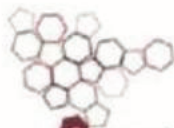




**ISPRA**

Istituto Superiore per la Protezione  
e la Ricerca Ambientale



Sistema Nazionale  
per la Protezione  
dell'Ambiente

## SUMMARISING... THE ENVIRONMENT



STATO DELL'AMBIENTE



ITALIAN  
ENVIRONMENTAL DATA  
YEARBOOK 2017





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ENVIRONMENTAL DATA  
YEARBOOK 2017

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On the occasion of the fifteenth edition of the Environmental Data Yearbook, starting from the same database at ISPRA disposal, some distinguished information products have been created with the aim of disseminating more punctual information to be addressed to a great community of users: from public decision-making to research, from economic business to private citizen.

From the 2017 edition have been obtained 7 products:

- **Environmental Data Yearbook** - full version, it presents the indicator sheets populated during 2017, organized by productive sectors, environmental conditions and answers. It is available in electronic format (PDF).
- **2017 Environmental Data** - it presents an accurate selection of Environmental Data Yearbook indicators aimed at the monitoring of the main objectives of the Seventh Environmental Action Programme (7th EAP). The document is organized around 5 sections or chapters according to the first three priority objectives and sub-objectives 4a and 7a listed in the 7th EAP. Each chapter presents an introduction and a selection of Environmental Data Yearbook indicators identified on the basis of the European Environmental Agency corresponding indicators to monitor adequately the achieving of the goal. It is available in electronic format (PDF).
- **The Yearbook in figures** - this statistical leaflet, contains the most representative graphs of the environmental issues addressed in the Environmental Data Yearbook accompanied by comments, short information and particular relevant data.
- **Summarising... the environment** - information brochure, it presents in a concise format some relevant environmental issues. It is available in paper and electronic version (PDF).
- **Indicators Platform** - tool for online consultation of the indicator sheets and the creation of reports. The Platform allows to publish, manage and organize the contents related to the different editions of the Yearbook and to create synthetic versions personalized namely according to the cognitive needs of individual users (<https://annuario.isprambiente.it>).
- **Multimedia** - it presents the 2017 edition of the Environmental Data Yearbook and shows briefly some environmental issues which are considered a priority for the reference target. The 2017 edition of the Environmental Data Yearbook film is available at <https://annuario.isprambiente.it>
- **Newspaper** - comic strip titled "Inspector SPRA investigation", it periodically (yearly) deals with a single environmental issue with the aim of disseminating information and the Yearbook data to a young audience of no expert people. For the 2017 edition the selected issue is "Geological hazards" (The Land moves!). It is available in electronic format (PDF).

**Summarising... the environment** describes concisely some environmental issues of priority importance or topical for citizens and decision-making. Some comparisons with European data are also shown and highlighted. Information and statistic data on environmental conditions are disseminated through a clear and accessible language, made particularly communicative also using a graphic layout, immediate and easy to read.

The brochure contains also summary tables (the issue "in a nutshell") with a short definition of the issue, some infographic used to present difficulties and to represent data and a synoptic picture of the Yearbook indicators which are considered more significant for the description of the addressed issues.

The addressed issues are: Biodiversity; Climate: state and changes; Air pollution; Allergenic pollen index; Inland water Quality; Sea and coastal environment; Soil; Waste; Physical Agents; Geological hazards; Chemical agents; Assessments, Authorizations and environmental certifications; Environmental knowledge.

The brochure is distributed to institutions, international organizations, media and opinion leaders and is available at: [www.isprambiente.gov.it](http://www.isprambiente.gov.it); <https://annuario.isprambiente.it>

The document has been prepared by the statistic coordinators in cooperation with the thematic coordinators (see general section Task Force Environmental Data Yearbook 2017).

# 1. BIODIVERSITY

**The level of threat to Vertebrates and vascular plants is still high. The Natura 2000 Network is being consolidated thanks to the increasing designation of Sites of Community Importance (SCI) as Special Areas of Conservation (SAC). The number of protected terrestrial and marine areas and wetlands is unchanged.**

Italy is one of the richest countries in Europe in terms of biodiversity, including over 58,000 species in its fauna and over 7,600 species and subspecies in its vascular plants, 18% of which are endemic.



Regarding the fauna, although comparison is limited to some animal groups for which reliable species lists are available, it can be observed that in Italy, among insects for example, Orthoptera are about three times that of Poland, ten times that of Great Britain and Norway, and 150 times that of Iceland; the number of species of Lepidoptera is more than double that of Britain, while Coleoptera species are approx. 12,000 compared to 6,000 in Poland, 3,700 in Britain, 3,375 in Norway and 239 in Iceland. As for the flora, even net of naturalized exotic species, the 7.600 species mentioned above make up more than a half of the 12,500 species estimated for Europe.

The threat level is however high: about 31% of vertebrates, 42% of the 202 policy species and 54% of the 1,020 Red List vascular plants are at risk of extinction.

Biodiversity is threatened mainly by human activities and the growing demand for natural resources and ecosystem services. The main threats to terrestrial vertebrates, excluding birds, are habitat loss and degradation (approx. 120 species) and pollution (approx. 80 species). Fisheries is also an important impact factor for the marine environment. Italy has adopted measures for limiting the

fishing effort, in accordance with the EU Common Fisheries Policy.

Fishing effort has decreased constantly since 2004, except in 2008-2009 when it increased from 25.2 to 26.5, then it started to decrease again reaching 20.5 in 2015. Catch per unit effort (CPUE) value is 9.2 kg/day, showing an increase compared to 2014. Since 2009 there has been a constant decrease in both values (effort and CPUE), probably indicating that, against the reduction in exploitation intensity, the overall recovery of exploited resources was not reached; from 2014 and in 2015 there was a slight trend reversal, with an increase of CPUE against the continuing decrease in effort. The introduction of potentially invasive alien species is also a threat for biodiversity. Currently in Italy there are approximately 2,700 recorded non-native animal and plant species.



Italy has signed and ratified several international conventions and agreements aimed at the protection of biodiversity, e.g. the Convention on Biological Diversity. The Natura 2000 network stems from the European Birds and Habitats Directives; it includes Special Protection Areas (SPAs), Sites of Community Importance (SCIs) and Special Areas of Conservation (SAC) that, net of overlaps, amount to 2,609 sites covering a surface of 6,412,234 ha, of which 5,824,434 ha are inland and represent 19.3% of Italy's territory, a slightly higher value than the European average (about 18%). In Italy, there are 871 Protected Areas for



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biodiversity protection, covering a land surface of more than 3 million ha, equal to 10.5% of the national land surface, as against an average of about 15% in Europe.

For the protection of marine environments in Italy were established 27 Marine Protected Areas; moreover there are 64 wetlands under the Ramsar Convention.

Italy has adopted a National Biodiversity Strategy, as part of its commitments under the Convention on Biological Diversity (CBD, Rio de Janeiro 1992).





## BIODIVERSITY in a nutshell

**58,000 animal species**

**7,634 vascular plants**

**3,873 non-vascular plants**

Italy is one of the richest countries in Europe in terms of biodiversity

**31% of vertebrates** threatened

**54% of IUCN Red List vascular plants** threatened

**42% of 202 policy species** threatened



**120 species of terrestrial vertebrates** threatened by habitat loss and degradation

### BIODIVERSITY:

can be defined as the wealth of life on earth, the millions of plants, animals, and micro-organisms, their genes, and the complex ecosystems they build in the biosphere



**2,700 non-native species** the introduction of potentially invasive alien species is a high threat for biodiversity

**871 Protected Areas, including 27 Marine Protected Areas**  
**2,609 sites of the Natura 2000 Network**  
**64 wetlands of international importance (Ramsar Convention)**  
 10.5% of national land surface is covered by Protected Areas

## 2. CLIMATE: STATE AND CHANGES

**In Italy throughout 2016 the most relevant weather characteristic, which has reaffirmed even more intensely during the first half of the year 2017, was persistent drought; at the same time strong rainfalls events have occurred.**

The European Union has been at the forefront in reaching a global climate agreement. After the lack of Agreement in Copenhagen, in 2009, EU contributed significantly to the successful outcome of Paris Climate Change Conference (December 2015 – COP 21). The Agreement sets out a global action plan aimed at avoiding dangerous climate changes, holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change. Under the Paris Agreement each Country shall communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions. NDCs can be reviewed over time provided that the expected contribution be not reduced. By October 2017, of 197 Countries which signed the Agreement, 168 have ratified it and 163 have communicated their NDC for the first time. The positive broad accession to the Agreement has been though offset by United States withdrawn, announced on June 1st by the new President Donald Trump. Such decision will not have immediate effect, since signatory countries could not withdraw from the Agreement before three years with a year's notice (USA could not officially get out of the agreement before November 2020). The absence of USA will however cause a strong weakening in combating climate change after having finally reached a global dimension in Paris.

Undertakings to reduce greenhouse gas

emissions provided by national action plans are not sufficient to keep global warming below 2 °C, but the Agreement sets out the modalities to reach this goal. The European Union has been the first major economy to submit its intended contribution in march 2015, defining the implementation modalities of the target objective to reduce emissions of at least 40% by 2030 compared to 1990.

On April 22nd 2016, the Agreement has been opened to signature for one year and it entered into force on November 4th when 55 Parties to the Convention accounting in total for at least an estimated 55 % of the total global greenhouse gas emissions, have deposited their instruments of ratification.

In Italy, the 2016 mean temperature anomaly (+1.35 °C) with respect to 1961-1990 climatological normal was higher than the corresponding global over land anomaly (+1.31 °C).

It places at the sixth place of the warmest years since 1961 and represents the 25th consecutive positive annual value. The warmest years of the last half century, in Italy, were 2015, 2014, 1994, 2003 and 2000 with mean temperatures anomalies between +1.35 °C and +1.58 °C.

As for the last 10 years, 2016 was warmer than climatological period 1961-1990 even with regard to the temperature extremes indices. However there were no record values for any index. In particular, the Warm Spell Duration Index, (WSDI) with an anomaly of about +10 days per year was lower than any of the last five years and places the year 2016 only at the 19th place of the series since 1961.

The main response measures to climate change

are related to mitigation, which is the reduction of greenhouse gas emissions and to adaptation with the aim of reducing the possible negative consequences and to prevent the potential damages of climate change. Such measures are complementary .

In Italy, in 2015, total greenhouse gas emissions expressed in CO<sub>2</sub> equivalent decreased by 16.7% compared to the base year (1990), despite an increase of 2.3% compared to the previous year. Between 1990 and 2015, total greenhouse gas emissions passed from 520 to 433 millions of tonnes CO<sub>2</sub> equivalent, a variation determined above all by the energetic sector and by CO<sub>2</sub> emissions which are 82.5% of the total of greenhouse gases and in 2015 are lower of 17.9% compared to 1990.



Since 90', EU28 shows a decoupling of economic growth from GHG emissions more accentuated compared to national one. Only

during the last years national emissions reduction shows a trend convergent to European one. However national emissions have felt the effects of the economic crisis to a greater extent than European ones.

In 2015, greenhouse gas emissions (except for LULUCF activities) in Europe (EU28 and Iceland) decreased by 23.6% compared to 1990, with GDP increase by 50% compared to the same period.

This decoupling was partly due to the growing of renewable energy quotas, thanks to national dedicated support systems and significant cost reduction, low carbon fuel in the energy mix and energy efficiency improvement. The trend to decrease greenhouse gas emissions and their future evolution prove that 2020 greenhouse gas reduction target will be reached. This will be not sufficient to achieve reduction target by 40% and it is considered that EU is not on the right

path to achieve the EU's 2050 decarbonisation objective. Therefore, the European Commission on October 23rd 2014 set out new objectives to reduce air emission to be achieved by 2030, with the aim of reducing greenhouse gas emissions at European level by 80% by 2050 compared to 1990. These objectives consider a reduction of total emissions by 40% compared to 1990, at least 27% of renewable energy in the final consumption and an indicative objective of about 27% of energy efficiency.



With regard to Adaptation to Climate Change, even though under the national competences of different Countries, at European level

important achievements have been reached. On September 2017, 28 Countries (25 EU Member States and 3 EEA Member Countries) adopted a national adaptation strategy and 17 Countries have developed a national adaptation plan. At least half of European Countries made progress in the identification and evaluation of adaptation options.



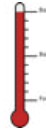
## CLIMATE: STATE AND CHANGES in a nutshell

### **+1.35 °C mean temperature anomaly**

in 2016 the anomaly of the mean temperature (+1.35 °C) was higher than global temperature over land (+1.31 °C)

### **+10 days with heat waves**

increase in 2016 respect to the mean value of the climatological period 1961-1990



**CLIMATE CHANGES:**  
climate changes attributable directly or indirectly to human activities, which alter planetary atmosphere composition and add up to natural climate variability observed over similar time intervals



### **-16.7% greenhouse gas emissions**

reduction of total greenhouse gas emissions in Italy from 1990 to 2015

### **from 520 to 433 MT CO<sub>2</sub> equivalent**

reduction of greenhouse gas emissions from 1990 to 2015

### **climate change adaptation strategy**

Italy adopted and approved its National Climate Change Adaptation Strategy (NCCAS) which identifies actions to address short-term (2020) and long-term (beyond 2020) climate change impacts. In 2017 the Ministry of the Environment, Land and Sea launched the preparation of the "National Adaptation Plan to Climate Change"

### 3. AIR POLLUTION

In Italy, as well as in Europe, air quality shows significant signs of improvement: main pollutant emissions continue to decline and atmospheric levels of some pollutants show generally decreasing trends. Despite these improvements, however, air pollution is still a concern: high levels of particulate matter, nitrogen dioxide and ground-level ozone are still observed, often exceeding regulatory standards in extensive areas. Italy, with the Po valley, is one of the most critical regions in Europe.

In 2015, the annual mean limit value for PM10 ( $40 \mu\text{g}/\text{m}^3$  as annual average) was met at 96% of monitoring stations (17 out of 466 stations were in exceedance). When compared with the World Health Organization (WHO) reference value of  $20 \mu\text{g}/\text{m}^3$ , 70% of monitoring stations were in exceedance. Considering the daily limit value of  $50 \mu\text{g}/\text{m}^3$  (not to be exceeded more than 35 times in a calendar year), the stations in exceedance were 40%, rising to 81% when compared with the WHO reference value of  $50 \mu\text{g}/\text{m}^3$  not to be exceeded more than 3 times in a calendar year, based on known short-term effects on human health. The highest values were recorded in the Po valley and in some urban areas of Central and Southern Italy.



In 2015, PM10 limit values were exceeded as well in most of Europe; 95% of exceedances were recorded in urban and suburban areas.

As for PM2.5, the limit value of  $25 \mu\text{g}/\text{m}^3$  was met at 84.5% of monitoring stations (175 out of 207 stations), while the WHO reference value of  $10 \mu\text{g}/\text{m}^3$  was exceeded at 93.7% of them (194 out of 207).



Like PM10, also PM2.5 limit values were exceeded across Europe, in Bulgaria, Czech Republic and Poland besides Italy.

As for ozone, the Long Term Objective (LTO)

for human health protection has been exceeded at most of the monitoring stations, and only 6% (18 out of 283 stations) met the LTO.



In 2015, there were many heat waves in Europe that led to intense and prolonged episodes of photochemical smog, with high ground-level ozone concentration. In particular, the concentration peak occurred in Central Europe and Northern Italy between July 1st and July 5th. Main sources of ozone precursor pollutants are considered road traffic and, to a lesser degree, industrial emissions.

As for nitrogen dioxide, the hourly limit value of  $200 \mu\text{g}/\text{m}^3$  (not to be exceeded more than 18 times in a calendar year) was met at almost all monitoring stations (only 2 stations exceeded) and 42 stations (8 %) exceeded the WHO reference value (no exceedances of  $200 \mu\text{g}/\text{m}^3$ ). The annual limit value for the protection of human health and the WHO reference value, both set at  $40 \mu\text{g}/\text{m}^3$ , were exceeded at 13% of the monitoring stations throughout Italy. Almost all of exceedances were recorded at traffic monitoring stations located in important urban areas.



In 2015 in Europe, exceedances of nitrogen dioxide annual limit value occurred in 22 of the 28 EU Member States, and 89% of exceedances were recorded at traffic stations.

The analysis of air quality data for 2016 in province capitals, basically confirms the difficulty in complying with PM10 daily limit value in the Po Valley and in several Central-South Italy urban areas, as well as a general failure to meet the long-term objective (LTO) for the protection of human health from ozone (88% of urban areas exceeded, 82 municipalities out of 93 considered). Just in the first half of 2017, more than 35 exceedances of PM10 daily limit value ( $50 \mu\text{g}/\text{m}^3$ ) were already recorded in 20 municipalities in the Po valley area and in the Central Italy town of Frosinone.

Overall, from 1990 to 2015, emissions of sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>) and ammonia (NH<sub>3</sub>) have decreased by 65.9%. With reference to EU Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants, setting out national emission reduction commitments applicable from 2020 to 2029 and from 2030 onwards, sulfur oxides emissions reduction target for 2020 was met as early as 2009; nitrogen oxides emissions are still higher than the limit for 2020; ammonia emissions reduction target for 2020 was achieved already in 2014.

Italy's PM10 emissions have reduced by 34.1% from 1990 to 2015. Over the entire period, the road transport sector, which in 2015 contributed to PM10 total emissions with a share of 12.2%, recorded a reduction of 59.1%.





## AIR POLLUTION in a nutshell

### PM10: 40% of monitoring stations

exceeded PM10 daily limit value in 2015  
(50  $\mu\text{g}/\text{m}^3$  not to be exceeded more than  
35 times a year)

### PM10: 81% of monitoring stations

exceeded WHO reference value for  
PM10 in 2015 (50  $\mu\text{g}/\text{m}^3$  daily not to be  
exceeded more than 3 times a year)

### ozone: 94% of monitoring stations

exceeded the long term objective set  
for the protection of human health  
(120  $\mu\text{g}/\text{m}^3$ ) in 2015



### AIR POLLUTION:

according to the World Health Organization (WHO) definition,  
"Air pollution is as a situation in  
which the outdoor atmosphere  
contains certain materials in  
concentrations which are harmful to  
people or their environment"



### NO<sub>2</sub>: 13% of monitoring stations

exceeded nitrogen dioxide (NO<sub>2</sub>) annual limit  
value (40  $\mu\text{g}/\text{m}^3$  as annual mean) in 2015

### NO<sub>2</sub>: 8% of monitoring stations

exceed WHO reference value for nitrogen  
dioxide (NO<sub>2</sub>) in 2015  
(200  $\mu\text{g}/\text{m}^3$ , 1-hour mean no exceedance)

### -65.9% emissions for SO<sub>x</sub>, NO<sub>x</sub>, NH<sub>3</sub>

from 1990 to 2015 emissions for sulfur  
oxides, nitrogen oxides, and ammonia  
have decreased

### -34.1% PM10 emissions

from 1990 to 2015 particulate matter  
emissions have decreased

## 4. ALLERGENIC POLLEN INDEX

**A great variability in the Allergenic Pollen Index (API) is observed at local level.**

The allergenic pollen index is obtained from the annual sum of daily pollen concentrations for the main and most common allergenic plant families occurring in Italy. It allows to evaluate the allergenic pollen load in a specific area and to compare it with that of other places, as well as to study its variability in space and time.

These data contribute to the evaluation of health risks associated with allergies and allow for the initial assessment of any specific mitigation measures taken by competent authorities.

Some indicator variability, even very strong locally, is confirmed by comparing data from 2016 with those of previous years. The variability is mainly attributable to weather conditions recorded during the year, that can favour or reduce the presence of airborne pollens. This is especially true when plant families involved are Cupressaceae/Taxaceae, Urticaceae and Graminaceae, that are responsible for most of the observed pollens. Even in presence of this high seasonal variability, the allergenic pollen index confirms that the areas with the highest and lowest presence of airborne pollens are basically always the same (highest: Lecco, Trento, Bolzano, Perugia; lowest: Genova, Savona, Lignano Sabbiadoro, Ravenna).

The Cupressaceae-Taxaceae family, in particular, is present throughout the country and especially in central Italy. Cypress trees are very widespread in urban green areas since they are both greatly ornamental and functional. However, they produce large amounts of highly allergenic pollen and their use should be therefore reduced in favour of plant species with the same beauty and functionality, but not as troublesome to human health.



Aerobiological monitoring is carried out in most European countries, and the monitoring networks of 35 Countries adhere to the EAN - European Aeroallergen Network (<https://polleninfo.org>). This distribution led to the need to standardize the activity, and in 2015 it resulted in the Technical Document CEN/TS 16868:2015, which defines the reference method at European level for performing aerobiological monitoring.

Regarding airborne pollens in Italy, the peculiarity is the high biodiversity, with numerous allergenic pollen plant species blooming in very different periods. This implies a greater complexity in the monitoring and a commitment extending for most of the calendar year.

## ALLERGENIC POLLEN INDEX in a nutshell

### API variability at local level.

The observed variations are mainly due to weather conditions recorded during the year

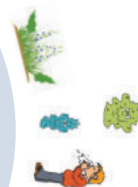
### Cupressaceae-Taxaceae:

plant family occurring throughout the national territory, which includes highly ornamental plants such as cypresses, widely used in ornamental greenery. However these plants produce large quantities of very allergenic pollen



### ALLERGENIC POLLEN INDEX (API):

It is a value depending on the amount of airborne allergenic pollens in the monitoring area. The API allows to evaluate the allergenic pollen load in a specific place, to compare it with that of other places, and to study its variations in time and space



### airborne pollens in Italy

Italy's peculiarity lies in its high biodiversity and therefore in the presence of a large number of plant species with allergenic pollens blooming in very different periods

### risk assessment

the allergenic pollen index allow to assess health risk associated with allergies and an initial assessment of mitigation measures undertaken

## 5. INLAND WATER QUALITY

At hydrographic district level, the highest percentage of water bodies with an ecological status achieving the quality objective is observed for more than 50% of rivers in the Eastern Alps, Serchio and Sardinia Districts. While as for lakes only 20% falls into the “good” or “high” class. Regarding the chemical status, as for rivers, most districts show a percentage of water bodies in a “good” status ranging from 65% in Sardinia to 94% in the Central Apennines; for lakes the quality objective is achieved from 48% of water bodies. It is to highlight the high percentage of lake water bodies not classified (42%), especially in the Southern Apennines, Sicily and Sardinia Districts. With regard to groundwater, for the chemical status (SCAS) and quantitative status (SQUAS), the western Alps District and Serchio District show the highest number of water bodies in good status.

The transposition of 2000/60/EC and 2006/118/EC Directives, from Leg. Decree No. 152/06 and Leg. Decree. 30/2009 respectively, has allowed to define for surface waters the quality status of water bodies and for groundwater the criteria to assess the good chemical status.

Data on inland surface water (rivers and lakes) quality, collected by Regional and Provincial Environmental Agencies, refer to the first six-year monitoring cycle (2010-2015) as indicated in Leg. Decree No. 152/06.

With regard to the ecological status, for more than 50% of rivers the highest percentage of water bodies meeting the quality objective is observed in the Eastern Alps, Serchio and Sardinia Districts. Significant percentages of unclassified water bodies are observed in Sicily, Southern Apennines and Sardinia Districts (respectively, 56%, 55%, 30%). On the other hand for lakes, only the 20% (17% good and 3% high) achieves the objective, while 39% of lake water bodies has lower quality classes. It is to point out that 41% of lake water bodies are non-classified. It is preponderant for almost all the districts, the quality status moderate (or

less), furthermore in the Sicily and Southern Apennines Districts, an high percentages of lake water bodies unclassified are registered (respectively 84% and 73%).

With regard to the chemical status, for rivers, most districts present a percentage of water bodies in “good” status ranging from 65% of Sardinia to 94% of central Apennines. In Southern Apennines and Sicily Districts however, the “good” status is observed respectively in 37% and in 16% of water bodies, with significant percentage of unclassified water bodies (59% and 83%).

However for lakes, the quality objective is achieved from 48% of water bodies. It is to highlight the high percentage of unclassified lake water bodies (42%), above all in Southern Apennines, Sicily and Sardinia Districts.

With regard to the chemical status of groundwater (SCAS), out of 1,052 water bodies identified at a national scale, 869 were classified, of which 57.6% are in “good” class and 25% in “poor” class, while the remaining 17.4% are not yet classified. The SCAS has been elaborated also in terms of surface with the aim of considering the dimensions of the

classified water bodies from which emerges that 57% of groundwater is in “good” status, the 34.4% in “poor” status and the remaining 7.9% not yet classified. To the aim of assessing the quantitative status of the groundwater resources, interpreting it in terms of equilibrium of the hydrogeological balance of aquifer that is the capacity to support on the long-term the drainages (anthropic pressions) in relation with the recharge factors, the quantitative status index of groundwater (SQUAS) has been elaborated. Out of 791 classified water bodies (75.2% of the national total), 60.8% falls into “good” class, 14.4% into “poor” class and the remaining 24.8% not yet classified. Instead, in terms of surface, the test shows that 77.3% of groundwater bodies is in “good” class, the 9.2% in “poor” class, and the 13.5% not yet classified.

The safeguard of waters represents a very important field of action in which the principles of cooperation, solidarity and common good must be recognized as key values by national and international policies. In 2014, the conformity of collection systems to requirements provided by regulations achieved 100% in 12 regions and in the autonomous provinces of Trento and Bolzano, while it is between 92% and 99.6% in the remaining regions. The organic load produced by agglomerations on the national territory (with potentiality greater than or equal to 2,000 p.e.) is 78,622,951 p.e., while the portion of the organic load purified is 70,709,008 p.e. (89.9%). The purification systems conformity Index proved to be higher than 90% in 8 regions and in the autonomous provinces of Trento and Bolzano, between 70% and 90% in 8 regions, while less than 70% in 3 regions.



## INLAND WATER QUALITY in a nutshell

**43% of rivers achieves the quality objective for the ecological status**

**75% of rivers achieves the quality objective for the chemical status**

**20% of lakes achieves the quality objective for the ecological status**

**48% of lakes achieves the quality objective for the chemical status**



**INLAND WATER:**  
all standing or flowing water on the surface of the land, and all groundwater on the landward side of the baseline from which the breadth of territorial waters is measured



**7,494 rivers**  
**Ecological status**  
**5% into high class**  
**38% into good class**  
**41% into moderate or less class**  
**16% unclassified**

**Chemical status**  
**6 Districts out of 8 in good status**  
from 65% of Sardinia to 94% of Central Apennines

**Chemical status (SCAS)**  
**58% into good class**  
**25% into poor class**  
**17% unclassified**

**347 lakes**  
**Ecological status**  
**3% into high class**  
**17% into good class**  
**39% into moderate or less class**  
**41% unclassified**

**Chemical status**  
**4 Districts out of 8 in good status**  
from 56% Padano to 86% of Central Apennines

**Quantitative status (SQUAs)**  
**61% into good class**  
**14% into poor class**  
**25% unclassified**

groundwater

## 6. SEA AND COASTAL ENVIRONMENT

**Significant geomorphological changes to Italy coastline are observed over the last decades, due to both natural and man-made processes.**

**In 2016 over 90% of coastal bathing waters are classified as excellent.**

**Microalgae *Ostreopsis cf. ovata* was detected in 11 coastal regions.**

A regular monitoring of natural coastal evolution and of impacts from human activities provides the necessary knowledge base for devising any protection, management and intervention measure.

In 2015, the quality status of coastal bathing waters with regards to sanitation parameters and faecal contamination was for 90.4% excellent, for 4.9% good, for 1.9% sufficient and for 1.9% poor. For about 0.9% of bathing waters it was not possible to carry out the classification, due in most cases to irregularities in the monitoring frequency. In 2016, coastal bathing waters quality was for 90.7% excellent, for 4.9% good, for 1.5% sufficient, for 2.0% poor and for 0.9% it was not possible to carry out the classification.



Italy's coastal bathing waters represent 33% of all monitored coastal bathing waters in Europe (2016 data). The percentage of

Italian bathing waters classified as "excellent" is higher than the European average, which is 87%.

In 2016, microalgae *Ostreopsis cf. ovata* was detected in 11 coastal regions, while it was always absent in all samples collected along the coasts of Abruzzo and Emilia-Romagna regions. An important goal of the EU Water Framework Directive is to achieve the "good" status of water bodies by 2015 (or by 2027 in the event of an extension). The chemical and ecological classification of coastal and transitional waters, hereafter presented, refers to management plans (update #1) of the eight river basins

identified by Italy.

The ecological quality of coastal and transition waters is assessed by measuring the deviation of Biological Quality Elements (BQE) from the natural values, i.e. the reference values. Based on the river basins' Management Plans for coastal marine waters, in the Po Delta Basin 100% of water bodies have "moderate" ecological status. "Good" status is assessed for 88% of water bodies of Eastern Alps Basin, for 80% of waters of Central Apennines and for 49% of waters of Northern Apennines Basin. The Sardinia Basin stands out with 92% of water bodies in "good" status and as the only one with 1% of water bodies in "high" status. With regards to transition waters, in almost all basins there is a high percentage of water bodies not reaching the "moderate" status class: in particular, for Po Delta and Southern Apennines Basins, 62% and 53% respectively of water bodies are in "poor" and "bad" status. In the Central Apennines Basin, 50% of waters are in "good" status, 33% are in "moderate" status and the remaining 17% are classified as "bad".

The chemical quality status of water bodies depends on the presence in water, sediment and biota of priority substances and priority hazardous substances compared against their established Environmental Quality Standards (EQS) which cannot be exceeded to achieve the "good chemical status" classification. Critical conditions are observed in more than 40% of water bodies in 3 Basins out of 7 (Po, Northern Apennines, Eastern Alps). Conversely, in Sardinia, Central Apennines and Eastern Alps basins 90%, 88% and 57% respectively of water



bodies are in “good” chemical status.

As for transition waters, more than 50% of water bodies of Eastern Alps, Po and Northern Apennines Basins and 100% of Central Apennines basin are in “good” chemical status. In contrast, 76% of water bodies of Southern Apennines Basin and 40% of Sardinia Basin fail to achieve good status. In some of the Basins, percentage of not classified waters is high (Sicily 67%, Sardinia 48%).

From the analysis of wave parameters (Hs significant wave height, direction, T period), as for 2016 it is evident the seasonal nature of storms. However, winter months, in particular January and February 2016, showed a higher average number of sea storms (especially in western Mediterranean), while for the final months of 2016 the number of sea storms was lower than the average of previous years.

Significant geomorphological changes to Italy coastline are observed over the last decades, due both to natural and man-made processes: from 1950 to 1999, 46% of low coasts have undergone changes of more than 25 meters; between 2000 and 2007, 37% of the coastline has undergone changes of more than 5 meters, and the stretches of coast under erosion (895 km) are still more than those in progradation (849 km). Despite many conservation and restoration measure, between 1999 and 2007 Italy’s beaches have lost about 16 km<sup>2</sup>, compared to 15.2 km<sup>2</sup> of areas in progradation. Moreover, their surface decreased of further 600,000 m<sup>2</sup>.

675 km of Italy’s coasts, approximately 8.2% of the entire national coastline, are artificialised, in particular with: shore-connected defence works, occupying 414 km of the coastline (62% of the total artificialised coastline); port works, occupying 252 km of the coastline (37% of the

total); replenishments for the remaining 9 km (1%). Between 2000-2007, additional 14.2 km of coastline were artificialised, mainly for the construction of new port facilities for 12.1 km (+5.7% compared to 2000), and of defence works for 2.1 km (+0.5%).



## SEA AND COASTAL ENVIRONMENT in a nutshell

**more than 90% of coastal bathing waters are classified as excellent in the five years period 2012-2016**

with regards to sanitation parameters, 4.9% are good, 1.5% moderate and 2% poor

**occurrence of microalgae *Ostreopsis cf. ovata* in 11 coastal regions in 2016**

it is always absent in Abruzzo and Emilia-Romagna regions



**62% of the Po Basin lagoons are in "poor" and "bad" ecological status**

**92% of the Sardinia Basin water bodies are in "good" ecological status**

a high percentage of transition waters do not achieve moderate ecological status

**100% of transition waters of Central Apennines Basin have "good" chemical status**

**90% of Sardinia coastal marine waters have "good chemical status"**

# 7. SOIL

## In Italy soil consumption does not halt.

In Italy soil consumption continues to increase despite marking a slowdown during the last years. About 23,000 km<sup>2</sup> of national territory and related ecosystem services are now lost. The phenomena seems to increase but with a significant slowdown in the transformation speed, probably due to the current economic climate.



The recently updated estimations by Eurostat are substantially in line with national monitoring estimations and the portion of territory with artificial

covering in Italy for 2012, is estimated to be equal to 7.0% of the national total, against the 4.1% of EU average. Italy ranks fifth after Netherlands (12.3%), Belgium (12.1%), Luxembourg (10.1%) and Germany (7.2%) (Eurostat, 2016).

With regard to the geographic distribution of the territory, the highest percentage values of consumed soil are observed in the North of Italy, (Veneto and Lombardy regions have already surpassed 12% of sealed soil according to 2016 data). At provincial level, the highest percentage of consumed soil, respect to the administrative territory, is observed in Monza Brianza followed by Naples and Milan with values of more than 30%.

Soil consumption in coastal area shows values definitely higher than in the rest of the national territory. The 23.2% of coastal strip within 300 m, 19.6% between 300 m and 1,000 m and 9.3% between 1 km and 10 km, is already artificialized against a 7% of the rest of the territory. The highest values, more than 45% of consumed soil within 300 m from the sea, are observed in Liguria Region and in the Marche Region.

Different areas of the national territory are subject to loss soil phenomena by water erosion. Renaturalization of different abandoned agricultural areas, together with the growing development of agricultural conservation practices, even because of Rural Development Policies, indicates a decrease of the erosion phenomena.

At the same time, the increase of meteorological phenomena at high density, determines the loss of huge volumes of soil in very short time, especially in those areas crossed by fires. The loss of soil by water erosion and the decrease of organic carbon of soils are strictly related and represent two of the main causes which contribute to the loss of soil functionality and to the activation of desertification processes. The southern regions are mostly subject to desertification phenomena although some critical issues can be also observed in the northern regions.



According to recent estimates made at European level, Italy ranks first for soil loss by water erosion with values higher than 8 tonnes/hectar\* year against European average of about 2.5 tonnes/hectar\*year (RUSLE, 2015).

## SOIL in a nutshell

### 7% of soil is consumed

in Italy we passed from 2.7% of consumed soil in the '50 to 7% in 2016

### 23,000 km<sup>2</sup> consumed

### 3 m<sup>2</sup>/sec. transformation speed

23,000 km<sup>2</sup> of consumed soil as for 2016 even though transformation speed decreased from 8 m<sup>2</sup>/sec (2000) to 3 m<sup>2</sup>/sec (2015-2016)



### SOIL:

the thin porous and biologically active medium which represents “the top layer of the earth’s crust, formed by mineral particles, organic matter, water, air and other living organisms”. It represents the interface between earth, air and water and hosts most of the biosphere”



### high soil consumption in coastal area

soil consumption in coastal area within 300 m is equal to 23.2%, while between 300 m and 1,000 m is equal to 19.6%, more than 45% of consumed soil within 300 m from the sea in Liguria Region and Marche Region

### soil loss by water erosion is decreasing due to policies but rain erosivity is increasing

the renaturalisation of several abandoned agricultural areas and the increasing development of conservative farming practices also due to Rural Development Policies, indicates a decreasing of the erosive phenomenon.

At the same time the increase of high-intensity extreme weather events causes in any case the loss of huge soil volumes

## 8. WASTE

**Municipal waste (MW) generation increased by 2%, consistent with the trend of socio-economic indicators. The separate collection amounted to 52.5% of the total waste generated, not yet sufficient to achieve the 2011 target of 60%. MW preparation-for-reuse and recycling rates have increased.**

In 2016, municipal waste generated was slightly over 30 million tons, showing an increase of 2% compared to 2015. The national per capita MW generation confirms this trend, passing from 487 kg/inh. in 2015 to 497 kg/inh. in 2016. In 2016 per capita MW generation by macroarea continued to be uneven, with 510 kg/inh. in Northern Italy, 548 kg/inh. in Central Italy and 450 kg/inh. in Southern Italy.



At European level (EU 28) municipal waste generation in 2015 (242.3 million tons) decreased by 0.05% compared to 2014 (117,000 tons

less), confirming the decreasing trend started in the previous years (between 2011 and 2012 the decrease was 1.9%). Also the per capita MW generation confirms this decreasing trend, passing from 477 to 476 kg/inh. per year (-0.2%).

In 2016 separate collection amounted to 52.5% of the total municipal waste generated, marking a further improvement though still not sufficient to achieve the 2011 target (60%) and the 2012 target (65%). In Northern Italy separate collection was 9 million tons, in Central Italy 3.2 million tons and in Southern Italy 3.5 million tons, corresponding to 64.2%, 48.6% and 37.6% respectively.

The analysis of waste management data shows that, in 2016, 25% of municipal waste was disposed in landfills; therefore landfilling is no longer the most common management model. Recycling of fractions from the separate collection and from mechanical biological treatment accounts overall for 45% of the

annual waste generated.

In 2016, the preparation for reuse and recycling accounts for 47.7% of urban waste generated, calculated for all paper and board, organic, glass, plastic, metal and wood fractions. More than a third (41.2%) of the recycled quantities consist of organic fraction and 25.2% consist of paper and cardboard.

Although a progressive increase in municipal waste preparation for reuse and recycling rates is observed, a further improvement is needed to meet the target set by legislation for 2020.

## WASTE in a nutshell

**30 millions tons of municipal waste generated**

in 2016 + 2% compared to 2015

**per capita generation has increased**

from 487 kg/inh. in 2015 to

497 kg/inh. in 2016



**in 2016 separate collection is 52.5 %**

despite an improvement, the 2011 target (60%) and the 2012 target (65%) are still far from being achieved

**25% of waste landfilled**

landfilling is no longer the preferred waste management option; 25% of municipal waste was landfilled in 2016

**municipal waste reuse and recycling is 47.7%**

the quantities recycled are 41.2% organic fraction, and 25.2% paper and cardboard

## 9. PHYSICAL AGENTS

Citizens keep on maintaining the focus on the issue of electromagnetic fields. High noise levels can affect our well-being; the negative effects of noise on human health include stress, decreased psychological well-being, sleep disturbance as well as cardiovascular disease. According to the World Health Organization (WHO) most of Italian people is day-time and night-time exposed to serious noise levels. The main noise source is road traffic.

**Nuclear activities:** in Italy most of radioactive waste, in terms of activity, can be found in the Piedmont Region (74.1%), follow Campania Region with 12% and Basilicata Region with 8.9%. The regional distribution of radioactive waste, in terms of volume, shows a greater concentration in Lazio Region with 29.1%, followed by Piedmont Region (18.8%) and Lombardy Region (17.4%).

**Environmental radioactivity:** in absence of relevant nuclear accidents, radon represents the main source of exposure to radioactivity. In Lazio Region and Lombardy Region is observed a high concentration of radon (Rn-222). This discrepancy with the other regions is due to the different concentration of uranium in rocks and soils and to their different permeability.

**Electromagnetic pollution:** in Italy the total power of RBS plants is equal to 11,446 kW and it is slightly higher than the one of RTV plants which is equal to 10,347 kW.

It is observed that the number of cases exceeding the regulatory limits with regard to RTV installations plants (equal to 493) is 7.5 time higher than that of RBS plants (equal to 66). In July 2017, cleaned up exceeding cases related to RTV plants proved to be 61% of the total while those related to RBS plants 83% of the total.

Concerning RTV plants no substantial changes have been observed between 2015 and 2016

(little more than 0.2% for sites and no new plants) except for a reduction in terms of power equal to 3%.

On the other hand, concerning RBS plants, an increase of services and sites respectively of 10% and 7% and of their related total power of 12% is registered. This indicates the phase of the technological development which is continuing to characterize the telecommunications sector.

From July 2016 to July 2017 the events of excess of limits of law related to RTV plants have slightly increased (from 483 to 492) while those related to RBS have substantially remained the same (from 63 to 66). In particular, with regard to RBS it is noted that within the period of eighteen years the number of events of excess of limits of law resulted to be fundamentally small.

With regard to experimental checks, for RTV a variable trend is pointed out which in any case from 2010 to 2016 led to a decrease equal to 44% of the number of checks carried out; however for the RBS except for 2012, the number of checks remained almost unchanged attesting around 1,000 annual checks. For 2016, from experimental checks carried out on RBS plants 41% proves to be carried out at the request of citizens; while for RTV plants checks carried out at the request of citizens is equal to 34%. Anyway percentages show a strong interest of population for this issue.

**Noise:** in 2016, the 40.6% of noise sources



controlled by ARPA/APPA showed at least an excess of legal limits, highlighting a noise problem.

The most controlled sources proved to be also for 2016, the service and commercial activities (56.6%) followed by product activities (29.6%). The percentage of Italian municipalities approving noise classification plan is equal to 59% (31 December 2016).

Regions with the highest percentages of zoned municipalities are Valle d'Aosta (100%), Lombardy and Tuscany (96%), Veneto (91%), Marche (90%), Liguria (85%), Piedmont (75%), Province of Trento (73%), Emilia-Romagna (72%); while the regions registering percentages below 15% are: Apulia (12%), Abruzzo (10%) and Sicily (2%).

At present in the Regions of Friuli-Venezia Giulia, Basilicata and Calabria the Noise Classification Plan doesn't prove to be a tool used for municipality planning. Instead, as regards Molise Region updated information is not available.



## PHYSICAL AGENTS in a nutshell

**492 events of excess of limits of law related to RTV plants**

**66 events of excess of limits of law related to RBS plants**

in Italy the total power of RBS plants is equal to 11,446 kW and it is slightly higher than the one of RTV plants which is equal to 10,347 kW

**stationarity of RTV plants**

no substantial changes have been registered between 2015 and 2016 (little more than 0.2% for sites and no new plants)

**increase of RBS plants (+7%)**

an increase of services and of sites has been registered respectively equal to 10% and 7%



**PHYSICAL AGENTS:**  
for physical agents are meant electromagnetic fields, noise vibrations, radiations, ultraviolet radiations and light pollution which can cause serious health risks



**40.6 % of noise sources present at least an excess of legal limits**

provided for the legislation highlighting a noise pollution problem

**59% of municipalities approved the noise classification**

**100% of zoned municipalities in Valle d'Aosta**

the noise classification is the result of the subdivision of urbanized land in homogeneous noise areas

## 10. GEOLOGICAL HAZARDS

In 2016 Italy was hit by a swarm of earthquakes that began on 24 Aug. with a 6.0-magnitude event in the town of Accumoli (Lazio region), followed on the same day by a second earthquake of magnitude 5.4 with epicenter in the Norcia area (Umbria region). Other earthquakes of magnitude greater than 5 occurred on 26 October in the towns of Castelsantangelo sul Nera and Ussita, and on 30 October again in the town of Norcia, where a stronger earthquake of 6.5 magnitude occurred. In the whole epicentral area, which involves the regions Lazio, Abruzzi, Umbria and Marche, almost 45,000 earthquakes were recorded in 2016.

Italy is particularly prone to natural hazards for its distinctive geological and geomorphological structure. Natural events potentially hazardous to people are divided in two main categories, based on their originating mechanism: endogenous events (e.g. earthquakes, volcanic eruptions) that originate from within the Earth, and exogenous events (e.g. floods, landslides, avalanches) that occur on the earth surface. The study of earthquakes, surface faulting and volcanic eruptions is very important in a country like Italy, where hazards from such events often affect densely populated and industrial areas. Since the second postwar period also hydrogeological instability has become a problem of great social and economic importance, precisely for the interactions between natural processes and human activities.

A fact-finding analysis of hazard conditions is therefore important for a better land use management, which must be backed by a combined policy of prediction and prevention.

In 2016 Italy was hit by a swarm of earthquakes that began on 24 Aug. with a 6.0-magnitude event in the town of Accumoli (Lazio region), followed in the same day by a second earthquake of magnitude 5.4 with epicenter in the Norcia area (Umbria region). Other earthquakes of magnitude greater than

5 occurred on 26 October in the towns of Castelsantangelo sul Nera and Ussita, with magnitude 5.4 and 5.9 respectively, and on 30 October again in the town of Norcia where a stronger earthquake of 6.5 magnitude occurred. A MCS intensity X-XI was reached in several villages. In the whole epicentral area, comprising the regions of Lazio, Abruzzi, Umbria and Marche, almost 45,000 earthquakes were recorded in 2016. The earthquake sequence has prompted thousands of environmental effects, mostly landslides. The 2016 seismic sequence is typical of the central Apennines and especially of the stricken area, where earthquakes of similar magnitude occurred in historical times. The two known most destructive historical precedents in the area were the Monti della Laga earthquake in 1639 (estimated magnitude 6.2) which reached MCS intensity IX-X in Amatrice and VIII-IX in Accumoli, and the Valnerina earthquake in 1703 (estimated magnitude 6.9), which reached MCS intensity X in Accumoli and IX in Amatrice.

In Italy there is a large number of capable faults, i.e. of active faults able to produce surface or near-surface rupture or significant deformation. Surface faulting is a part of seismic hazard that focuses on possible surface rupture/tectonic deformation during an earthquake. The intense urbanization of the last decades has widely

affected even areas near capable faults, and currently there are no regulatory measures to curb this trend. In 2016, the reactivation of the Mount Vettore-Mount Bove fault system that caused the swarm of earthquakes in Central Italy, produced surface ruptures with dislocations ranging from a few centimeters up to about two meters during the three main earthquakes. Seismic hazard poses a risk also to the valuable cultural assets of Italy: heritage assets located in municipalities classified as seismic zone 1 (dangerous areas where very strong earthquakes may occur) are 12,433, i.e. 6.0% of the total.

With regard to volcanic activity, during 2016 the Mount Etna had one paroxysmal eruption, with a limited impact on human activities. The eruption began on the evening of 17 May and in the following days it was characterized by modest strombolian episodes, with formation of cineritic clouds which produced ashes and lapilli fallouts along the sides of the volcano; in some cases there were lava overflows. The eruptive phase progressively diminished from 22 May. The cultural heritage is also exposed to volcanic hazard: heritage assets falling in high-risk areas are 3,281, equal to 1.6% of the total.

With regards to weather, in 2016 there were thirty events of heavy rainfall within a day or even few hours, which were followed by flash floods both in urban and agricultural areas. Failure of embankments, floodings, erosion, over-flooding, landslides and coastal storms have deeply affected the Italian territory and this seems to confirm that nowadays the natural climate oscillations in Italy are undergoing persistent alterations. The population living in flood hazard zones (data updated to 2015) equals to: 1,915,236 inhabitants (3.2%) for the “high hazard” scenario P3 (return period between 20 and 50 years); 5,922,922

inhabitants (10%) for the “medium hazard” scenario P2 (return period between 100 to 200 years); 9,039,990 inhabitants (15.2%) for the “low hazard” scenario P1 (low probability of floods or extreme events).

Cultural heritage assets at risk from flooding are 30,424 for the “medium hazard” scenario P2, and 40,393 for the “low hazard” scenario P1.

In 2016 there were 146 major landslide events in Italy, which caused one dead, 17 injured people and damages to the main road networks. These events occurred throughout almost the entire country, in particular in the province of Bolzano and in the regions of Lombardy, Piedmont, Liguria, Marche and Sicily. Among these major events there are landslides triggered by the seismic sequence that hit Central Italy starting from 24 August 2016, including the landslide of Pescara del Tronto near the Salaria state road and the landslide of Visso, which blocked the Nera river, as well as landslides triggered by the intense rainfall that fell on the Piedmont region between 21 and 25 November 2016, in particular on the provinces of Turin and Cuneo.

The population at risk of landslides in Italy is equal to: 503,282 inhabitants living in “very high hazard” zones P4; 744,397 inhabitants living in “high hazard” zones P3; 1,587,177 inhabitants living in “medium hazard” zones P2; 2,132,393 inhabitants living in “moderate hazard” zones P1, and 680,197 inhabitants living in areas of attention. Considering the 2 most hazardous classes (P3 and P4), the population at risk equals to 1,247,679 inhabitants, representing 2.1% of the total (data updated to 2015).



Italy is among the European countries most at risk from all types of natural hazards, including earthquakes, volcanic eruptions, landslides and floods. With regards to

earthquakes and capable faults, in Europe only Greece has a greater hazard than Italy. In Europe, 16% of the UNESCO heritage sites fall in highly seismic areas, while 62% of the sites are located in low seismic areas. For Italy, however, this scenario is reversed, with 28% of UNESCO sites in highly seismic areas and only 16% in low seismic areas. Furthermore, because of its geological and morphological features (75% of the territory is mountainous-hilly), Italy is the European country most affected by landslides. Of the almost 900,000 landslides surveyed in Europe, more than 600,000 occurred in Italy (EuroGeoSurveys survey, to be published). Concerning flood hazard following heavy or exceptional rainfalls, Europe's most exposed areas are in Great Britain and nearby the main mountain ranges. Therefore, central-northern Italy has the same high flood hazard than Alps and Pyrenees regions and great river plains of France, Germany, Austria, Czech Republic, Slovakia, Hungary, and the Balkan area. In addition, flood hazard in Italy is particularly high for its valuable cultural assets. In Italy there are 6 volcanoes that, in case of eruption, pose a risk to the UNESCO cultural and natural sites, on a total of 10 volcanoes in Europe considered dangerous for the UNESCO sites. In particular, at Italy's level, the buffer zones of Mount Vesuvius and Phlegraean Fields reach UNESCO cultural sites, while buffer zones of the other 4 volcanoes involve only UNESCO natural sites. At Europe's level, the buffer zone of the Methana Volcano (Greece) involve the cultural site of Epidaurus, while the other 3 volcanoes reach only UNESCO natural sites.

## GEOLOGICAL HAZARDS in a nutshell

### 10,703 earthquakes with magnitude $\geq 2$

were recorded in 2016 by the Italian National Seismic Network. 2 earthquakes had magnitude 6 or greater, and 6 earthquakes had magnitude above 5

### 3,281 heritage assets exposed to high volcanic hazard

corresponding to 1.6% of the total



#### GEOLOGICAL HAZARDS:

natural events potentially hazardous are divided in two main categories: endogenous events (e.g. earthquakes, volcanic eruptions) that originate from within the Earth, and exogenous events (e.g. floods, landslides, avalanches) occurring on the earth surface



### rainfall

in 2016 rainfall was overall scarce in Northern and Central regions and islands, while it was abundant in the Southern regions

### about 1,900,000 people living in high flood risk areas

the population living in flood hazard zones equals to 1,915,236 inhabitants for the "high hazard" scenario P3 (return period between 20 and 50 years) (2015)

### 146 main landslides

in 2016, that caused one dead, 17 injured and damage to the road network

### about 500,000 people living in very high hazard areas

# 11. CHEMICAL AGENTS

Since 1930 the global production of chemical substances has increased from 1 million of tonnes to several hundreds of millions of tonnes. EU is the second largest producer in the world after China and about 100,000 chemical substances are estimated on the European market. Italy is the third producer after Germany and France in Europe, and the ninth in the world. The chemical enterprises operating in Italy are 2,810 and they employ about 108,000 workers, but the use of chemical products concerns all productive sectors.

The chemical agents are potentially dangerous substances for man and the environment. Their use is spread in all productive sectors and are incorporated in most objects of common use. Their use is essential in daily life contributing to economic wellbeing also in terms of employment. It is not possible to give a simple response to risk issue, as it varies with the substance, the quantity, the time and the exposure modality. As reported in the EU White Paper "Strategy for a future Chemicals policy", the incidence of diseases, even very serious ones and allergies, has significantly increased in the last decades. A not yet adequate knowledge on the consequences for human health and the environment strongly contributes to arouse worries. The 7th EAP – The new general Union Environment Action Programme to 2020, "Live well, within the limits of our planet" has set the objective to produce and use the chemical substances to limit possible harmful effects. The European Union has updated legislation on chemical substances and has issued REACH Regulation, establishing an integrated system of registration, assessment, authorization and restriction of chemical substances. The aim is to improve the security level in the management of the substances, maintaining competitiveness and stimulating innovation in the chemical industry. With the aim of harmonizing and making information on chemical products risk more effective, CLP Regulations have been also issued. The companies which produce, import or use chemical substances are first

responsible for security in the management. The European Agency for chemical substances (ECHA) and the competent authorities for the Member States carry out a control activity on the accomplishments by enterprises and can intervene with specific measures in case the risk of substances is not adequately controlled.

With REACH Regulation, thousand of chemical substances are under evaluation, often present on the market without appropriate information about security. In particular a coordinated effort is being made to identify "extremely alarming" substances as those with characteristics like carcinogenicity, mutagenicity, and toxicity for reproduction, sensitisation, PBT, endocrine disrupting associated to relevant exposure conditions. Of these substances 174 have been channeled so far in a substitution path considering more secure alternatives. Compared to the previous legislation the restriction process has been made more efficient. Before REACH, two restrictions per year were averagely adopted ; now the average has increased of 50%. At the end of 2016 the number of restrictions proposals under REACH is equal to 34. CLP Regulation, with the adoption of the United Nations' Globally Harmonised System of Classification and Labelling of Chemicals (GHS), facilitated communication on hazardous substances around the world. The classification process however has been made more efficient, concentrating on more significant types of



danger. Since 2009 have been set up about 200 harmonized classifications.

In addition to the above described regulations, which can be generally applied to chemical substances, there are also specific sectoral regulations as in the case of pesticides, subject to an aimed rule because dangerous by definition.

The monitoring of pesticides in waters is included in the Directive on sustainable use of pesticides (Directive 2009/128/EC), with the aim of identifying possible adverse effects which have not been taken into account in the authorisation phase. The produced information gives also the possibility to support decision processes aimed at limiting the risks for the environment. In more than ten years of monitoring activities an increase of territorial covering and of the representativeness of surveys has undoubtedly occurred. The levels of contamination referred to environmental limits as defined by the legislation in force, prove a state of contamination already pointed out in the previous years, with considerable exceedance of limits especially in superficial waters. In superficial waters, 370 monitoring points (23.8% of the total) have concentrations exceeding the environmental quality limits.

The substances that more frequently caused the exceedance are: glyphosate herbicide and its metabolite AMPA (aminomethylphosphonic acid), metolachlor and its metabolite, fludioxonil, dimetomorf, hexachlorobenzene fungicides and hexachlorocyclohexane insecticide. As for groundwater, 276 monitoring points (8.6% of the total) have concentrations exceeding the environmental quality limits. The substances that more frequently caused the exceedance are: atrazine-desethyl-desisopropyl, which is the metabolite of atrazine herbicide, triadimenol,

oxadixil and metalaxil fungicides, bentazone herbicide and the metabolites of AMPA and 2.6-diclorobenzammide herbicides and imidacloprid insecticide. The analysis of the evolution of contamination shows a gradual increase of the territorial diffusion of contamination during the period of observation from 2003 to 2016, with a direct association to the extension of the monitoring network and to the number of the substances searched. However considerable differences persist among regions and with regard to water status the whole national context is not adequately represented. Furthermore, it is important to consider that the contamination phenomenon is continuously evolving, mainly because of the introduction of new substances in the market to which monitoring plans hardly conform to. Therefore it is possible to affirm that we are still in a temporary phase in which the entity and degree of pesticide contamination are not sufficiently known.



New EU Regulation has laid the groundwork for a more safe and efficient management of chemical substances. Ten years which is the period of time since REACH was issued are not enough to fully estimate the long-term effects. However a first analysis is absolutely positive. With REACH have been started the evaluations of priority substances and have been adopted restrictions for substances of unacceptable risks in certain conditions of use. Finally with the authorisation process, the “extremely alarming” substances are channeled in a substitution path with more safe alternatives.



## CHEMICAL AGENTS in a nutshell

**Italy 3rd producer in Europe**  
following Germany and France  
and the ninth in the world

**2,810 chemical enterprises in Italy**  
employ about 108,000 highly skilled  
workers but the use of chemical  
products concerns all productive  
sectors



**REACH: 174 “extremely alarming”  
substances have been identified**  
with REACH Regulation, for the  
registration, evaluation, authorisation  
and restriction of chemical substances,  
thousand of substances have been  
evaluated and an effort is being made  
to identify those extremely alarming,  
174 have been identified so far which  
will be substituted with alternatives

### CHEMICAL AGENTS:

chemical elements or compounds,  
alone or in their mixture, in their  
natural state or obtained, used or  
disposed of including as waste,  
through any working activity,  
whether intentionally produced  
or not and be they placed on  
the market or be not



**pesticides in superficial waters,  
excess of limits in 370 points**  
equal to 23.8% of the total

**pesticides in groundwater, excess  
of limits in 276 points**  
equal to 8.6% of the total

**increase of contamination from pesticides**  
in the observation period, from 2003 to 2016,  
however entity and diffusion of pollution are  
not enough known

## 12. ASSESSMENTS, AUTHORIZATIONS AND ENVIRONMENTAL CERTIFICATIONS

**Towards a sustainable development with EIA, SEA and IEA. EMAS and EU Ecolabel are constantly growing.**

**EIA** (Environmental Impact Assessment), **SEA** (Strategic Environmental Assessment) and **IEA** (Integrated Environmental Authorization) are all mandatory tools which discipline several aspects related to sustainability of human activities affecting the environment.

Among the works subject to national EIA, procedure ends positively in about 84% of cases. In 2016 26 EIA decrees have been issued, of which, 24 positive with prescriptions and 2 negative. Over the years, the type of works subject to EIA, under the government jurisdiction have undergone some variations according to the changes of European directives and Italian regulations. This more articulated normative system and the evolution of the procedure itself, allowed work completion conditions to give rise to always more complicated prescriptive frameworks. In fact, the average number of prescriptions contained in the decrees has increased compared to the number of decrees thus revealing a growing trend. Furthermore the percentage of prescriptions in which the Agency System (ISPRA/ARPA/APPA) is involved, on the total of given prescriptions is equal to 37%, reflecting the consolidation of the role played by the System in the assessment and environmental monitoring actions. In the decrees issued in 2016 is observed a total of 851 prescriptions, of which 264, equal to 31% concerns the Agency System.

The Strategic Environmental Assessment (SEA) starts with the elaboration of plans/programmes and continues parallel to their

complete development to assure the integration of the environmental and sustainability aspects in the planning/programming. In 2015 (19 regions out of 20) stands out clearly that the largest number of SEAs concluded in the different regions concerns inter-municipal/ municipal urban plans (262); in particular the SEAs of municipal plans represent about 70% of total SEAs. Data related to subsection checks show that most of checks concluded in 2015 are concentrated in Lombardy (22%), Emilia-Romagna (16%), Tuscany (10%) and Veneto (8%), which together cover 56% of the total of subsection checks. The 94% of checks carried out are of exclusion from VAS, of which, about 48% are subject to the observance of certain prescriptions.

The procedure for IEA issue falls within the actions aimed at integrated pollution prevention and reduction. In particular, due to the application of new technologies and the improvement of management techniques with real benefits for the environmental quality achieved by adopting new limit values of polluters issued at the source and appropriate prescriptions on operating conditions of the installments, IEA issue requires a significant reduction at the source of pollution released to the environment near the installments subject to IPPC.

Data elaborated in 2016 concerning the polluters NO<sub>x</sub>, SO<sub>x</sub>, CO, COV and NMCOV of the different types of plants taken into consideration (thermoelectric power plants, chemical plants and refineries) are related to the

only changes of emission to atmosphere limit values, already authorized in the EIA in force or to the introduction of new emission limit values for new emission points subject to authorization, as for the construction of new settlement units.

This is the reason why significant reductions of the emissions to the atmosphere are not observed and, as in the case of chemical plants, the quantity of substances totally released in the atmosphere with regard to NO<sub>x</sub> e SO<sub>x</sub> pollutants may result increased respect to what already authorized during the EIA first issue.

In particular IEA of thermoelectric plants contributed to the reduction of SO<sub>x</sub> and NO<sub>x</sub> respectively with quantities of 3,534 e 2,099 tonnes/year equal to 55% and 33%, while for CO and PTS with quantities of 70 and 731 tonnes/year equal to 1% and 11%.

With regard to VOC emissions, data elaborated was always referred to changes of available EIAs, in particular to the introduction of new points of channeled emissions which were previously fugitive.

If we consider that channeled emissions opposed to fugitive ones, provide for the abatement of polluting substances before their emission in the atmosphere, the environmental benefits, even if not evident are however present.

The managers of operational plants with IEA issued by the Ministry of the Environment Land and Sea (MATTM) have the obligation of self controlling the plant including the monitoring of emissions and periodical dissemination of results to control agencies. The number of plants subject to surveillance corresponding to 149 in 2016, is slightly decreased as a consequence of the transfer of responsibilities to the regions of some plants and of the disposal of some others. This trend highlights that the authorization phase of existing plants

ended and the request of authorizations for new plants is almost non-existent.

The number of ordinary inspection visits made in 2016 is unchanged respect to the previous year but is proportionally higher respect the total of supervised plants, also as a consequence of some control characteristics on some plants particularly relevant both for the impact on the territory and on the environment.

The number of non-compliances observed in terms of warnings from the competent Authority (IMELS) upon the proposal of ISPRA following the inspections, shows a slight increase compared to previous years. Non-compliances are strictly correlated to the type of plants subject to inspections in the reference year and to the specificity of each EIA, if in absolute terms or expressed in percentage respect to the total number of inspections carried out. In this sense, the values are only partly comparable with previous years data of non-compliance and should be considered as indicative of the activity carried out by the control units only for the year in question.



The amending process of the directive on the environmental impact assessment.

The EIA Directive, firstly adopted more than 20 years ago, was submitted to an updating process aimed at assimilating the acquired experience and the most recent changes of legislation and of EU policy. EU Member States Public Consultation started in 2010, ended with a proposal of amendment and in October 2012, EU Commission adopted the proposal of a new Directive amending EIA Directive in force (already updated two times). The new EIA Directive (2014/52/EU) entered

into force on 15 May 2014, in line with the principles of a smart-regulation aimed at improving the environmental protection level. The new approach pays greater attention to the threats and challenges emerged since the entry into force of original rules. This means a greater attention to sectors like resource efficiency, climate change and disaster prevention which now better reflect in the assessment process. Member States have the mandate to simplify their environmental assessment procedures. In Italy on 21 July 2017 the Legislative Decree 16 June 2017, n.104, entered into force adopting Directive 2014/52/EU and introducing radical changes in EIA discipline included in the second part of Legislative Decree 152/2006. The Decree lays down that provisions apply to screening procedures to EIA and to EIA procedures started in 16/05/2017 the time-limit for the transposition of the EU Directive. The transposition respects the principles and the guidance criteria of the Law n 114/2015, the European delegation act, a tool containing the necessary dispositions for the transposition of the directive and other EU Acts. The Legislative Decree 104/2017 introduces many changes in EIA discipline.

The SEA Directive (2001/42/EC), entered into force on 21 July 2001, provides that European Commission prepares a report on the application and the efficacy of the directive every seven years. The second Report to the European Council and Parliament, COM(2017) 234, reflects the experience gained in the application of the Directive in the period 2007-2014. All Member States recognized that SEA has at least partially influenced the planning process and that improved the quality of the plans and programmes. Nevertheless some difficulties have been observed in terms of application with regard to the different elements which characterize SEA procedure, like quality, availability and the level of detail of information

used in the analysis and assessments, the identification of the “reasonable alternatives”, the interaction between EIA and SEA procedures.

According to EC data, with reference to the situation communicated at the end of 2012, it follows that at EU level on a total of less than 50,000 installations subject to IPPC discipline, more than 6,000 have been listed in Italy. Only Germany and France have a greater number of installations, while Spain and United Kingdom have a number of installations comparable with that of Italy. With regard to the other main activity categories, on average in EU is present a greater incidence of energy and chemical plants while in Italy, of metals and minerals industry. The significant diversity of productive tissues and approaches used in the different EU States would make less significant to refer to a “European average”.

### **Voluntary certifications: EU EMAS and Ecolabel**

EMAS Scheme being applicable to every type of organization (company or Public Administration) results to be particularly versatile, it can contribute to improve the resource management and to empower company towards the environment. It is a Scheme which certify company environmental impact processes.

In 2016, 1,794 EMAS certificates have been issued in Italy and the Region with the greatest number of registrations (192) is Lombardy. The most active organizations concerning registration in the last year are those operating in the waste and material recovery sector (274), with a further increased and Public Administrations (186) which remained unchanged.

Concerning registered organizations at present 1,000 units are counted. From 2012 to 2016

there is a decline of active registrations (-13.6%): in particular respect to 2015 a decreased occurred of 2%.



As at April 2017, in Europe, 3,963 registered organizations are counted. First ranks Germany with 1,251 active registrations, followed by Italy (990) and by Spain (869).

EU Ecolabel certifies the environmental sustainability of products/services present in the European market. It takes into consideration both the ecological and the performance aspect of products/services. In Italy, at December 2016, 349 EU Ecolabel licenses are into force for a total of 16.803 products/services certified distributed on 17 categories of products.

At European level, in March 2017, EU Ecolabel licenses in force are 2,023, on a total of 34,135 products and services certificates. The greatest number of licenses has been attributed to France (24% - 489 licenses in total), followed by Italy (17% - 350 licenses) and Germany (14% - 228 licenses). However from an analysis of the number of products and services certified, it is Italy who holds the record with 8,551 products-services, followed by France (4,392) and Greece (3,146). The group of products with the greatest number of licenses results to be tourism infrastructure (655 licenses), followed by multiuse and for sanitary products cleaners (275) and tissue paper (139). However, with regard to the subdivision of the number of products and services, at the first place rank hard coverings (8,081) and following tissue paper (7,301) and copy and graphic paper (4,296).





## ASSESSMENTS, AUTHORIZATIONS AND ENVIRONMENTAL CERTIFICATIONS in a nutshell

### EIA procedure ends positively in 84% of cases

in 2016 on 26 EIA decrees issued, 24 are positive and only 2 negative



### 70% of SEAs are referred to municipal plans

in 2015 the 70% of concluded SEAs (Strategic Environmental Assessment), refers to municipal urban plans

### ASSESSMENTS, AUTHORIZATIONS AND ENVIRONMENTAL CERTIFICATIONS:

EIA, SEA and IEA are mandatory tools which discipline different aspects of sustainability of human activity affecting the environment. EU EMAS and Ecolabel certifications are voluntary tools forenvironmental prevention



### EIAs of thermoelectric power plants reduce SOx emissions (-55%) and CO emissions (-33%)

in 2016 EIAs (Integrated Environmental Authorization) of thermoelectric power plants have contributed to the reduction of SOx and of CO with a quantity equal to 3,534 and 2,099 tonnes/year, respectively -55% and -33%

### 1,794 EMAS certifications in 2016

released in Italy, the most active organizations those of the waste and material recovery sector with 274 registrations

### 349 EU Ecolabel licenses in 2016

for a total of 16,803 certified products/services

# 13. ENVIRONMENTAL KNOWLEDGE

## New tools for environmental information.

Environmental information is pivotal for policy makers and stakeholders, including citizens; online publications and databases are nowadays essential to spread environmental culture and awareness.

The main communication and information tools used by the Italian environment agencies are divided into 5 categories: Public Relations Office, website, social media, media relations, publishing products for environmental communication and events.

The engagement of the National System for Environmental Protection (SNPA<sup>1</sup>) in the above 5 categories varies from 48% for social media – a category still not widespread within the SNPA (only 59% of the members have a twitter account and only 36% have a Facebook account) – to 100% for website, with average yearly visitors of over 600,000 and about 6,000,000 displayed pages in 2016.

Based on a survey carried out by ISPRA, in the period 2014-2016 there was a general improvement in the availability of environmental information and communication products in the websites of the SNPA as well as of some of the main Italian research institutions performing activities in the environment field.

Environmental publications and information products are available in all the agencies' website. In detail, 95% of the SNPA members disseminate via their websites both environmental news and reports, under the section dedicated to environmental publishing and information (191 is the average number of news diffused via websites in 2016).

Although social media are currently less used

within SNPA, they are the most immediate way of informing the general public, so it is interesting to note that each of the 13 SNPA members using Twitter, in 2016 released an average of 1,629 tweets and at the end of the year they had a total of around 44,000 followers, to be compared, for example, with the EEA (51,700), the Italian Ministry of Environment (74,000) and Legambiente environmentalist association (77,000).

In the same period, the 8 environment agencies with a Facebook page recorded 40,865 "likes", with an average of 5,108 each, to be compared with the EEA (28,000), the Italian Ministry of Environment (33,000) and Legambiente environmentalist association (122,000).

As for the other categories, in 2016 the average contacts number of Public Relations Offices is 1,750; moreover each SNPA member started about 1,300 proceedings averagely regarding complaints and access requests (access to files, access to public information).

As for the "relations with media" category, i.e. the classic institutional communication channel, 82% of the SNPA members have an office/officer for press relations while 95% issue press releases (46 is the SNPA average number in 2016).

Own publishing products are available in the websites of all SNPA members.

As for the availability of reports, there is great difference among SNPA members. The most active in this category are: ISPRA (36), ARPA Veneto (27), ARPA Tuscany (23), ARPA Piedmont (22). The thematic areas mostly present are "air" and "water".

<sup>1</sup> made-up of ISPRA and 21 regional/provincial environment Agencies (ARPAs/APPAs)

In 2016 the most widely used reporting product was the "thematic report".

With regards to "Reports on the state of the environment" it is to be highlighted that, in many cases, these are actually "yearbooks", i.e. lists of statistics on environmental components and factors rather than "reports" in the full sense of the word, i.e. documents containing not only statistics on environmental components and factors, but also information on the underlying assumptions of environmental policies.

For the joint "yearbooks/reports", the number of available publications, for each year, is less than ten.

Despite the absence of these products, about 80% of members ensure, however, the update of the online indicator databases.

As for the training offer, 174 training courses were held by the SNPA on various environmental issues in 2016; they involved 7,552 participants, with a total of 2,927 hours of training provided. ARPA Lombardy in particular provided 28 training courses attended by almost 1,400 people. Courses were implemented almost exclusively with traditional teaching methods (frontal) and mainly involved internal staff. Only ISPRA, ARPA Emilia-Romagna and APPA Trento used e-learning/blended methods. With regard to financing, the use of external funds was minimal: 93% of the courses were implemented with internal resources. In 2016, the topics most frequently dealt with in the courses concerned hydrosphere (19%), environmental assessment/authorization (13%), waste (11%) and atmosphere (10%). In 2016 SNPA activated 472 internships (76% curricular), of which 88 delivered by ARPA Emilia-Romagna alone. The most frequently dealt topics were: hydrosphere (19%), waste, atmosphere (~10%), chemicals (9%).



## ENVIRONMENTAL KNOWLEDGE in a nutshell

### improvement of web environmental information and communication

in 2014-2016 there is an improvement in the availability of information and communication products on the websites of members of the Italian System for Environmental Protection



### Twitter Followers (2016):

**44.000 SNPA (ISPRA + 12 Agencies)**

51,700 EEA

74,000 MATTM

77,000 Legambiente

### Facebook Likes (2016):

**40.865 SNPA (ISPRA + 7 Agencies)**

28,000 EEA

33,000 MATTM

122,000 Legambiente



### ENVIRONMENTAL KNOWLEDGE:

connection between information and communication concerning the environment



### thematic reports are the most used reporting product

**80%** of the environment agencies guarantee the update of online indicator databases, even in the absence of other publishing products

### 174 training courses

### 472 internships

174 training courses on various environmental issues were held by SNPA members in 2016; they involved 7,552 participants, with a total of 2,927 hours of training provided.

SNPA also activated 472 internships (76% curricular), of these 88 were activated by ARPA Emilia-Romagna

# BIODIVERSITY: IMPORTANCE, THREATS AND CONSERVATION

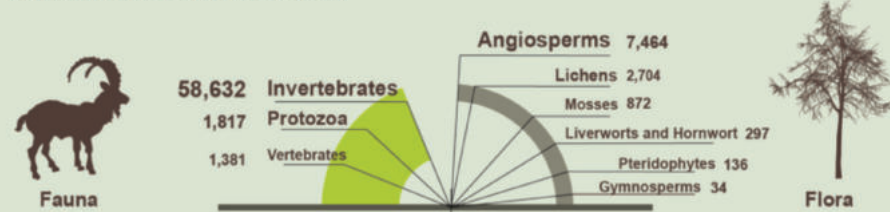
## WHAT IS BIODIVERSITY

Biodiversity can be synthetically defined as the variety of living forms that are found in a given environment. Biodiversity is generally studied at three different levels, which correspond to the three organization levels of the living world: the genetic, the species, and the ecosystem levels.

## IMPORTANCE OF BIODIVERSITY

Biodiversity has a great value in itself, comparable with the great value of cultural assets and works of human genius. Besides this fact, which already fully justifies measures for its protection, biodiversity is also important as a source of goods, resources and services (the so-called ecosystem services) essential for mankind survival and with a key role in national economies. Among the ecosystem services, it's worth mentioning: the supply of food, fuels, building materials; the purification of air and water; the function of stabilizing and regulating the climate; the positive effects on flooding, drought, extreme temperature jumps and wind force; the essential contribution to the pollination of plants; the great strategic importance as a reservoir of genetic resources for food and pharmaceutical purposes; cultural and aesthetic benefits and many more.

## COMPOSITION OF SPECIES IN ITALY



some species are:

**Critical endangered (CR)**



**Marsican brown bear**  
*Ursus arctos marsicanus*

**Endangered (EN)**



**Red coral**  
*Corallium rubrum*

**Vulnerable (VU)**



**Morimus funereus**  
*Morimus funereus*

## MAIN SOURCES OF THREAT

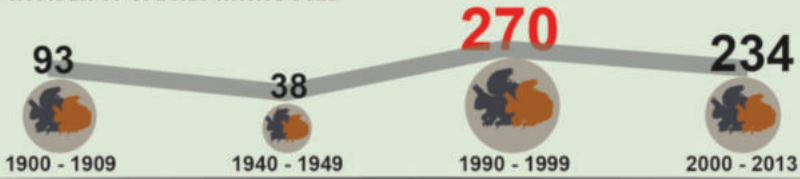
**Habitat destruction, degradation and fragmentation**

**Introduction of invasive alien species**

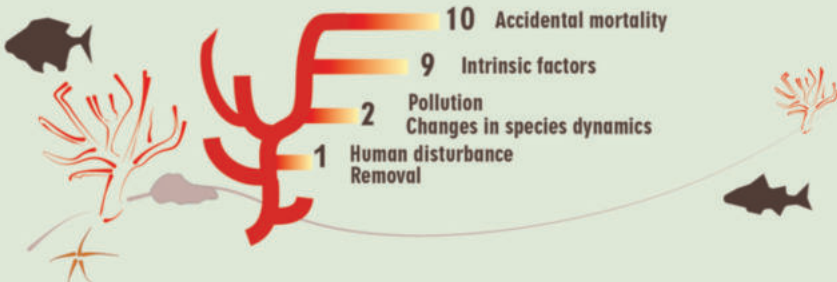
**Over-exploitation of resources and species**



## NUMBER OF SPECIES INTRODUCED

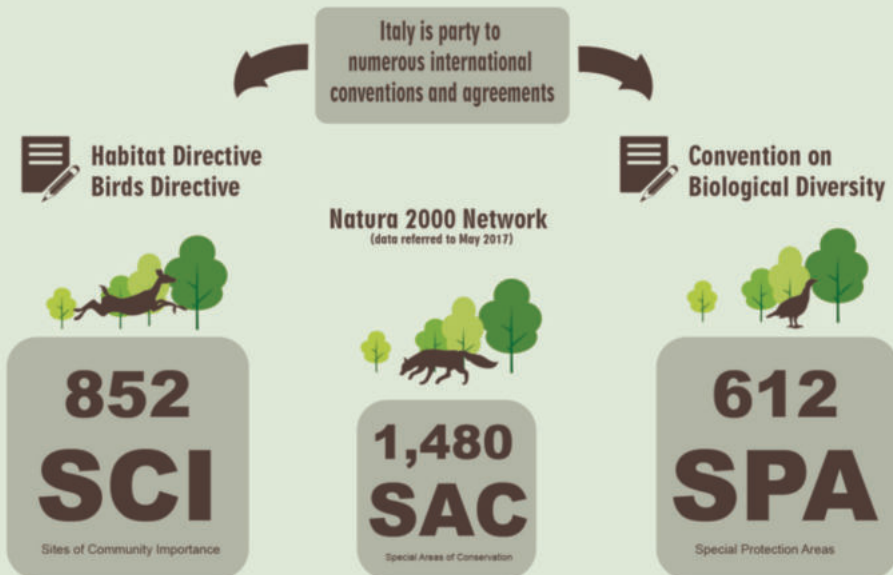


## MAIN THREATS TO CORALS



## ACTIONS AIMED AT BIODIVERSITY PROTECTION

Both indirect and direct measures are adopted at national and international level to contrast the loss of biodiversity. Actions aimed at reducing sources of pressure, for instance through the control of pollutant emissions or the protection of water quality, belong to the first category. Measures aimed at the direct conservation of species and ecosystems, such as the creation of protected areas and accession to international conventions and agreements, belong to the second type.



# CLIMATE CHANGES

## ABOUT CLIMATE CHANGE

Climate Changes represent a priority among the global emergencies and has become a relevant item on political agendas of national and international institutions. Climate Changes are broadly recognized as one of the most important challenges to face for mankind. Several studies highlight how commitments for emission reduction even if entirely implemented are no longer sufficient to comply with the global warming threshold of 2 °C. They will be even less sufficient to achieve the goal of 1.5 °C provided for the Paris Agreement. Climate Changes are the result of interactions of natural and anthropic complex systems. Even without ignoring the effects of natural phenomena, such as the variability of the intensity of solar radiation, the majority of scientific community is convinced that "most of warming observed in the last 50 years is attributable to human activities". The fifth Assessment Report of the Intergovernmental panel on Climate Change (IPCC) underlines that the simultaneous increase of the concentrations of greenhouse gas emissions in the atmosphere and of temperatures registered since the first half of the XX century has been most probably caused by human activities.

## CAUSES OF CLIMATE CHANGES

### Fluorurate gases

They cause a strong greenhouse gas effect. These gases are released in smaller quantities and EU legislation provides for their gradual reduction.

### Greenhouse gases

CO<sub>2</sub>  
NO<sub>x</sub>  
HFC  
CH<sub>4</sub>

### Deforestation

Trees contribute to regulate climate by absorbing CO<sub>2</sub> from the atmosphere. By felling trees, this action is missing and CO<sub>2</sub> contained in wood is released in the atmosphere, thus feeding greenhouse gas effect.

### Energy consumption from fossil sources

The combustion of coal, petrol and gas produce carbon dioxide and nitrogen oxide.

### Nitrogenous fertilisers

They produce emissions of nitrogen oxide.

### Livestock development

Bovines and sheep produce high levels of methane during the digestion process.



↑ **2.3%**

In Italy, in 2015, greenhouse gas emissions, expressed in CO<sub>2</sub> eq increased



↓ **520**  
**433**  
CO<sub>2</sub> eq  
millions of tonnes

Between 1990 and 2015, all greenhouse gas emissions decreased thanks to CO<sub>2</sub> prevalent reduction from the energy sector

CO<sub>2</sub> NO<sub>x</sub>  
HFC CH<sub>4</sub> **82.5%**

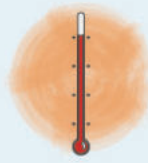
CO<sub>2</sub> contribution to total emissions in 2015 from energy sector



### Tropical nights



Year	Change
2016	+10
2003	+44
1976	-10
1961	-1



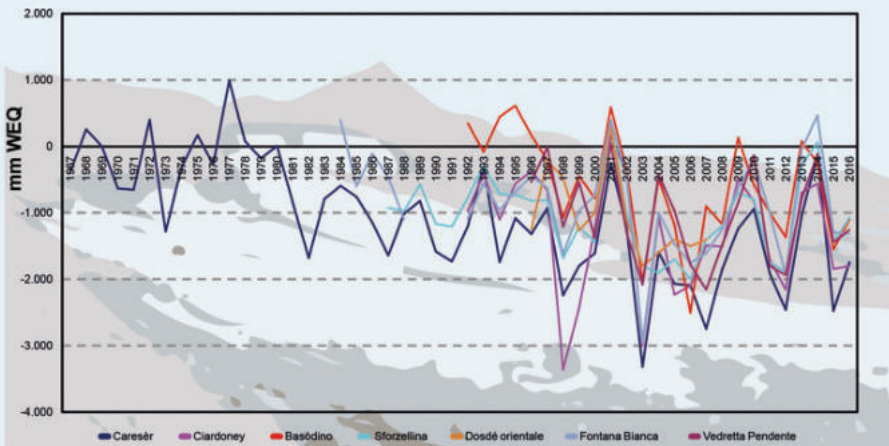
### Average temperature 2016 – Anomaly

Italy  
**+1.35 °C**

Global  
**+1.31 °C**

The word tropical nights is used to indicate those nights in which the lowest temperature don't drop below 20 °C.

### Net mass balance of some Italian glaciers



### MAIN RESPONSE MEASURES

#### Mitigation

Reduction of Greenhouse gas emissions.

An example of mitigation :

#### Decoupling



In 2014 greenhouse gas emissions in EU-28 decreased of 24% compared to 1990, with a GDP increase of about 48% thanks to the growth of the renewable energies quota.

#### Adaptation

Minimize possible consequences of climate changes.

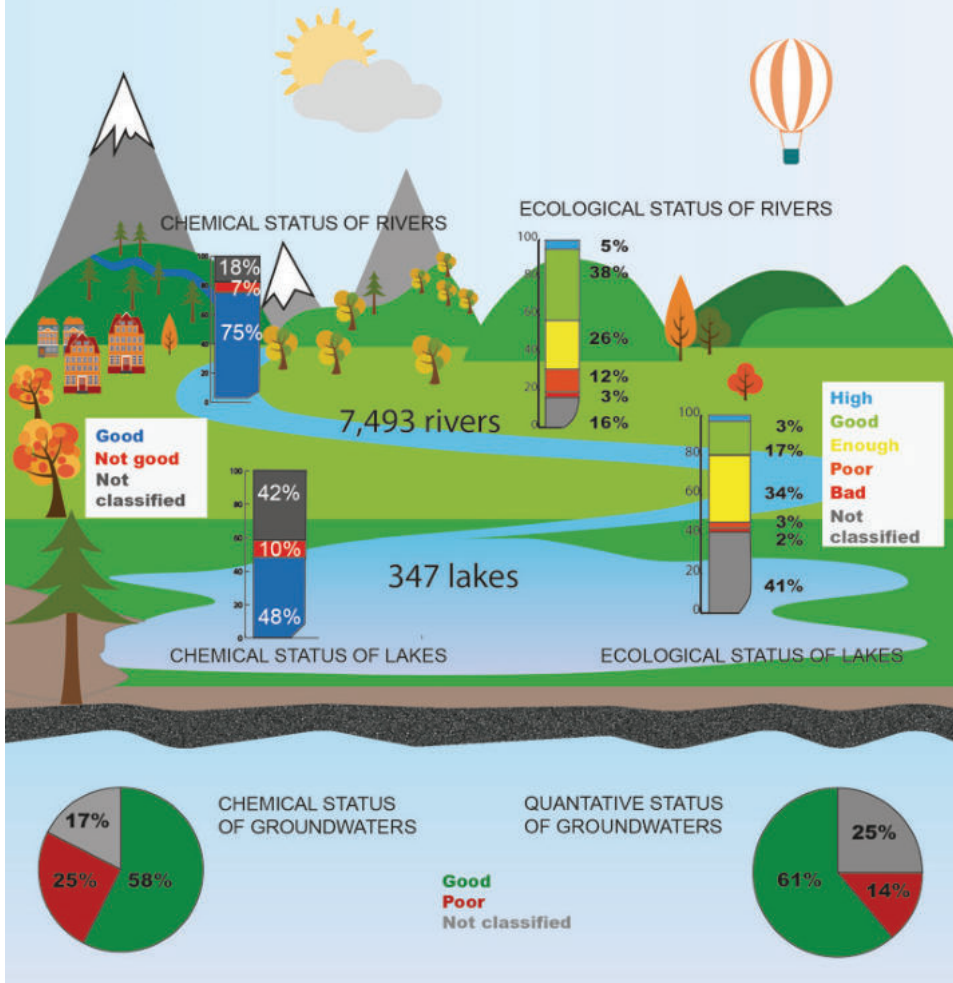
An example of adaptation:

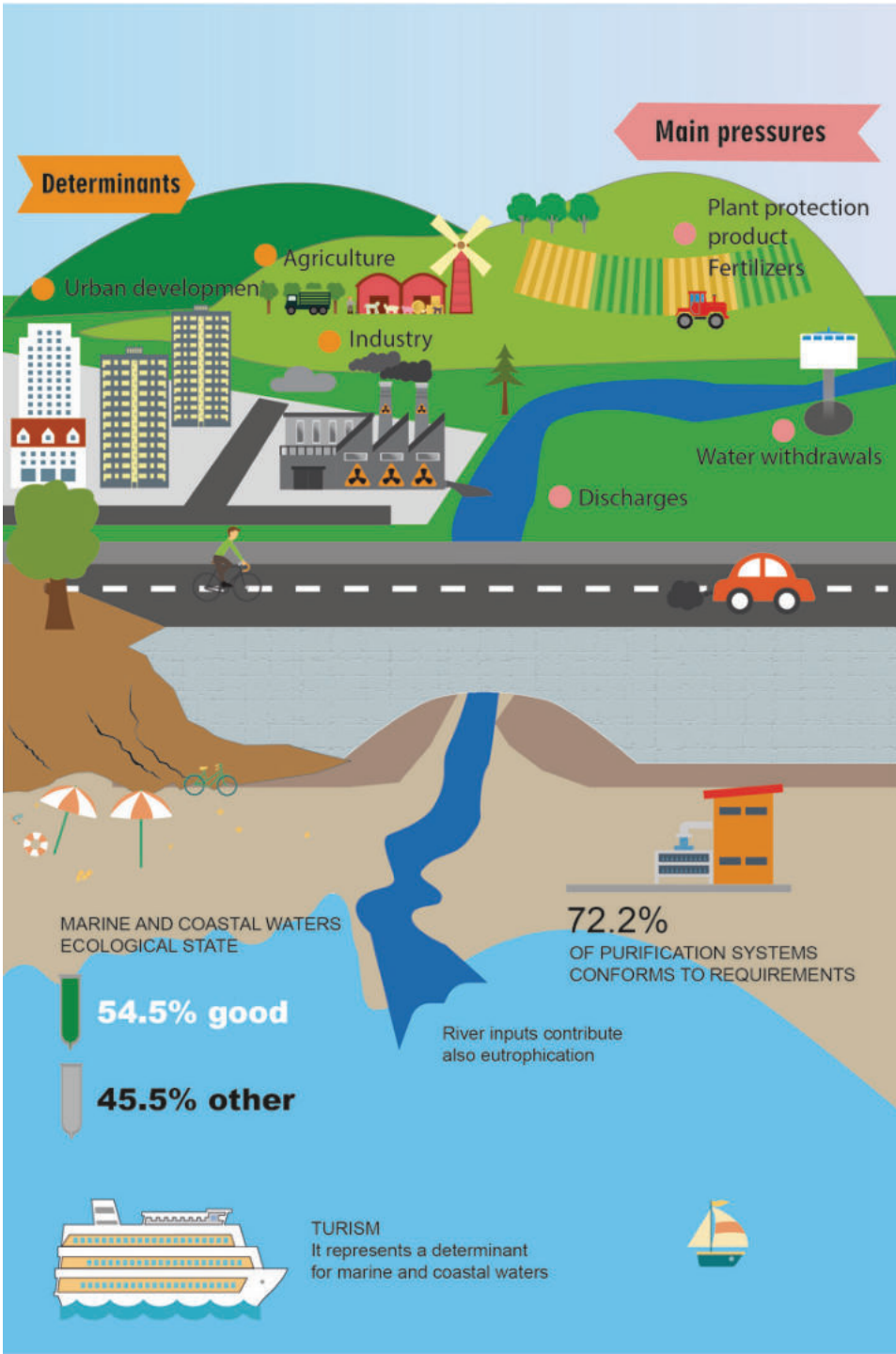


Italy approved the National Strategy for Adaptation to Climate Changes (SNAC) .

# WATER QUALITY

Water occupies two thirds of the land surface and through its cycle it allows the exchange of substances and energy among all the ecosystems. The following classes can be distinguished: internal surface waters (rivers and lakes), transitional waters (river mouths and coastal lakes), marine and coastal waters and groundwaters. Each of these classes supports the life of animal species and plant species and constitutes a complex system of interchanges among waters, sediments, soil and air which allow their functionality. Water resource is subject to modifications of the composition because of natural and anthropogenic causes; these latter often cause polluting phenomena which are always more relevant and sometimes irreversible. The intrinsic resilience of water bodies allows them in a certain extent, to tolerate inputs of natural and synthetic chemical substances and modifications of the physical and morphological conditions, almost "metabolizing" the alterations suffered and restoring the conditions which assure a full recovery. However, the exceed of certain alteration thresholds compromises such capacity in an irreversible way and determines the deterioration of the water body, which means a smaller capacity of self-purification, decrease or alteration of local and general biodiversity, causing a lesser availability of the water resource for the human necessary uses.





# SOIL: IMPORTANCE, THREATS AND PROTECTION



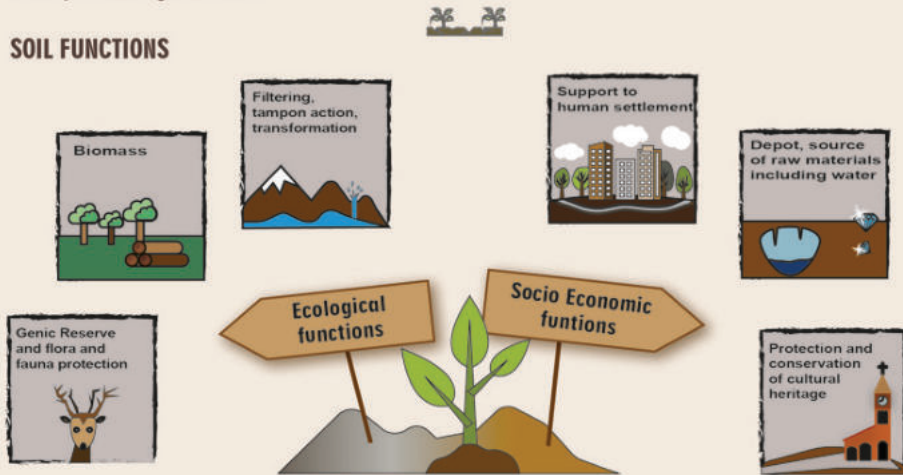
## ABOUT SOIL

With the term "Soil" we mean the thin porous and biologically active medium which represents "the top layer of the earth's crust, formed by mineral particles, organic matter, water, air and other living organisms. It represents the interface between earth, air and water and hosts most of the biosphere".

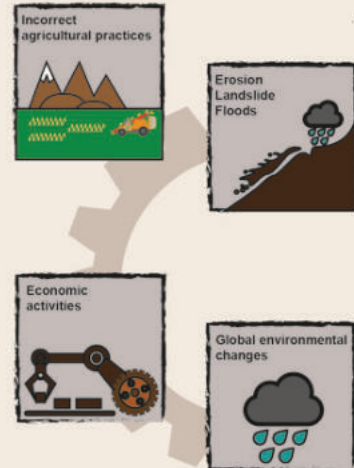
## IMPORTANCE OF SOIL

Soil not only represents the physical basis on which to develop human activities, but it also performs a series of ecosystem supply, control and support services which bring it at the core of environmental balances, from adaptation and mitigation of climate changes to food security and human health. Soil is a non-renewable resource: therefore each degradation process nearly always represents an irreversible loss with consequences at global level.

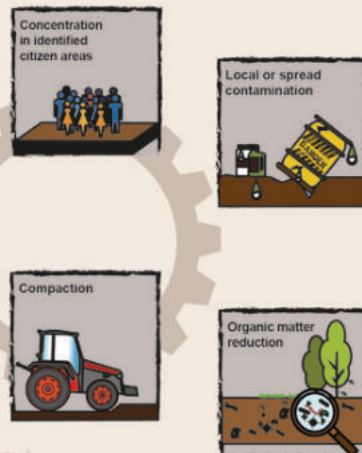
## SOIL FUNCTIONS



## CAUSES OF THREAT



## MAIN THREATS



## SOME IMPORTANT DATA



### Water Erosion

It causes a very  
Soil loss equal to

**8.5 t/ha\*year**

European average is of 2.461/ha\*year



### Artificial covering of soil

**7%**

European average is of 4.1%

## Sensitivity to desertification



**10%**

very  
vulnerable



**42.9%** medium  
vulnerability



**26%**

low  
vulnerability

## ACTIONS AIMED AT SOIL PROTECTION



The priority objectives established by the European Union and introduced by rules regulating land conservation in good agricultural and environmental conditions (BCAA) are four:

- to protect soil from erosion;
- to maintain the level of soil organic matter ;
- to protect the soil structure;
- to maintain a minimum level of ecosystem and to keep habitat conservation.



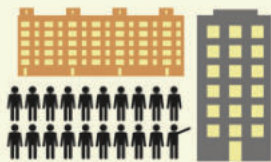
In Italy on May 12 2016, the draft law on control of built soil consumption has been approved. In particular it allows soil consumption exclusively when there are non-consistent alternatives for reusing already urbanized areas and in the regeneration of the same, recognizing the objectives established by the European Union about the goal of the net soil consumption equal to zero to achieve by 2050.

# WASTE

Waste is defined as any substance or object from human activities or natural cycles, which the holder discards, intends to discard or is required to discard. Waste can be classified as municipal waste or special waste depending on their source, and as hazardous waste or non-hazardous waste on the basis of their characteristics.

All policies and regulations of the European Union have as their primary goal the sustainable use of resources, linked with the sustainable management of waste.

The aim is to ensure that the consumption of renewable and non-renewable resources does not exceed the carrying capacity of the environment, and to achieve a decoupling of resource use from economic growth through significantly improved resource efficiency and the reduction of waste, dematerialisation of the economy and waste prevention.



PEOPLE  
PRODUCE  
WASTE



WHAT CAN WE  
DO WITH SO  
MUCH WASTE?

1

## REUSE

Often pre-used items can be reused



2

## SELECT

Understanding what can be recycled, to give waste a new life

3

## RECYCLE

Recycling is the process of converting waste materials into new materials and objects



4

## ENERGY PRODUCTION

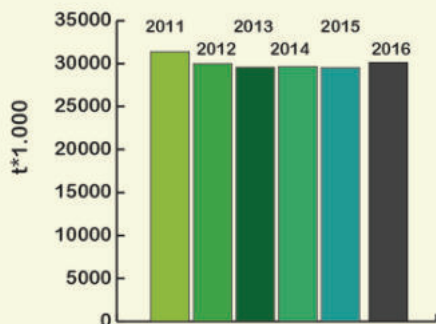
Energy can also be generated from the treatment of some types of waste



WHAT TO  
DO WITH  
SO MUCH  
WASTE ?



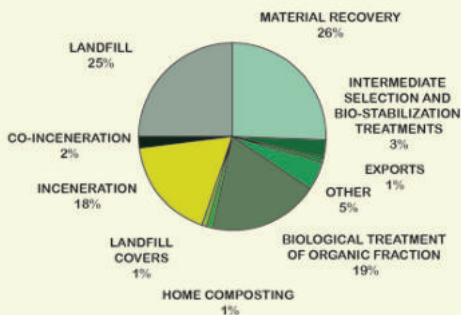
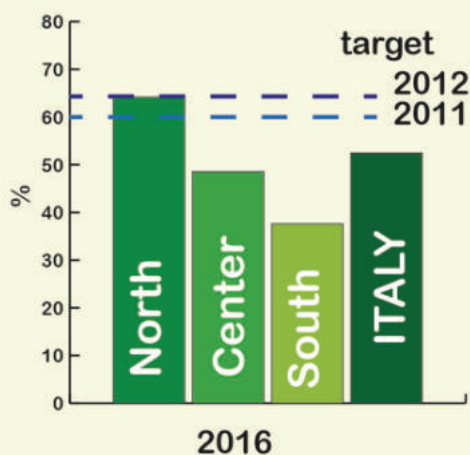
## Municipal waste generation



## Municipal waste



## Separate waste collection



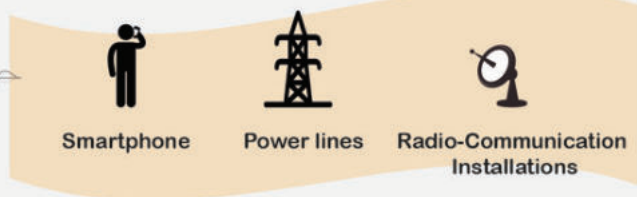
## HOW MUCH MATERIAL WAS RECYCLED?



# PHYSICAL AGENTS

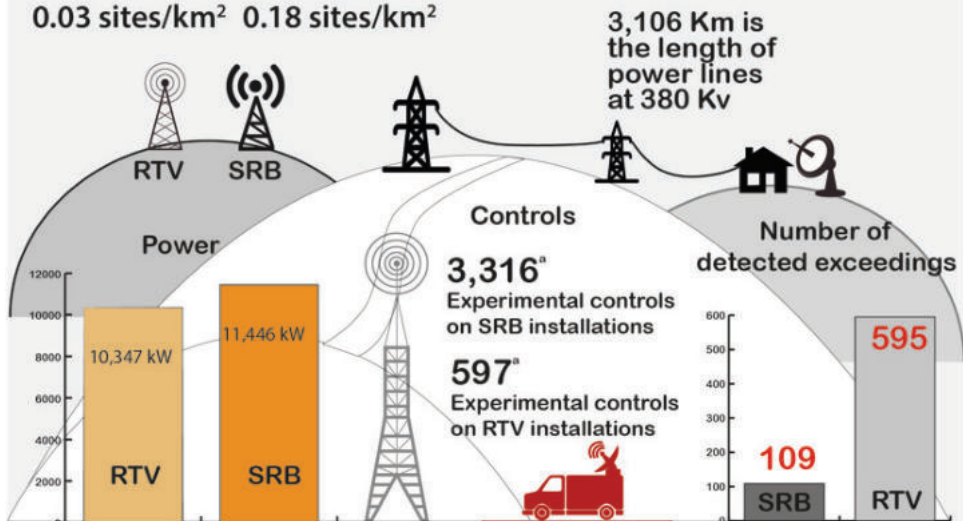
No-ionizing radiations (NIR) are electromagnetic radiations which have got enough energy to cause thermal, mechanical, and bioelectric (biologic effects) changes in the constituent matter of living organisms. Such effects, if not compensated by human body, can lead to a real damage for health (sanitary effect). Italy decided to adopt protection policies more oriented to the protection of population compared to the international approach, taking into due account the connected risk with prolonged exposures to very low levels, even in the absence of a proven connection of cause-effect between exposure and disease. Therefore some multi-level limit values have been defined: exposure limits, which protect against established sanitary effects (acute effects), attention thresholds or cautionary measures to be respected in the environments intended for prolonged stays, as well as quality objectives, aimed at a further reduction of inappropriate exposures to be respected in high frequented areas.

## NO-IONIZING RADIATIONS



### Density of Sites

0.03 sites/km<sup>2</sup> 0.18 sites/km<sup>2</sup>



\*Italy total refers to those Regions whose data are complete and updated



## NOISE some causes



Air traffic



Demonstration



Railway traffic

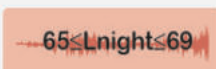
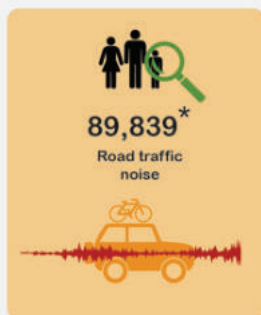


Road traffic

Number of citizens

Noise levels (dBA)

Number of exposed citizens (%)



400



7,900



20,000

Monitored sources with noise pollution problem



45.9%

Italian municipalities with noise classification



59%

## IONIZING RADIATIONS

Radioactive waste, in terms of activity, present in Italy can be found:



In Lazio and Lombardy Regions a high concentration of Radon is observed

\*The study refers to a sample of population living in the city of Lecce (2016)

# GEOLOGICAL HAZARD

## WHAT IS GEOLOGICAL HAZARD

Natural hazard is defined as the probability of occurrence, within a specific period of time in a given area, of a potentially damaging natural phenomenon (UNDRO 1979). Therefore geological hazard is related to the occurrence of geological phenomena such as earthquakes, tsunamis, volcanic eruptions, landslides, floods, sinkholes, subsidence, etc.

Because of its geodynamical, geological and geomorphological features, Italy is subject to many hazardous geological events, both endogenous (earthquakes, volcanic eruptions) and exogenous (landslides and floods). Earthquakes are the most damaging events, both for loss of lives and in economic terms. Low magnitude earthquakes ( $M \leq 3-3.5$ ) occur daily in many areas of the country without causing any damage, while events exceeding the damage threshold occurred approx. every 4 years in the period 1997-2016 (every 3 years considering the period covering 2009-2016). Seismic hazard in Italy is high, due to the frequency of occurrence of destructive earthquakes and because in some areas of Apennines, Calabria and eastern Sicily, earthquakes with magnitude up to 7 and MCS intensity up to XI (highly destructive) may occur.

## HAZARDOUS GEOLOGICAL EVENTS

### Volcanoes

The main sources of hazard linked to volcanic activity are: magmatic fragments and ash, lava flows, pyroclastic flows, burning clouds, lahars flowing down from a volcano, gas emissions.

### Landslides and floods

Over 70% of Italy's landscape is mountainous or hilly. This feature, together with periodic, severe weather events and with an increase of urbanized areas, puts large areas of the country at risk of flooding and landslides.



### Earthquakes

Earthquakes are the most damaging events, both for loss of lives and in economic terms. Eastern Alps, Apennines, Calabria and Sicily have a high hazard level.

The use of not always appropriate agro-pastoral practices, and at the same time the abandonment of hydraulic-forestry maintenance techniques, especially in mountainous-hilly areas, have contributed to increase geological hazards, along with the increasing number of forest fires.



## 1997-2016

Damaging earthquakes occurred at an average of one every four years.

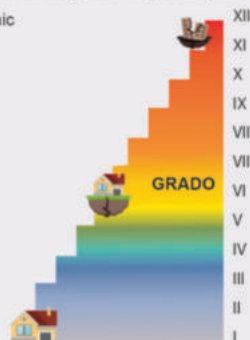


## 1688-1706

During this period, 14 strong earthquakes occurred almost yearly. Similar sequences may repeat.

### Mercalli-Cancani-Sieberg intensity scale (MCS)

totally catastrophic  
catastrophic  
extreme  
violent  
severe  
very strong  
strong  
moderate  
light  
weak  
weak  
not felt



## THE MOST DESTRUCTIVE EARTHQUAKES IN HISTORICAL TIMES

Verona area,  
3 Jan. 1117  
(IX MCS)

Messina (Sicily) and  
Calabria, 28 Dec.  
1908 (XI MCS)

Alta Irpinia,  
23 luglio 1930  
(X MCS)

Friuli, 6 May and 11  
and 15 Sept. 1976  
(X MCS)



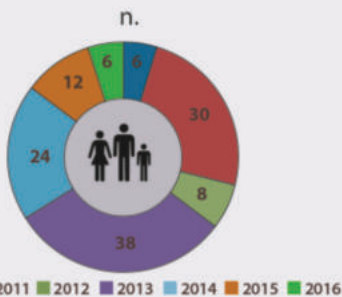
Val di Noto (Sicily),  
11 Jan. 1693  
(XI MCS)

Fucino (Abruzzi),  
13 Jan. 1915  
(XI MCS)

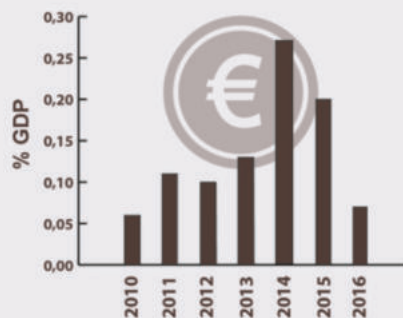
Belice (Sicily), 15  
Jan. 1968  
(X MCS)

Irpinia (Campa-  
nia), 23 Nov. 1980  
(X MCS)

## VICTIMS OF MAJOR FLOODS IN ITALY



## ESTIMATES OF TOTAL DAMAGE OF MAJOR FLOODS COMPARED WITH GDP



## MITIGATION MEASURES FOR GEOLOGICAL HAZARDS

The best protection tool against geological hazards is know them. Knowing how geological phenomena have occurred in the past enable us to estimate possible future scenarios. Italy has a good seismic catalog covering the last 2,000 years, whose information are considered in the national Seismic Hazard Map and in the territorial Seismic Classification subdivided in 4 Zones. As for flood and landslides, representing the second main geologic hazard in Italy in terms of damage and loss of life, the mitigation measures put in place are both of structural and non-structural type.

### Seismic Microzonation (SM)

Microzonation is the process of estimating site-specific seismic response based on geological, lithological, geomorphological, hydrogeological tectonic, geotechnical and geophysical characteristics of the sites.



Centro MS

In 2015 the Center for Seismic Microzonation and its application (Centro MS) was founded in Italy.

### Prevention measures for flood and landslides

Since 1999 both Italian Government and Ministry of the Environment have financed nearly 5,000 structural interventions, to prevent damage from landslides, floods and avalanches.



Mission Office for hydrogeological instability and the development of water infrastructures.




# INDICATOR

DPSIR



TEMPORAL  
COVERAGE

TREND



## 1. BIODIVERSITY

- Terrestrial protected areas	R	1922 - 2010	
- Marine protected areas	R	2003, 2012	
- Natura 2000 Network	R	2003 - May 2017	
- Wetlands of international importance	R	1976 - 2013	
- Consistency of fishing activity	D/P	1996 - 2015	
- Consistency of animal species and level of threat	S/I	2005, 2009, 2012, 2013, 2014, 2015	
- Consistency of plant species and level of threat	S/I	1992, 1997, 2005, 2008, 2013, 2014, 2015, 2017	
- Spreading of alien animal and plant species	P	1900 - 2014	

## 2. CLIMATE: STATE AND CHANGES

- Total greenhouse gas emissions and Greenhouse gas emissions from energy processes	P	1990 - 2015	
- Mean Temperature	S/I	1961 - 2016	
- Tropical Nights	S/I	1961 - 2016	
- Heat waves	S/I	1961 - 2016	

## 3. AIR POLLUTION

- Emissions of acidifying substances (SO <sub>x</sub> , NO <sub>x</sub> , NH <sub>3</sub> ): trends and breakdown by sector	P	1990, 1995, 2000 - 2005 - 2015	
- Particulate matter emissions (PM <sub>10</sub> ): trends and breakdown by sector	P	1990, 1995, 2000 - 2005 - 2015	
- Atmospheric concentration of PM <sub>10</sub>	S	2015	
- Atmospheric concentration of PM <sub>2.5</sub>	S	2015	
- Atmospheric concentration of O <sub>3</sub>	S	2015	
- Atmospheric concentration of NO <sub>2</sub>	S	2015	

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## 4. ALLERGENIC POLLEN INDEX

- Allergenic pollen index	S	2013 - 2016	-
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## 5. INLAND WATER QUALITY

- Purifiers: conformity of urban waste water sewage system	R	2014	
- Percentage of purified waste water	R	2014	
- Ecological status of surface waters	S	2010 - 2015	
- Chemical status of surface waters	S	2010 - 2015	
- Chemical status of groundwater (SCAS)	S	2010 - 2015	-
- Quantitative status of groundwater (SQUAS)	S	2010 - 2015	

## 6. SEA AND COASTAL ENVIRONMENT

- Coast artificialised with maritime and coastal defense works	P/S/R	2000 - 2007	
- Coastal dynamic	P/S/R	1950 - 1999, 2000 - 2007	
- Concentration of <i>Ostreoptis ovata</i>	S/I	2016	
- Protected coast	P/S/R	2000 - 2007	
- Bathing waters classification	S	2015 - 2016	
- Ecological status of coastal marine waters	S	2010 - 2016	
- Ecological status of transitional waters	S	2010 - 2016	
- Chemical status of coastal marine waters	S	2010 - 2016	-
- Chemical status of transitional waters	S	2010 - 2016	
- Eutrophication	S	2001 - 2009	
- Sea storms	S	2002 - 2016	



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## 7. SOIL

- Water erosion	S	2014 (project SIAS 14 regions), 2015	
- Soil sealing and soil consumption	P	2015 - 2016	
- Soil consumption in coastal area	P	2015 - 2016	
- Organic carbon (OC) present in soil superficial horizons (30 cm)	S	2014	
- Desertification	S/I	1990 - 2000 2004, 2006, 2007, 2008, 2009	

## 8. WASTE

- Amounts of municipal waste separately collected	R	2007 - 2016	
- Percentage of preparation for re-use and recycling	R	2010 - 2016	
- Municipal waste generation	P	2017 - 2016	
- Amounts of waste disposed in landfills, total and type of waste	P/R	2000 - 2016	

## 9. PHYSICAL AGENTS

- Number of opinions on prior checks and of monitoring interventions on RF field sources	R	2016	
- Quantity of held radioactive waste	P	2014	
- Exceedings of regulatory reference values for electromagnetic fields generated from radiotelecommunication installations, remedial actions	S/R	2016	
- Monitored sources and relative percentage where at least an exceedance of limits has been observed	D/S	2000 - 2003, 2006 - 2016	
- State of implementation of municipal noise classification plans	R	2016	
- Traffic noise: exposition and annoyance	S	2012	
- State of implementation of noise characterization of airport's neighbourhood	R	2016	
- Concentration of indoor radon activity	S	1989 - 2016	

# INDICATOR

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## 10. GEOLOGICAL HAZARDS

- Population exposed to flooding risk	I	2015	
- Population exposed to landslides risk	I	2015	
- Cultural heritage exposed to landslides and flood risk	I	2016	
- Cultural heritage exposed to seismic hazard	I	2016	
- Cultural heritage exposed to volcanic hazard	I	2016	-
- Floods	P/I	2016	
- Landslides	S/I	2016	
- Earthquakes	S	2016	
- Earthquake environmental effects	S	2016	
- Surface faulting (capable faults)	S	2000 - 2017	

## 11. CHEMICAL AGENTS

- Safety of chemical substances: REACH	D/R	2008 - 2015	
- Water quality-pollution by pesticides	I/S	2003 - 2014	-

## 12. ENVIRONMENTAL ASSESSMENTS, AUTHORIZATIONS AND CERTIFICATIONS

- Monitoring of state jurisdiction plants	R	2009 - 2016	
- Reduction of macro-polluters (SOx, NOx, CO, Dusts) released into the air	I/R	2016	
- Reduction of micro-polluters (VOCs – Volatile Organic Compounds) released into the air	I/R	2012 (E-PRTR) 2016	
- Number of certified licenses and products with EU Ecolabel	R	1998 - 2016	
- Number of EMAS registrations	R	1997 - 2016	
- EIA Decrees under State jurisdiction	R	June 1989 - December 2016	
- Prescriptions set out in EIA decrees under State jurisdiction	R	June 1989 - December 2016	
- SEA procedures under jurisdiction of State Regions and Autonomous Provinces	R	For state SEAs: from 01/05/2016 to 30/06/2017 For regional SEAs: 2015	-


# INDICATOR

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## 13. ENVIRONMENTAL KNOWLEDGE

- Online environmental information and communication	R	2013 - 2015	
- Number of environmental information products	R	2014 - 2015	-
- Environmental training courses supply	R	2016	-





