptable from the environmental point of view, maintaining, at the same time, high performance standards. In fact, the label testifies that the product or service has a reduced environmental impact during its entire life cycle.

The ecological criteria definition derives from the life cycle assessment (*LCA*) highlighting the environmental impacts generated during its life (water and air quality, waste reduction, energy reduction, protection of the ozone layer, etc.). The aim of these ecological criteria is to reduce the above environmental impacts. The products and services have to observe the ecological criteria identified for each product group.

Products of widespread use (with the exception of food products, beverages and drugs) and services can be labelled. To date, 19 Ecolabel product groups have been identified. In particular, various types of detergents, footwear, electrical products (dishwashers, washing machines, televisions, refrigerators), tissue paper, copy paper, paints, soil improvers, personal computers, textiles, electric bulbs. Tourist accommodation has been chosen as the first Ecolabel service and the criteria will be published by the end of 2002.
The EU Ecolabel is characterised by the following elements: it is a voluntary tool; it is selective; it gives reliable and immediate information on the environmental nature of the product and, finally, it is valid throughout Europe. The label is awarded by the Ecolabel Ecoaudit Committee with technical support from APAT.

INDICATOR: NUMBER OF ECOLABEL LICENCES AWARDED



Source: APAT (update: 30/08/2002)

Figure11.16: Evolution of Ecolabel licences

The Ecolabel indicator "environmental friendly consumption", indicated by the numbers of Ecolabel licences awarded, aims to measure the environmental awareness of the industries through the implementation of voluntary tools and, consequently, measure the consumers environmental behaviour.
The evolution of the EU Ecolabel is indicated in Italy[4] from 1998 to 2002 with 656 labelled products for 8 products groups and with 26 Ecolabel licences awarded. (Fig.11.16).
The increase is confirmed also at European level. Besides Italy, France and Denmark have granted many Ecolabel licences during the last few years.
The data shows that, in Italy, the largest geographical distribution is in the north and centre. The major labelled product groups are represented per various types of detergents, textile and paper products.
In Europe, on the other hand, this is represented by paint products. The indicator data can be considered as comparable, reliable and precise due to same methodology having been applied over the years.

[4] Source: Database of APAT's ECOLABEL site.

12. Inspections

Introduction

Environmental inspections, in the more common sense of inspection activities, respond to the need to ascertain that the requirements and provisions of legislation and regulations are fulfilled and, in the event of non-fulfilment or ascertained non-conformity, to promote the necessary sustaining action needed to reach required conformity, by means of administrative measures and/or suitable deterrent and sanctionary action to identify and circumscribe any irregularity and illicit phenomena.
Inspection activities are consequently a response, in accordance with the DPSIR scheme, of the Institutions to limit illicit phenomena and environment impacts.
The environmental agencies – national, regional and of the autonomous provinces of Trent and Bolzano - (APAT/ARPA/APPA), and other institutional bodies such as the Environmental Protection Carabinieri Division (CCTA), Harbour Authorities, Basin Authorities, the Water Magistracies, the State Foresters' Corps, are competent in matters of environmental inspection.
The environmental agency system is currently pursuing organisational, methodological and data-collecting initiatives aimed at optimising the tools for planning and reporting on environmental control ispection: the preparation of standards of information and information exchange, environmental pressure and performance indicators (effectiveness/efficiency), indicators defining inspection targets (demanded by the standards and in order to assess territorial complexity/fragility in relation to environmental pressures).
The indicator selection and validation process of the inspection is in progress, and a few preliminary, non-standard aggregate indicators at national level are included in this chapter.

***INDICATOR*: Inspection Activities**

TABLE 12.1 Number of Environmental Inspection Activities Performed in Italy by ARPA, APPA & PMP.

Subject of Control	n°. inspections		Sampling and/or Measurements		Evaluation and/or Certifications
	1998/99	1999/2000	1998/99	1999/2000	1999/2000
Water quality protection	74,436	67,091	215,407	143,868	11,425
Air	15,257	21,182	2,124	7,669	4,732
Soil quality protection	16,378	13,511	8,643	2,578	1,243
Physical agents (noise, ionising & non-ionising radiations)	10,318	25,219	61,362	22,383	7,256
Waste	5,618	13,032	4,411	6,684	4,601
Nature preservation	19	14	111,137	-	-
Industrial risk (industrial hygiene & work premises)	678	61,657	19	41,705	52
Foodstuffs	4,074	2,172	61,678	95,334	-
Asbestos & Dust	413	1,094	1,731	4,144	-
Others	84,547	89,928	44,158	3,874	6,898
Total	**211,738**	**294,900**	**510,670**	**328,239**	**36,207**

SOURCE: Prepared by APAT on data provided by ARPA/APPA & PMP

Although corresponding to about 60% of the national territory, the data represents about 65% of the population.

TABLE 12.2 Number of Environmental Inspection Activities Performed in Italy by Central Institutions and Other State Bodies

Central Institutions & Other State Bodies	Subject of Control	n°. controls 1999	2000	2001
State Foresters' Corps	Soil defence & Waste	33,585		
	Nature Preservation	224,618		
	Others	5,626		
	Protection of waters, soil, waste, nature		741,838	
	Water, air & soil defence & control of electro-magnetic waves			4,278
	Waste			49,871
	Nature preservation (flora, fauna, territory, forest fires & protection areas)			592,239
	Other (agro-food chain, forestry, smuggling against E.U. rules)			25,329
	Total	**263,829**	**741,838**	**671,717**
Environmental Protection Carabinieri Command (ex Ecological Operations Nucleus)	Water protection (discharges)	12,850	10,720	4,201
	Air defence (emissions)	2,513	2,739	1,356
	Physical agents	1,790	3,061	833
	Soil protection (waste)	13,877	12,314	5,806
	Nature preservation	3,239	4,180	1,467
	Industrial risk	219	396	
	Total	**34,488**	**33,410**	**13,663**
Harbour Offices	Sea water protection	186		
	Waste management	1,953		
	Nature preservation	2,665		
	Merchant navy units	10,857		
	Others (fishery surveillance)	9,558		
	Environmental protection		10,735	
	Fisheries		35,083	
	Nature & state property preservation		21,569	
	Marine archaeology		1,649	
	Protection of marine coastal waters			41,763
	Total	**25,219**	**69,036**	**41,763**
Water Magistracy	Water protection (discharges)	439	368	803
	Waste	12	432	-
	Total	**451**	**800**	**803**
Agecontrol SpA(1)	Control of waste waters, olive residue, oil mills	1,820	1,900	1,811
	Total	**1,820**	**1,900**	**1,811**
Grand Total		**325,807**	**846,984**	**729,757**

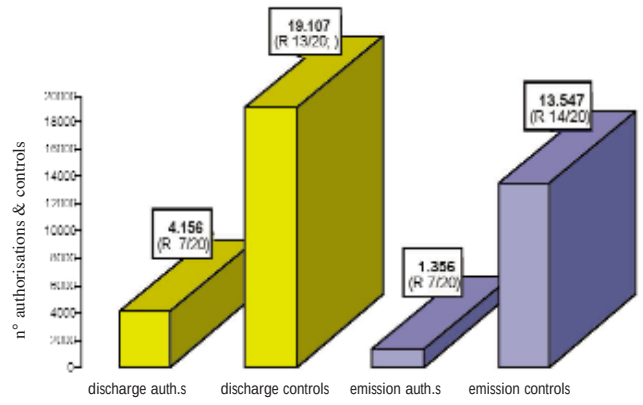
(1) Control Agency for Community Actions in the context of olive oil subsidies.

Source: Prepared by APAT, on data provided by CFS, CCTA, Harbour Offices, Water Magistracies & Agecontrol S.p.A.

TABLE 12.3. Number of Environmental Ispection Activities Performed in Italy by ARPA, APPA in 2001.

SUBJECT OF INSPECTION	Inspections	Measurements / Sampling	Tests / Determina-tions	Measures & Sanctions against offences	Interventions authorisations & estimates	Other
Water protection:						
Discharges	19,107	15,911	207,227	1,282	9,659	-
Surface waters	11,515	20,715	483,153	96	326	39
Ground waters	4,643	64,949	656,909	55	726	9
Total	**35,265**	**101,575**	**1,347,289**	**1,433**	**10,711**	**48**
Air protection (emissions)	13,547	288,072	3,705,737	200	6,971	-
Total	**13,547**	**288,072**	**3,705,737**	**200**	**6,971**	**-**
Soil defence	6,667	17,900	119,922	32	7,102	-
Total	**6,667**	**17,900**	**119,922**	**32**	**7,102**	**-**
Waste	14,137	5,526	105,147	702	4,737	-
Total	**14,137**	**5,526**	**105,147**	**702**	**4,737**	**-**
Physical agents:						
Noise	4,806	96,632	-	251	3,134	-
NIR	4,335	18,797	-	9	8,413	64
Ionising radiations	2,085	19,486	477	12	2,951	-
Total	**11,226**	**134,915**	**477**	**272**	**14,498**	**64**
Activities for third parties / other:						
Foodstuffs	7,235	81,471	914,973	225	4,606	-
Asbestos	1,214	6,550	10,326		5,025	-
Industrial risk	3,211	3	620		167	-
Bathing water	11,045	51,818	139,477	3	-	570
O.G.M.	5	369	850	-	-	-
Other	92,637	202,921	261605	433	17,476	-
Total	**115,347**	**343,132**	**1,327,851**	**661**	**27,274**	**570**
Grand Total	**196,189**	**891,120**	**6,606,423**	**3,300**	**71,293**	**682**

Source: Prepared by APAT, on data provided by ARPA / APPA

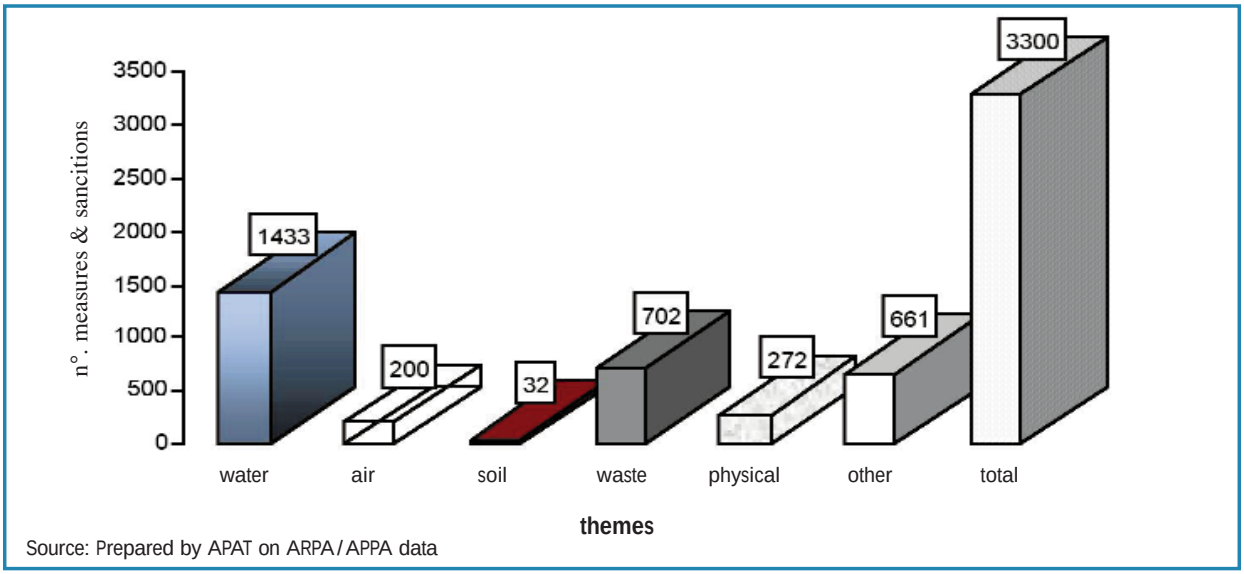


Source: Prepared by APAT on ARPA / APPA data

Figure 12.1: Number of Inspection Activities Versus Number of Liquid Discharge & Atmospheric Emission Authorisations for 2001.

This indicator is used to assess the effectiveness of the inspection activities performed on the territory, whether planned or not, in view of regulatory and territorial complexity, through the quantification of the number of formal or technical actions according to the various environmental matrices, such as air, water, soil, waste management, physical agents (noise, vibrations, ionising and non-ionising radiations), anthropogenic risk, etc. for a given territory, carried out by the competent authorities. The available data is for the period 1998-2001 (Tables 12.1, 12.2, 12.3).

INDICATOR: Measures & Sanctions Against Offences

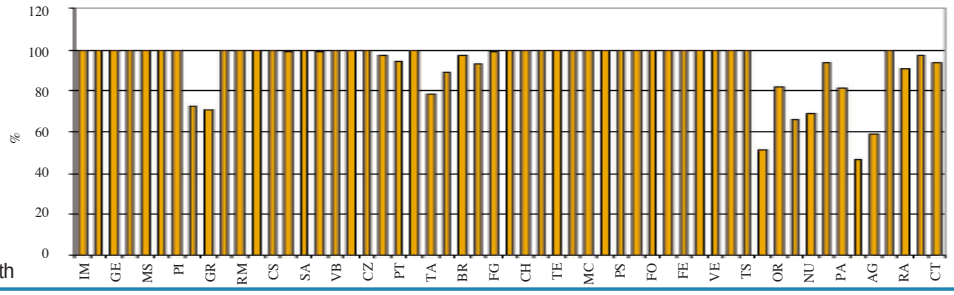


Source: Prepared by APAT on ARPA/APPA data

Figure 12.2: Number of Measures & Sanctions against Offences in 2001

The indicator assesses the effects and consequences – both administrative and penal – deriving from inspection activities in the event that the requirements and performances of law, regulations and inspection organs are not observed. It quantifies over a period of time the number of instruments issued by the competent organs (sanctions, notifications of offence, etc.) to those not observing the law and regulations.
Sanctions inflicted are given in figures for the various sectors in which inspection activities have been carried out.

INDICATOR: -Bathing Inspection



Source: Ministry of Health

FIGURE 12.3: Percentage of Coastline Monitored Compared to Coastline to be Monitored for Bathing water in Italy – Year 2001

The indicator highlights the response of the various administrations in aligning their monitoring programmes to the prescribed standards.
The indicator represents the percentage of coastline effectively monitored related to the total coastline and including all coastal areas that, owing to specific regulations or technical impossibility or in areas with no pressure, need no inspection.
All the data has been taken from the publication of the Ministry of Health, Health Information System, Prevention Department, titled "Bathing Water Quality – Result Summary for the 1999 Season" ["Qualità delle acque di balneazione - Sintesi dei risultati della stagione 1999"] and the same for 2001.
An examination of the 2001 data shows that, for most provinces, all or almost all the coast is monitored: 33 provinces out of 56 show 100% and in other 7, the percentage is between 95 and 99%.
A further considerable part of province coastline is exempt from such monitoring, owing to low environmental importance.
National response to the need for bathing monitoring is consequently almost complete, taking into account the considerations indicated above (Figure 12.3).

APPENDIX

1. Atmosphere

Q1: Synoptic Table of Air Indicators

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Emissions	**Greenhouse gases emissions (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6): trend & sectorial breakdown**	**Estimate national emissions and evaluate sectoral contributions in order to verify achievement of established targets**	**P**	**I**	**1990-2000**
	Production of stratospheric ozone depleting substances (CFCs, CCl4, 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_x, NO_x, NH_3): trend & sectorial breakdown	**Estimate national emissions and evaluate sectoral contributions in order to verify achievement of established targets**	**P**	**I**	**1980-2000**
	Emissions of tropospheric ozone precursors (NOx and NMVOC): trend & sectorial breakdown	**Estimate national emissions and evaluate sectoral contributions in order to verify achievement of established targets**	**P**	**I**	**1980-2000**
	Emissions of carbon monoxide (CO): trend & sectorial breakdown	Estimate national emissions and assess trends resulting from actions adopted to reduce emissions mainly from traffic and heating plants	P	I	1980-2000
	Emissions of benzene (C_6H_6): trend & sectorial breakdown	Estimate national emissions and assess sectoral contributions in order to verify the effectiveness of emission reduction policies	P	I	1990-2000
	Local inventories (regional and/or provincial) of emissions to the atmosphere (existence of inventories & territorial distribution)	Check with local bodies (regions and/or provinces) as to the availability of local inventories of emissions to the atmosphere (whether compiled or being compiled)	R	I	1999
Air quality	Air quality monitoring stations at national level	Provide an overall picture of answers to demands for air quality data	R	I R 19/20	2001
	Stations selected for national air quality data collection	Set up a contained but qualified set of representative information about air quality on a national scale	R	I R 19/20	2001
	Sulphur dioxide (SO_2) concentrations in the air	Check that regulations are observed and verify trend over time	S	I R 19/20	1995 - 2001
	Nitrogen oxides (NO_2, NO_x) concentrations in the air	**Check that regulations are observed and verify trend over time**	**S**	**I R 19/20**	**1995 - 2001**
	Ozone (O_3) concentrations in the air at ground level	**Check that regulations are observed and verify trend over time**	**S**	**I R 18/20**	**1995 - 2001**

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continua

Air quality	Carbon monoxide (CO) concentrations in the air	Check that regulations are observed and verify trend over time	S	I R 19/20	1995 - 2001
	Benzene (C_6H_6) concentrations in the air	**Check that regulations are observed and verify trend over time**	**S**	**I R 16/20**	**1995 - 2001**
	Fine particulate (PM10) concentrations in the air	**Check that regulations are observed and verify trend over time**	**S**	**I R 17/20**	**1995 - 2001**

2. Biosphere

Q2: Synoptic Table of Biospheric Indicators

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Bio-diversity: trends & changes	State & *trend* of i gruppi di specie ornitiche	Provide a picture of the *"state of health"* of sensitive species ornitiche sensibili	S	I	1999
	Overall number of threatened animal species	**Provide the scenario of the current biodiversity conservation status**	**S**	**I**	**1998, 1999**
	Overall number of threatened vegetable species	**Provide the scenario of the current biodiversity conservation status**	**S**	**I R 20/20**	**1982, 1997, 2001**
	Loss of biodiversity (species ornitiche)	Monitor the biodiversity trend nationwide for selected species	S	I	1998
	Number of aquaculture plants and overall farming volumes	Show overall production for the aquaculture sector and provide an orientation to identify aquiculture impact levels on the marine and coastal environments	D	I R 20/20	1998 - 1999
	Importance of fishing activities	Show sectorial trends towards diversifying activities and the status of targeted resources	D	I	1993 - 2002
	Hunting impact	Assess which Italian regions undergo greater induced pressure from hunting activities	P	I R 20/20	1998
Effects of climate changes	Variation of glacier fronts	Verify any trends in glacier fronts and any anomalies attributable to Global Change	S	I	1958 - 2000
Protected areas	Protected land area coverage	Assess the percentage of national territory covered by protected land areas	S R	R 20/20	2000
	Protected marine area coverage	Assess the percentage of national territory covered by protected marine areas	S R	R 20/20	2001
	Special Protected Areas (SPA)	**Assess the percentage of national territory covered by SPA and the trend of safeguarding actions over the years**	**R**	**R 20/20**	**2000**

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Protected areas	**Impact of communications infrastructures in protected areas**	**Assess the development of the main communications network present in protected areas, to provide indirect information about nature area levels and highlight potential conflicts between conservation and infrastructural connection requirements**	**P**	**R 20/20**	**1997, 1999, 2002**
Wetlands	Wetlands of international interest	Assess the area covered by wetlands of international interest as a portion of total wetlands and the safeguarding of national territory	R	R 20/20	2000
Forests	Forest areas: status & variations	Indicate the status and trend of forest coverage over the period in terms of typology, territorial distribution and form of government	**S**	**R 20/20**	**1948-2000**
	Extent of forest fires	Indicate the complex phenomenon of forest fires, highlighting event features and trend over the period	**I**	**I**	**1970 - 2001**
	Critical loads of total acidity and excesses	Assess the impact of acidifying atmospheric deposits on vegetal ecosystems throughout the national territory	I	I	1985 - 1995
	Critical loads of nutrient nitrogen and excesses	Assess the impact of eutrophicising atmospheric deposits on vegetal ecosystems throughout the national territory	I	I	1985 -1995
	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 - 2001
Landscape	Land use subdivided per coverage category	On the basis of the *CORINE Land Cover* categories, indicate landscape features for each region concerning rural and natural landscapes	S	R 20/20	1996
	Land protected by Act 1497/1939 & 431/1985	Provide the overall national and/or regional extent, subdivided per typology of protected area	R	I, R, P	1998
	Regions possessing approved countryside plan	Indicate the number of regions that have completed the legislative requirements on the countryside plan	R	R 20/20	1997

3. Hydrosphere

Q3: Synoptic Table of Hydrospheric Indicators

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Water body quality	**TRIX trophic status index**	**Establish the trophic status of coastal sea waters**	**S**	**R.c.[1] 14/15**	**1997-2000**
	Bacteriological Quality Index (BQI)	Assess the level of antrophic contamination (civil and agricultural) in seabathing waters	S	C.c.[2] 630/630	2000-2001

[5] R.c. = Coastal regions, even if data has been gathered at particular sampling points
[6] C.c. = Seaboard municipalities

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Water body quality	***bathing water quality***	**Assess the hygienic suitability of sea-bathing waters, based on regulatory standards**	**I**	**C.c. 630/630**	**1999-2001**
	Macrodescriptions	Provide further information to characterise watercourses	S	R 14/20	2000-2001
	IBE Index	Assess and classify water course biological quality	S	R 14/20	2000-2001
	LIM Index	Determine pollution level	S	R 17/20	2000-2001
	SECA Index	**Assess and classify water bodies quality**	**S**	**R 17/20**	**2000-2001**
	Waters suitable for fish	Check that the targets established by regulations have been achieved	S	R 17/20	1998-2000
	Waters suitable for molluscs	Check that the targets established by regulations have been achieved	S	R 10/20	1998-2000
	SCAS Index (Chemical Status of Underground Waters)	Define the degree of endangerment of aquifers from a chemical point of view from natural and atrophic causes, measuring the achievement of targets established by regulations	S	R 7/20	2000-2001
Water resources & sustainable uses	**Water for drinking purposes**	**Measure the quantitative impact of water abstraction**	**I**	**R 20/20**	**1993-1998**
Water resource pollution	Average nutrients in the closure of basins	Further information to characterise rivers and their pollutant supply	P	R 5/20	2000-2001
	Potential organic content	Assess the impact on water quality of pollutant contents theoretically reaching a water source	P	R 20/20	1990-1996-1999
	Depurators: compliance of urban waste water sewer system	**Assess the compliance of sewer systems according to the requirements of arts 3 & 4 of Directive n° 91/271/EEC, assimilated in Italy by Decree Law 152/99, subsequently integrated and amended by Decree Law 258/00.**	**R**	**R 20/20**	**2001**
	Wastewater Treatment System: compliance of urban waste water treatment system	**Assess the compliance of sewer systems according to the requirements of arts 3 & 4 of Directive n° 91/271/EEC, assimilated in Italy by Decree Law 152/99, subsequently integrated and amended by Decree Law 258/00.**	**R**	**R 20/20**	**2001**

4. Geosphere

Q4: Synoptic Table of 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 anti-parasites or fertilizers.	S	P 40/103	1980-2000

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Soil quality	Balance of nutrients in soil (nutrient input/output)	Define the deficit or surplus status of nutrients per unit of cultivated area	S	R 20/20	1994 -1998
Physical & biological degradation of Soil	Desertification risk	Estimate the desertification risk for Italian soil	P	I R 4/20	2002
	Soil compaction risk related to number and power of tractors	**Estimate the soil compaction risk due to the passage of heavy machines on agricultural soil**	**P**	**R 20/20**	**1967-1999**
	Water erosion of soil	Estimate the risk of soil erosion due to surface water action in complex agricultural systems (basins)	I	I	1999
Soil contamination local and diffuse	Mineral fertilizer sales (N, P, K)	Provide the change over time in quantities of N, P, K fertilizers used in agriculture from data for fertilizers placed on the market or applied to the land	P	R 20/20	1971-2000
	Sale of phytosanitary products (herbicides, fungicides, insecticides)	Provide an indirect evaluation of the degree of soil contamination and the trend in the use of phytosanitary products in agriculture	P	R 20/20	1990-1999
	Stockbreeding & zootechnical waste waters	Assess the incidence of stock loads on the territory through nitrogen production compared to treatable SAU	**P**	**R 20/20**	**1990-1999**
	Areas used for intensive agriculture	Assess the trend in agricultural practice towards intensive agriculture, leading to the loss of biodiversity in the long or short term	P	R 20/20	1995-1999
	Areas used for crops with low environmental impact	**Estimate the temporal and spatial tendency to observe EEC regulations incentivating agriculture with low environmental impact**	**R**	**R 20/20**	**1993-2000**
	Contaminated sites	Provide the actual status of areas requiring reclamation interventions for the soil and/or for surface and underground waters.	P	R 20/20	2002
	Contaminated sites of national interest	**Provide the actual reclamation status of sites of national interest**	**P**	**R 20/20**	**2002**
	Reclaimed sites	Describe the number and location of reclaimed sites	R	R 14/20	2002
Use of territory	***Land Use***	**Provide a general picture of the main anthropical and/or economic activities on the territory**	**S**	**R 20/20**	**1990**
	Urbanisation & Infrastructure	Describe territorial occupation for urbanisation and infrastructures, deemed the main form of irreversible land loss	P	R 20/20	1990-1999
	Sites for the extraction of second category minerals (quarries)	Describe the distribution of extraction sites and related plants and obtain information about land quantities subtracted from agricultural activity. Indirectly, this can be a land loss indicator and provide information on potential contaminated sites	P	P 47/103	1996-1998

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Use of territory	Sites for the extraction of first category minerals (mines)	Quantify anthropical activities of "sites for the extraction of first category minerals" with high environmental- landscape impact, strictly correlated with the local geological and geomorphological context.	P	R 20/20	1995 - 2000
	Energy extraction sites	Quantify anthropical activities of "sites for the extraction of first category minerals" with high environmental- landscape impact, strictly correlated with the local geological and geomorphological context.	P	R 20/20	1995 - 2002

5. Waste

Q5: Synoptic Table for Waste Indicators

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Waste generation	**Total generation of waste by main categories**	**Measure the total quantities of waste generated**	**P**	**I, R, P, C**	**1995-2000**
Waste management	**Waste landfilled, total and by main categories**	**Indicate the effectiveness of waste management policies**	**R, P**	**I, R, P, C**	**1996-2000**
	Number of landfills	Indicate the impact generated in a determined geographical area	P	I, R, P, C	1997-2000
	Waste incinerated, total and by main categories	Verify trends in waste disposal	R, P	I, R, P, C	1996-2000
	Number of incineration plants	Verify achievement of targets fixed by regulations in force	P	I, R, P, C	1997-1999
	Industrial waste recovery	**Indicate the effectiveness of waste management policies**	**R, P**	**I, R, P, C**	**1997-1999**
	Municipal waste fractions collected separately	**Indicate the effectiveness of municipal waste management policies**	**R**	**I, R, P, C**	**1996-2000**
Packaging generation and management	**Packaging generation, total and by material categories**	**Measure the quantity of packaging generated**	**P**	**I**	**1993-2000**
	Marketing of packaging, total and by material categories	**Measure the total quantity of packaging effectively marketed at national level**	**P**	**I**	**1998-2001**
	Packaging recovery by material categories	**Determine the quantity of packaging recovered to satisfy regulatory targets**	**R**	**I**	**1998-2001**

6. Ionising Radiations

Q6: Synoptic Table of Ionising Radiation Indicators

SINAnet	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Ionising radiations	Work activities with Naturally Occurring Radioactive Materials (NORM)	Quantify "NORM-related" environmental pressure sources	D	I	1999-2001

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Ionising radiations	Facilities authorised to utilise radioisotopes	Document the number and National distribution of facilities authorised to employ radiation sources (category A)	D	R 16/16	2002
	Scrap-metal treatment plants (collection, storage, fusion)	Monitor the number of plants for scrap-metal treatment	D	R 20/20	2001
	Nuclear plants: activity of radioisotope discharged in air and water	Monitor radioactive emissions in air and water	P	I	2001
	Quantity of radioactive waste stored	Document typology and quantity of radioactive waste according to the different facilities	P	R 10/10	2001
	Activity concentration of radon indoors	**Monitor one of the main sources of exposure to radioactivity for the public**	**S**	**I R 20/20**	**1989-1997**
	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	R15/20	1970-2001
	Activity concentrations of radioisotopes in environmental and food matrices (atmospheric particulate, humid 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	1986-2001
	Mean individual effective dose in one year	**Estimate contributions from sources of exposure to radioactivity (natural and anthropic origin) for the public**	**I**	**I**	**2001**

7. Non-Ionising Radiations

Q7: Synoptic Table for Non-Ionising Radiations

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Electro-magnetic fields	**Density of broadcasting and telecommunication systems and sites and global power over the National territory**	**Quantify the main pressure sources as regards RF fields.**	**D/P**	**R 9/20**	**2001**
	Power Line length, divided by voltage and by regional surface area	**Quantify main pressure sources as regards ELF fields**	**D/P**	**I R 20/20**	**2001, 1991 2001**
	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 17/20**	**1998-2002**
	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 18/20	1996-2000

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Electro-magnetic fields	**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 and telecommunication systems), and the discipline for installing**	**R**	**R 14/20 R 16/20 R 18/20**	**1999 2000 2001**
	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	R 14/20 R 15/20 R 17/20	1999 2000 2001
	Regional Regulatory Observatory	Assess regulatory response to problems concerning sources of non-ionising radiations, also with reference to the application of the framework law	R	R 17/20	1988-2001
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

8. Noise

Q8: Synoptic Table for Noise Indicators

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	2001
	Number and capacity of port infrastructures	Assess the number and importance of port infrastructures	D	I	2000
	Airport traffic	Assess the amount of airport traffic	P	I	1990-1999
	Rail traffic	Assess the amount of rail traffic	P	I R 20/20	1990-1999
	Motorway traffic	Assess the amount of motorway traffic	P	I	1990-2001
	Public exposed to noise pollution	Evaluation the percentage of the public exposed to levels higher than established thresholds	S	C 18/8100	1998-2002
	Inspected sources and percentage of these with at least one limit exceeded	**Assess noise pollution in qualitative and quantitative terms**	**S**	**R 17/20**	**2000-2001**
	Actuation status of municipal noise classification plans	**Assess the putting into effect of the national law as regards the activities of the administrations in prevention and protection from environmental noise**	**R**	**C 7691/8100**	**2001**
	Actuation status of the report on municipal acoustic status	Assess the putting into effect of the national law as regards the activities of the administrations in information activities	R	C 130/140	2001
	Approval status of municipal noise remediation plans	Assess the putting into effect of the national law as regards the activities of the administrations in remediation plans	R	C 6622/8100	2001

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9. Anthropogenic Risk

Q9: Synoptic Table for Anthropogenic Risk

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Industrial Risk	**Establishments with major-accident hazards**	**Estimate the hazards to which the air, soil, subsoil, water table and surface waters are subject due to the presence of establishments with major-accident hazards**	**P**	**I, R, P, C**	**2001**
	Municipalities with 4 or more establishments with major-accident hazards	**Provide initial elements to identify areas with high concentration of establishments with major-accident hazards**	**P**	**I, R, P, C**	**2001**
	Typology of establishments with major-accident hazards	Estimate the prevalent hazards to which the air, soil, subsoil, water table and surface waters are subject due to the presence of certain typologies of establishments with major-accident hazards	P	I, R, P, C	2001
	Quantities of hazardous substances in establishments with major-accident hazards	Estimate the prevalent hazards to which the air, soil, subsoil, water table and surface waters are subject due to the presence of certain hazardous substances in establishments with major-accident hazards	P	I	2001

10. Natural Risk

Q10: Synoptic Table for Natural Risk

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Tectonic Movements	**Surface faulting (Capable Faults)**	**Reduce seismic risk**	**S**	**I**	**-**
	Seismic events	**Reduce seismic risk**	**S**	**I**	**2001**
	Volcanic eruptions	Reduce volcanic risk	S	I	2001
Hydro-geological Risks	**Areas with very high hydrogeological risk from Special Plans**	**Verify the existence of plans aimed at removing the highest hydrogeological risk situations**	**S**	**R**	**2000-2001**
	Adoption of Transitional Hydrogeological Arrangement Plans	**Verify the existence of transitional hydrogeological arrangement plans (PAI) to identify areas at hydrogeological risk and the circumscription of areas to be subjected to protection measures**	**R**	**R**	**2000-2001**
	Progress status of interventions to reduce hydrogeological risk, funded as per DL 180/98 & s.a.&i.	**Verify the actuation status of interventions included in urgent programmes for reducing hydrogeological risk**	**R**	**R**	**2001-2002**

11. Production Sectors

Q11: Synoptic Table for Production Sectors

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Agricolture	**Farms & agricultural surface areas utilised**	**Describe territory effectively destined for agricultural production**	**D**	**I, R**	**1985-1999**

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Agricolture	Agrarian land management	Provide information about management procedures for agricultural land, with reference to agricultural practice, main crops, coverage practice	D/P	I, R	1998
	Water resource management	Divide irrigated surface areas according to irrigation method	P	I, R	1998
	Use of fertilizers	Show intensity of use of chemical & organic fertilizers	P	I, R	1998
	Use of phytosanitary products	Show intensity of use of phytosanitary products	P	I, R	1998
	Land used for OGM experimentation in agriculture	Quantify the number of OGM issued, subdivided per typology and quantity			
	Area with nature elements (hedges, rows of trees, copses)	Provide the extent of nature elements such as hedges, rows of trees, copses	S	I, R	1998
	Area converted to woodlands	Provide the extent of forest plantation areas	R	I, R	1998
	Eco-efficiency in agricolture	**Provide indications of eco-efficiency in the agricultural sector, i.e. ability to detach economic growth factors from an increase in pressure and impact factors**	**R**	**I**	**1990-2000**
Energy	**Greenhouse gas emissions: total and from energy processes**	**Assess the role of energy processes compared to emissions of greenhouse gases**	**P**	**I**	**1990-2000**
	Greenhouse gas emissions from energy processes per economic sector	Assess the trend of greenhouse gas emissions from energy processes for the various economic sectors	P	I	1990-2000
	Sulphur dioxide emissions: total and from energy processes	Assess the role of energy processes with regard to sulphur dioxide emissions	P	I	1980-2000
	Nitrogen oxide emissions: total and from energy processes	Assess the role of energy processes with regard to nitrogen oxide emissions	P	I	1980-2000
	Final energy consumption per economic sector	**Assess the energy consumption trend at national level and per economic sector**	**D**	**R 20/20**	**1971-2000**
	Final electric power consumption per economic sector	Assess the electric power consumption trend at national level and per economic sector	D	R 20/20	1990-2000
	Ratio of final energy consumption to total energy consumption	**Assess overall efficiency in primary energy conversion from the various utilisable energy sources**	**R**	**I**	**1990-2000**
	Gross electric power production from cogeneration plants	Assess the contribution of combined production plants for energy and heat to total electric power production	R	I	1997-2000
	Final and total sectoral energy intensities	Assess the relation between the energy consumption trend and economic growth	R/D	I	1990-2000
	Total energy consumption per primary source	**Assess the contribution of the different energy sources to energy production**	**D/R**	**I**	**1971-2000**
	Electric power production per source	Assess the contribution of the different energy sources to electric power production	D/R	R 20/20	1990-2000

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Energy	**Gross electric power production from renewable sources**	**Assess the contribution of clean and inexhaustible energy sources to total electric power production**	**R**	**R 20/20**	**1991-2000**
	Energy product prices	Assess the effect of international energy source markets and sector policies trends on energy prices	D/R	I	1990-2001
	Tax revenue from oil products	Assess to what extent tax levels correspond to external costs and favour the use of cleaner products	R	I	1998-2001
	External costs in energy production	Assess environmental and social costs of energy production	I	I	1999
Transport	**Final and primary energy consumption by transport, share of total per mode and type of fuel and percentage of unleaded petrol and alternative fuels (natural gas and LPG)**	**Quantify the environmental consequences of transport**	**D**	**P 103/103**	**1990-2000**
	Greenhouse gas emissions (CO_2, CH_4 ed N_2O), per mode	**Quantify the environmental consequences of transport**	**P**	**I**	**1990-2000**
	Emissions of main atmospheric pollutants (NO_x, NMVOC), per mode (TERM 03)	Quantify the environmental consequences of transport	P	I	1990-2000
	Passenger*km per mode, passenger km per capita and per GDP, vehicle*km, Tonne*km pe*mode, tonne*km per capita and per GDP, vehicle*km	**Quantify the evolution of transport demand and intensity**	**D**	**I**	**1990-2000**
	Capacity and extent of the infrastructure network	Quantify the evolution of transport demand and intensity	D	R 20/20	2000
	Energy efficiency and specific emissions of CO_2, road (MJ/p-km-t-km)	Describe the technologies utilised	D/P	I	1990-2000
	Specific emissions of NOx, and NMVOC, road (g/p-km-t-km)	Describe the technologies utilised	D/P	I	1990-2000
	Road vehicle park, total and per capita values, average age of vehicles, percentage of vehicles	Describe the technologies utilised	D	I	2000
Tourism	Tourist Infrastructures	Quantify the territory's reception capacity	D	I R 20/20	1990-2000
	Arrivals per transport mode	**Show incidence of tourist phenomenon on use of means of transport**	**D**	**I R 20/20**	**1990-1999**
	Tourism Intensity	**Determine the territory's touristic load**	**D**	**I R 20/20**	**1991-2000**
	Family expenditure for tourism	Determine incidence of touristic expenses on family expenditure and GDP	D	I R 20/20	1995-2000
Environmental Quality of Organisations, Firms, Products	**Number of EMAS registrations**	**Describe the evolution of environmental sensitivity applied to organisations and firms.**	**R**	**R 15/20**	**August 2002**

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Environmental Quality of Organisations, Firms, Products	**Number of ISO 14001 certificates**	**Describe the evolution of environmental sensitivity applied to organisations**	**R**	**I**	**June 2002**
	Number of Ecolabel licences awarded	**Illustrate the evolution of environmental sensitivity applied to products and services**	**R**	**R8/20**	**August 2002**

12. Inspections

Q12: Synoptic Table for Control Indicators

SINAnet Theme	Indicator	Aim	DPSIR	Spatial coverage	Time coverage
Inspections	**Inspection 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 15/20**	**1998-99 1999-00 2001**
	Measures and sanctions against offences	**Identify law observance on environmental topics over time**	**R**	**R 9/20**	**1998-99 1999-00 2001**
	Bathing water inspection	**Assess the percentage ratio between inspected and monitored costas kilometers**	**R**	**I**	**1999-2001**

Legenda:

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 represents 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 period of reference for the historical series available and/or for the data indicated in table.

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