10. Environment[1]

In the comparison with the previous year (and, to a greater extent, in the mid-term analysis), indicators show a prevalence of positive signals (Table 1). In a decade marked by a sharp slowdown in economic growth, also the pressure on the environment exerted by the economic system has decreased in some of its fundamental components (greenhouse gas emissions, domestic material consumption). More interestingly, a divergence has been emerging, at the exit from the crisis, between the economic trend and the trends of the main pressure indicators – although there is no sufficient evidence yet of a real break of the linkage between economic growth and the pressure on environment (at least as the weakness of the economic cycle persists). Indicators on cities' air quality and waste management are also improving. However, the situation remains critical on these issues, especially in northern cities (as regards air pollution) and in South and Islands (where, in several regions, more than 50% of municipal waste is still landfilled). Important progress has been made also in the use of renewable energy, allowing Italy to reach in advance the 2020 target set by the EU. On the other hand, there are negative signals from the indicators related to land governance and water resources management: soil consumption continues to advance, especially in the North, at a worrying pace, while the population exposed to hydrogeological risk (landslides and floods) is increasing, and the efficiency of water supply networks is worsening. Both of perception indicators – the satisfaction with the state of the environment in the place of living, and the concern about the loss of biodiversity – remain stable, compared to the previous year, but improve in the medium term. The first is higher in the North, but growing in South and Islands, while the second is considerably more widespread among the youngest, and the people with higher education attainment.
Although the indicators' trends are generally uniform at the territorial level, the differences in level between regions are, in most cases, very large. Only for 8 of the 16 indicators that are comparable at regional level[2], the difference between the extremes and the Italian average is less than 100%, while for three others the outliers are so numerous and so distant from the average to make the comparison between regional distributions not significant[3] (Figure 1).
Among the measures considered, the widest dispersions of regional values are observed in the two indicators of exposure to hydrogeological risk. The share of population exposed to flood risk varies between the minimum of Sicilia (nearly null) and the maximum of Emilia-Romagna (6 times the national average), while the share of population exposed to landslide risk has its minimum in Veneto (nearly null) and the maximum in Valle d'Aosta (almost 6 times the average). The indicators of air quality in the cities (referred to pollution from PM_{10} particulate matter and Nitrogen dioxide) also present a high degree of heterogeneity, being much influenced, like those of hydrogeological risk, by the morphology of the territories. The values of Veneto and the Province of Trento are 4 times higher than the average, respectively, for the indicators of PM_{10} pollution and Nitrogen dioxide pollution, while, at the opposite end, are the (fortunately numerous) regions where the monitoring stations have not detected any exceedances of the legal limits in the concentrations of the two pollutants.

1 This chapter was edited by Luigi Costanzo, with contributions from: Domenico Adamo, Raffaella Chiocchini, Elisabetta Del Bufalo, Aldo M. Femia, Flora Fullone, Antonino Laganà, Stefano Tersigni, Irene Tommasi, Angelica Tudini.

2 Greenhouse gas emissions are not available at regional level, Domestic material consumption is expressed in absolute values.

3 Urban green, Contaminated sites, and Electricity from renewable sources (see the footnote in Figure 1)

Finally, the distribution of the landfill of waste indicator is also very dispersed, with Molise (in the worst condition, with a value 4 times higher than the average) being very far from the province of Bolzano (about one tenth of the average).

Table 1. Environment indicators: value for the latest available year. Percentage variations on previous year and on 2010

INDICATOR	Latest available year value	% variation (compared to the previous year)	% variation (compared to 2010)
1. Emissions of CO_2 and other greenhouse gases *(tonnes per capita, 2018)*	7.3		
2. Domestic material consumption *(million tonnes, 2017)*	481.6		
3. Water losses in urban supply system *(%, 2015)* (a)	41.4	–	
4. Landfill of waste *(%, 2018)*	21.5		
5. Quality of urban air - PM_{10} *(%, 2018)* (b)	22.0		
6. Quality of urban air - Nitrogen dioxide *(%, 2018)* (b)	11.9		
7. Coastal bathing waters *(%, 2018)* (b)	66.5		
8. Urban green *(sq.m per capita, 2018)* (c)	32.8		
9. Satisfaction for the environment *(%, 2018)*	70.1		
10. Contaminated sites *(per 1.000 sq.km, 2018)* (d)	12.2	–	–
11. Population at risk of landslides *(%, 2017)* (e)	2.2		–
12. Population at risk of flood *(%, 2017)* (e)	10.4		–
13. Sewage treatment *(%, 2015)* (a)	59.6	–	
14. Protected natural areas *(%, 2017)* (f)	21.6		
15. Concern for biodiversity loss *(%, 2018)* (f)	21.0		
16. Electricity from renewable sources *(%, 2017)*	34.3		
17. Separate collection of municipal waste *(%, 2018)*	58.1		
18. Soil sealing from artificial land cover *(%, 2018)* (f)	7.64		

— Comparison not available Improvement Stability Deterioration

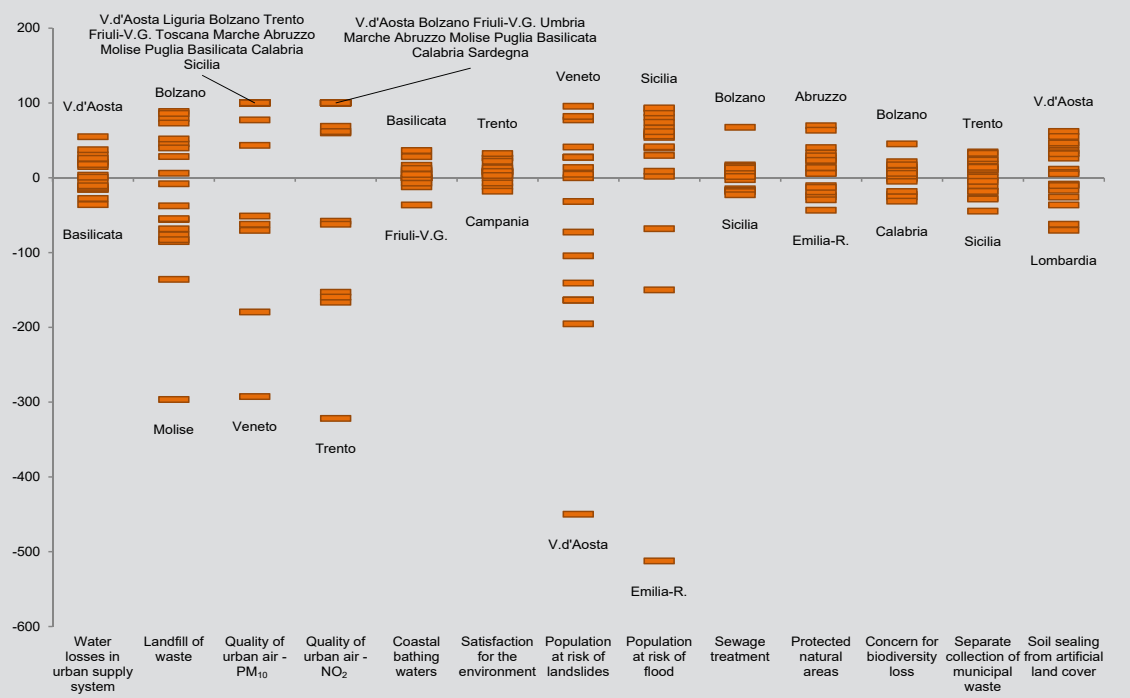
(a) Data 2010 not available, variation based on 2008;
(b) Data 2010 not available, variation based on 2013;
(c) Data 2010 not available, variation based on 2011;
(d) Time series not available;
(e) Data 2016 not available, variation based on 2015;
(f) Data 2010 not available, variation based on 2012.

Note: variations between two points in time above 1% are considered positive (in green), below -1% are considered negative (in red). Variations between -1 and +1% refer to stability (in grey).

The territorial variability of indicators referring to soil consumption and protected areas is relatively smaller. The coverage of artificial surfaces (soil sealing) varies between the minimum of Valle d'Aosta (0.4 times the average) and the maximum of Lombardia (1.7 times), while the coverage of protected areas has its minimum in Emilia-Romagna (0.6 times the average) and the maximum in Abruzzo (1.7 times). The distances between the extreme values are even smaller for the indicators referring to water services: the values of Valle d'Aosta and the province of Bolzano – in the best situations regarding the water network dispersion and wastewater treatment – are about 2 times higher than the national average; Sicilia and Basilicata, at the opposite, present values equal to 0.7 times the average. Similarly, the rates of separate waste collection range from the minimum of Sicilia (0.4 times the average) and the maximum of the province of Trento (1.3 times), and the percentages of bathing coasts between the minimum of Friuli-Venezia Giulia (0.6 times the average) and the maximum of Basilicata (1.4 times). Finally, the distributions of the two perception indicators are the most even – despite a clear polarization according to the usual North-South

pattern. The satisfaction with the environmental situation reaches the highest value in the province of Trento (1.3 times the average) and the lowest in Campania (0.8 times), while the concern about biodiversity loss has its maximum in the province of Bolzano (1.5 times the average) and the minimum in Calabria (0.7 times).

Figure 1. Percentage variation for Environment indicators comparing to the value for Italy by region. Latest available year (a) (b)



(a) The values of the following indicators are not shown due to the excessive presence of outliers: Urban green (Basilicata is 17 times higher than the Italian average, the province of Trento 12 times, Umbria 3 times, Friuli-Venezia Giulia and Calabria 2 times), Contaminated sites (Campania is 12 times higher than the average, Piemonte and Liguria 3 times) and Electricity from renewable sources (Valle d'Aosta is 9 times higher than the average, the province of Bolzano 5 times, the province of Trento, Molise and Basilicata 3 times, Calabria 2 times).
(b) Values above zero correspond to a better well-being conditions comparing to the Italian average; values below zero correspond to worse well-being conditions. The calculation took into account the polarity of indicators.

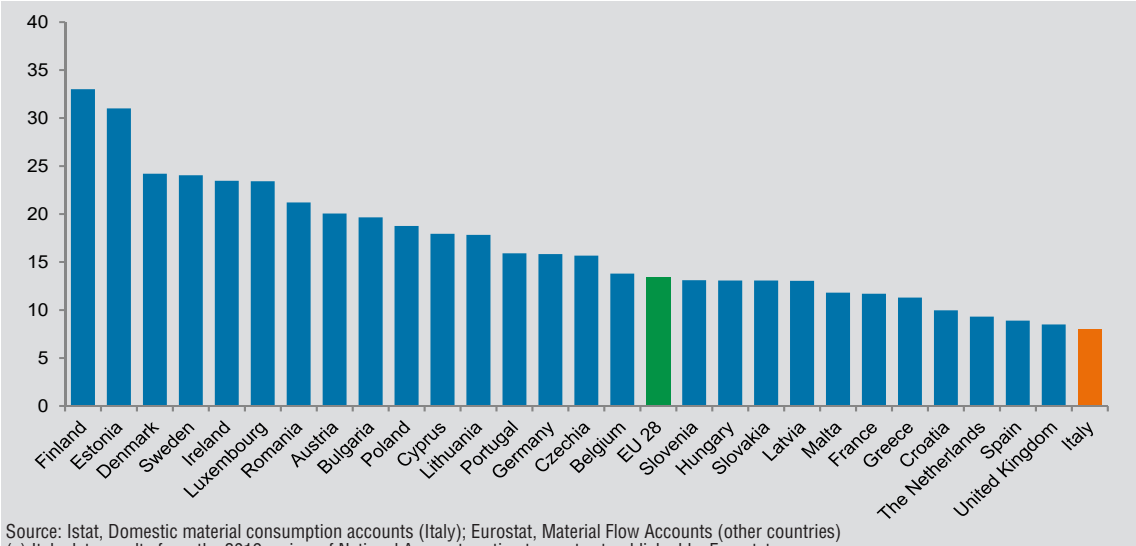
International comparison

Two general measures of the pressure exerted by the economic system on the environment – the Domestic material consumption (DMC), a quantitative estimate of the material resources transformed by the economic system, and the Emissions of greenhouse gases[4] – make possible to compare the situation of Italy to the other European countries. Given the size of its economy, Italy is among the EU countries that consume most resources in absolute terms

4 The DMC includes the domestic extraction of materials and the balance of trade in goods with foreign countries, taking into account all materials that have been incorporated into products in the reference year, and that, sooner or later, are to return to the environment in the form of air emissions, solids suspended in waste water, fertilizers and pesticides, waste, etc. The values of DMC commented in this chapter are those resulting from a general review of the National economic accounts, conducted in 2019. Both the DMC and the air emissions accounts refer only to the activities resident in Italy, according to the System of national accounts. These indicators thus represent only the environmental pressures generated directly in Italy by Italian residents, since they do not include what in the rest of the World needs to be extracted from (and returned to) the environment in order to make available to Italian residents what they consume. On the other hand, these indicators include the extractions and emissions generated in Italy "for the benefit" of the rest of the World. It is worth remarking that such limitation is all the more relevant, the more the chains of production and material consumption get global.

(after Germany, France, Poland, the United Kingdom and Spain), but it is the one that consumes the least in relation to its population: 7.9 tons per capita, just over half the average of the 28 Member States (13.4). In terms of material consumption, therefore, the pressure on the environment of the Italian economy can be considered, on the whole, relatively limited, and significantly lower than in other major European economies (15.8 t per capita in Germany, 11.7 in France, between 8.5 and 9 in Spain and the United Kingdom) (Figure 2).

Figure 2. Domestic material consumption in the EU by country. Year 2017 (a)**. Tonnes per capita**



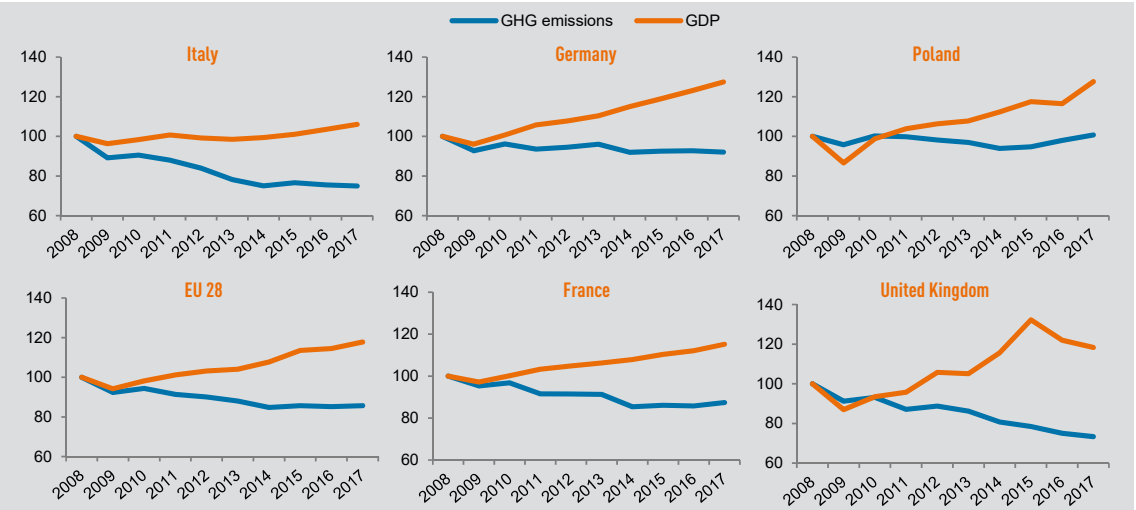
Source: Istat, Domestic material consumption accounts (Italy); Eurostat, Material Flow Accounts (other countries)
(a) Italy data results from the 2019 review of National Accounts estimates, not yet published by Eurostat.

As regards the greenhouse gases (GHG)[5], in 2017 more than 60% of the emissions of the entire EU was generated in five countries: Germany (21.4%), the United Kingdom (11.5%), France (10.3%), Italy (9.4%) and Poland (9.2%). In all these countries, as well as in the Union as a whole, the decade 2008-2017 – which was marked in its initial phase from a general economic crisis – has seen the emission trends to diverge from the GDP trends (Figure 3). Although this is a positive sign, indicating a tendency towards a desirable decoupling between the economic growth and the pressure on environment, in fact GHG emissions have been significantly reduced only in Italy and the United Kingdom (by 25 and 26.7% respectively, from 2008 to 2017) – and in Italy this occurred in conjunction with a very weak economic recovery. With the exception of the UK, the other major GHG producers, with a stronger economic growth, reduced their emissions much less (France by 12.6%, Germany by 8%) or not at all (Poland, +0.7%).
On the side of the responses that the economic system puts in place to counter the environment degradation, we can consider the use of renewable energy sources and the recycling of urban waste. The extent to which fossil energy sources are replaced by renewable energy sources[6] can be seen, in several respects, as a sustainability index of the economic system. A wider use of renewable sources can contribute to the reduction of GHG emissions, and improve the security of energy provision, by reducing the reliance on oil and natural gas imports. In

5 The Eurostat indicator considers Carbon dioxide (CO_2), Nitrous oxide (N_2O) and Methane (CH_4) – the latter in tonnes of CO_2 equivalent. The BES indicator "Emissions of CO_2 and other greenhouse gases" considers, instead, a broader set of elements (see below).

6 Wind, solar, hydroelectric, tidal, geothermal, heat pumps and bioenergy are considered renewable sources. Bioenergy includes the energy produced from biomass (the biodegradable fraction of products, waste and residues of biological origin), bio-liquids (liquid fuels obtained from biomass, of vegetable or animal origin), and biogas (generated by anaerobic fermentation of organic material).

Figure 3. GHG emissions and GDP at market prices in Italy, compared to other major EU economies and to the EU as a whole. Years 2008-2017. Indexes, year 2008 = 100



Source: Istat, based on Eurostat, Air Emissions Accounts and Annual National Accounts

the EU, from 2008 to 2017, the share of the gross final energy consumption[7] that is covered by renewable energy sources increased from 11.3 to 17.5%, so approaching the 20% target set for 2020. In the same years, Italy increased its share at a slightly faster pace, from 11.5% to 18.3%, thus achieving its national target (17%) in advance.[8] The position of Italy, however, is still far from those of the Countries most advanced in this field: Sweden, Finland, Latvia and Denmark, whose shares of renewable energy range between 35% and 55% (Figure 4).

Figure 4. Share of renewable energy in gross final energy consumption. Years 2008 and 2017. Percentage values

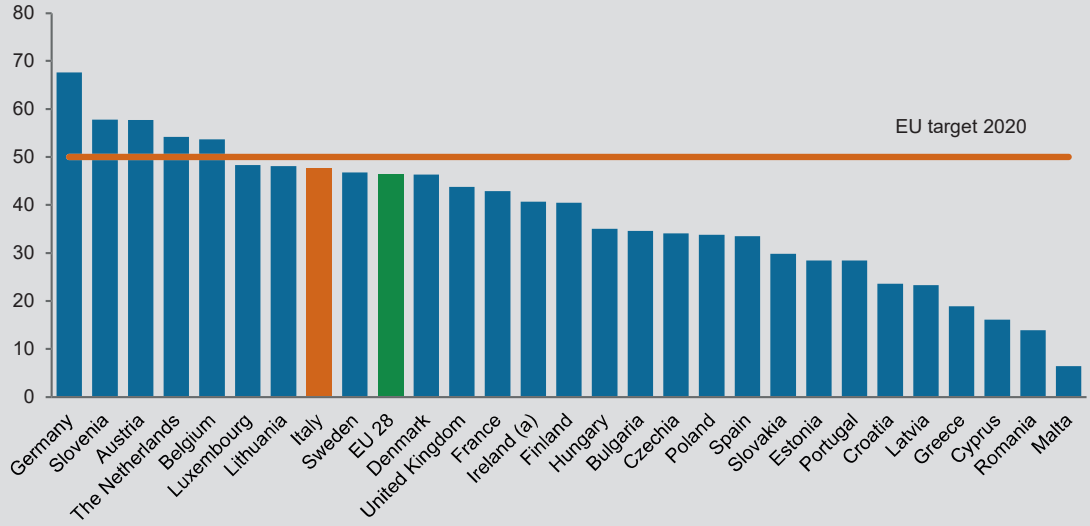
Source: Eurostat, Renewable energy statistics

7 Total energy products supplied to industry, transport, households, services (including public services), agriculture, forestry and fisheries – including electricity and heat consumption by the electricity sector for electricity and heat production, and electricity and heat losses through distribution and transmission.

8 Directive 2009/28/CE sets a target of 20% of energy consumption from renewable sources to be achieved by 2020 for the EU as a whole, and national targets that take into account the starting point and the development potential of renewable energy sources in each Country: from a minimum of 10% (Malta) to a maximum of 49% (Sweden).

In Italy, the relative quantity of waste generated by the entire economic system (business activities and households) is well under the EU average: 2,705 kg per capita against 4,968 (2016). Italian households, however, produce more waste than the EU average (almost 500 kg per capita compared to 420): the highest value among the Member States after Luxembourg, The Netherlands and Denmark. The recycling rate of municipal waste, which is considered to be a good indicator for assessing the quality of the entire waste management system, measures how much of the waste flow generated by the final consumers (thus, mainly by the households) is reused as a resource in the circular economy. In 2017, Italy's recycling rate is 47.7%, a little higher than the EU average (46.4%), and close to the 50% target set for 2020[9], but still far from the rates achieved by the most virtuous countries: Germany (67.6%), Slovenia and Austria (just under 58%) (Figure 5).

Figure 5. Recycling rate of municipal waste in the EU by country. Year 2017. Percentage values



Source: Eurostat, Waste Streams: Recycling rate of municipal waste
(a) 2016 data.

National data

Improvements of air quality in the cities

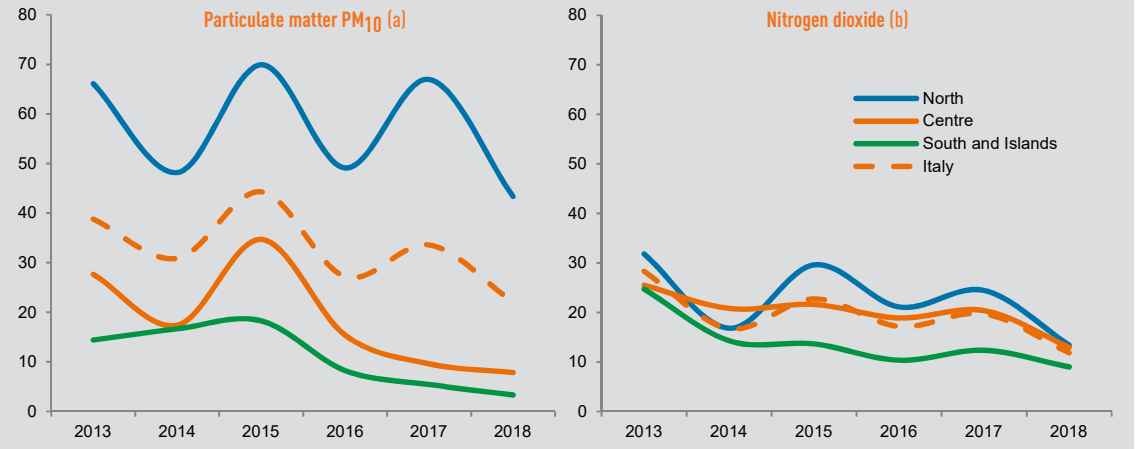
Among the pressure indicators referring to the urban environment, the two measures for air quality are based on the air concentrations of PM_{10} particulate matter and Nitrogen dioxide (NO_2) detected in Italian cities.[10] The emission of these pollutants derives mainly from the use of fossil fuels (in transport, residential heating, production activities), but their concentration over given thresholds, considered harmful to human health, also depends

9 This target was set by the Framework Directive 2008/98/CE, with regard to the preparation for re-use and recycling of household and similar waste. The following Directive 2018/851/EU set further targets, to be achieved by 2025 (55%), 2030 (60%) and 2035 (65%).

10 The indicators are based on data collected in the 109 provincial capital municipalities by the air quality monitoring stations, managed by the Regional environmental protection agencies (Arpa and Appa). High concentrations of PM_{10}, more frequent in the cold months, can represent an immediate risk for public health, while the Nitrogen dioxide tends to persist longer in atmosphere, and is associated with a higher risk in the medium period for the population exposed.

on a combination of meteorological and geomorphological factors, which can mitigate or aggravate the effects of primary pollution. In recent years, both indicators show a positive background trend, which can be associated to an actual reduction in pollutant emissions. The influence of weather and climate factors, however, determines a rather wide fluctuation of the concentration values in the short term – especially for particulate matter, which is more sensitive to changes in rainfall (Figure 6). The 2018 data show, for both indicators, a clear improvement over the less rainy previous year.[11] The monitoring stations that have detected exceedances of the legal concentration thresholds during the year are 22% for PM_{10} (33.6% in 2017) and 11.9% for NO_2 (19.6% in 2017).[12]

Figure 6. Monitoring stations that have detected exceedances of the legal limits in the concentrations of particulate matter (PM_{10}) and Nitrogen dioxide (NO_2) in the provincial capitals, by geographical area. Years 2013-2018. Per 100 stations with valid measurements



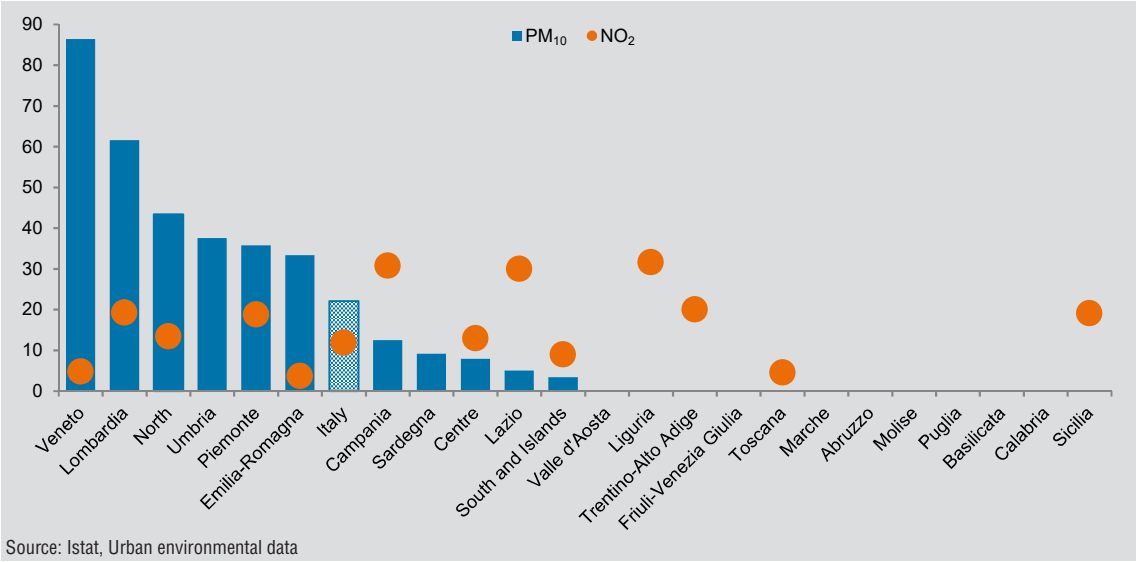
Source: Istat, Urban environmental data
(a) Monitoring stations that have exceeded the daily limit of 50 µg/m³ for more than 35 days in the reference year.
(b) Monitoring stations that have exceeded the yearly limit of 40 µg/m³ in the reference year.

Pollution from particulate matter mainly affects the cities of the North – where, during 2018, 43.4% of monitoring stations detected exceedances of the legal thresholds, with peaks of 86.4% in Veneto and 61.5% in Lombardia – while the average values in Central and Southern Italy are far lower (7.8 and 3.3%, respectively). The geography of Nitrogen dioxide pollution appears more homogeneous: also in this case, however, the cities of South and Islands are found in the best situation (as only 9% of the stations detected exceedances of the legal thresholds), while the cities of the Centre and the North recorded quite similar average values (13% and 13.4%, respectively) (Figure 7).

11 In 2017 (as in 2015) there was a drop of over 20% in precipitation in Italy, compared to the previous year (source: Mipaaf, *Statistiche meteoclimatiche*). Rainfall reduces the air concentration of pollutants.

12 The reference norm is the Legislative Decree no. 155 of 13/8/2010, implementing the Directive 2008/50/CE, according to which the concentration of PM_{10} shall not exceed a daily average of 50 µg/m³ for more than 35 days a year, and that of NO_2 the annual average of 40 µg/m³. These thresholds were identified, "based on the scientific knowledge and the best available technologies, in order to avoid, prevent or reduce harmful effects on human health or the environment in its complex". Exceeding those limits therefore denotes the occurrence of an actual risk for human health.

Figure 7. Monitoring stations that have detected exceedances of the legal limits in the concentrations of particulate matter (PM_{10}) and Nitrogen dioxide (NO_2) in the provincial capitals, by region and geographic area. Year 2018. Per 100 stations with valid measurements



Source: Istat, Urban environmental data

Greenhouse gas emissions and the consumption of material resources remain stable

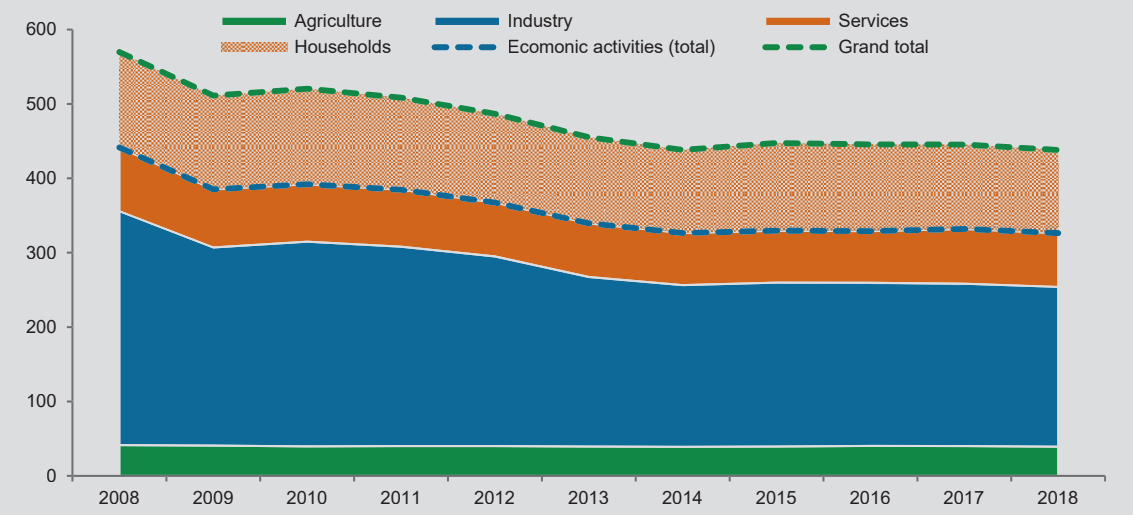
In 2018 it is estimated that the emissions per capita of CO_2 and other greenhouse gases were slightly lower than in recent years: 7.3 tonnes, after having remained stable at 7.4 from 2015 to 2017.[13] It is a small change, which does not interrupt a stabilization phase that had started in 2015, after the significant progress made from 2006 (in 2003-2005 emissions were over 10 tonnes per capita). Besides, the composition of sources keeps changing: compared to 2008, the share of emissions generated by households – mainly due to fuel consumption for private transport and heating – raises from 22.5% to 25.5%. As a result, the share of economic activities, in particular industry, is decreasing, but still accounts for almost half of the total emissions (49%, compared to 55.2% of 2008) (Figure 8).

A phase of stability continues also for the DMC, the more general measure of the pressure exerted on the environment by the economic system through the consumption of material resources, for which only small variations are observed since 2013. According to the new estimates, the DMC in 2017 was equal to 481.6 million tonnes, 0.6% less than the previous year.[14] A comparison between the trends of the two main pressure indicators (DMC and GHG emissions) and the GDP curve shows how our economic system (even though in a phase of weak growth) has been able to make some progress towards sustainability, by reducing both the direct extraction of resources and the direct emission of greenhouse gases per unit of economic output (Figure 9).

13 This indicator takes into account the emissions of Carbon dioxide (CO_2, excluding those from biomass), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluorides (SF_6), Methane (CH_4), Nitrous oxide (N_2O) and Nitrogen trifluoride (NF_3), measured in tonnes of CO_2 equivalent (calculated on the basis of the heating potential of the different gases compared to CO_2).

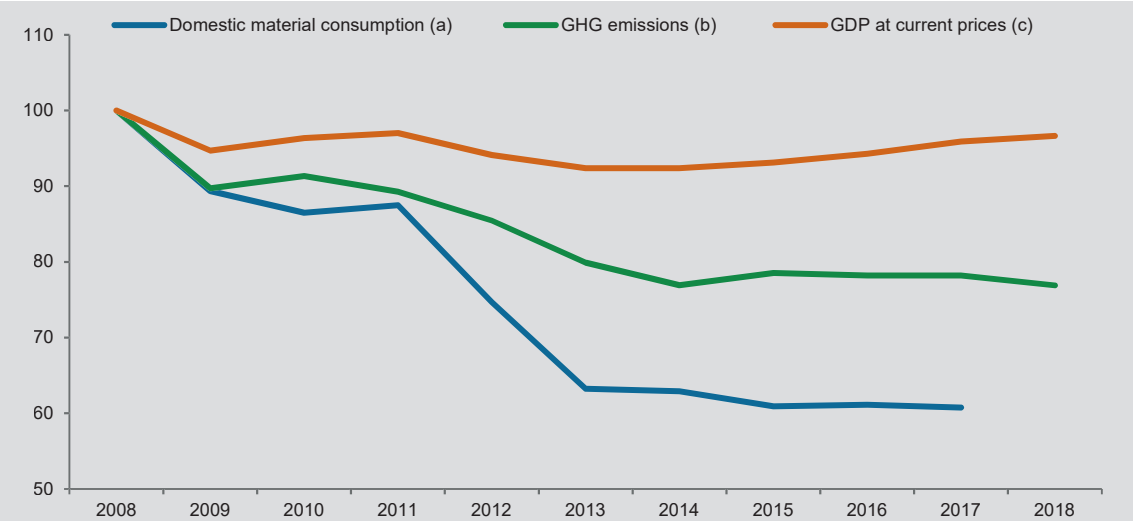
14 Comparison based on the data resulting from a general review of National accounting estimates, conducted in 2019.

Figure 8. Emissions of CO_2 and other greenhouse gases from economic activities by sector, and from households. Years 2008-2018 (a). Tonnes of CO_2 equivalent



Source: Istat, Ispra, Emissions Inventory and Accounts
(a) 2018 data are provisional.

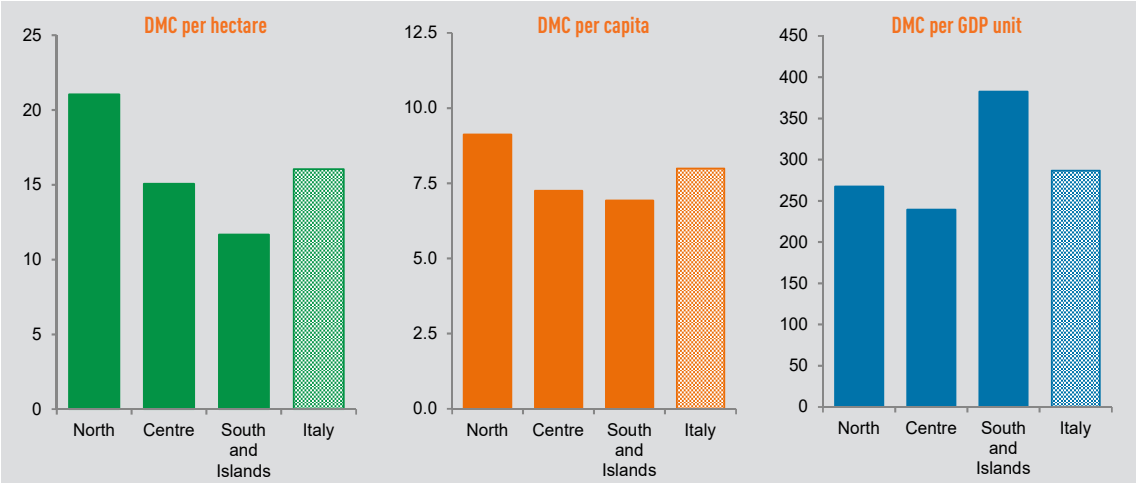
Figure 9. Domestic material consumption, GHG emissions and GDP. Years 2008-2018 (a). Indexes, year 2008 = 100



Source: Istat, Ispra, Emissions Inventory and Accounts; Istat, National economic accounts
(a) (a) 2018 data is provisional.
(b) 2018 data is not available.
(c) Chain index, reference year 2015.

However, also from the point of view of environmental sustainability, spatial data highlight important differences between Centre, North, and South and Islands. According to the DMC regional estimates, in 2016 more than 50% of the national consumption was concentrated in the North, where in fact the pressure of the system over the territory is higher (21 tonnes per hectare, compared to 16 of the Italian average). Territorial differences reduce in terms of consumption per capita (9.1 tonnes in the North, compared to 8.3 of the Italian average), but become significantly larger in terms of consumption per unit of GDP. In South and Islands, the consumption is 382.5 tonnes per million euros (over 40% more than the North, and almost 60% more than the Centre): a divide that indicates a substantial diversity of economic structure between the Southern regions and the rest of the country (Figure 10).

Figure 10. Domestic material consumption (DMC) per hectare, per capita and per GDP unit, by geographical area. Year 2016. Tonnes per hectare, per capita and per million Euros



Source: Istat, Domestic material consumption accounts

Contaminated sites over 1% of national territory, bathing allowed along 2/3 of the coastline

In 2018, the total area of contaminated sites, subject to decontamination procedures[15] was almost 370,000 hectares, equal to 12.2 per thousand of the national territory, with a maximum of 142.1 per thousand in Campania.[16]
In 2018, bathing is allowed along 66.5% of the national coastline. This percentage is slightly dropping down for the second year in a row (it was 67.2% in 2016).[17] In the last two years, there were no improvements in any Region, while the most remarkable reductions were recorded in Marche (from 75.4 to 73.2%) and Sicilia (from 57.1 to 55.4%). Basilicata and Calabria boast the highest percentages of bathing coastline (90.6 and 85.2%, respectively), while the lowest one is in Friuli-Venezia Giulia, where bathing is allowed only along 42.2% of the coastline.

Soil consumption keeps forwarding

The open surfaces that are being paved or built-up for urban development and the realization of infrastructures seal the underlying soil, so to prevent it from producing vegetal biomass[18], and performing other important ecosystem functions (regulation of climate, water and the cycles of essential life elements such as phosphorus and nitrogen). Soil

15 "Contaminated sites" are defined as areas where it was ascertained that, due to past or ongoing human activities, the qualitative features of environmental matrices (soil, subsoil, groundwater) have been altered in such a way as to pose a risk to human health. The reference norm is the Legislative Decree no.152 of 3/4/2006.

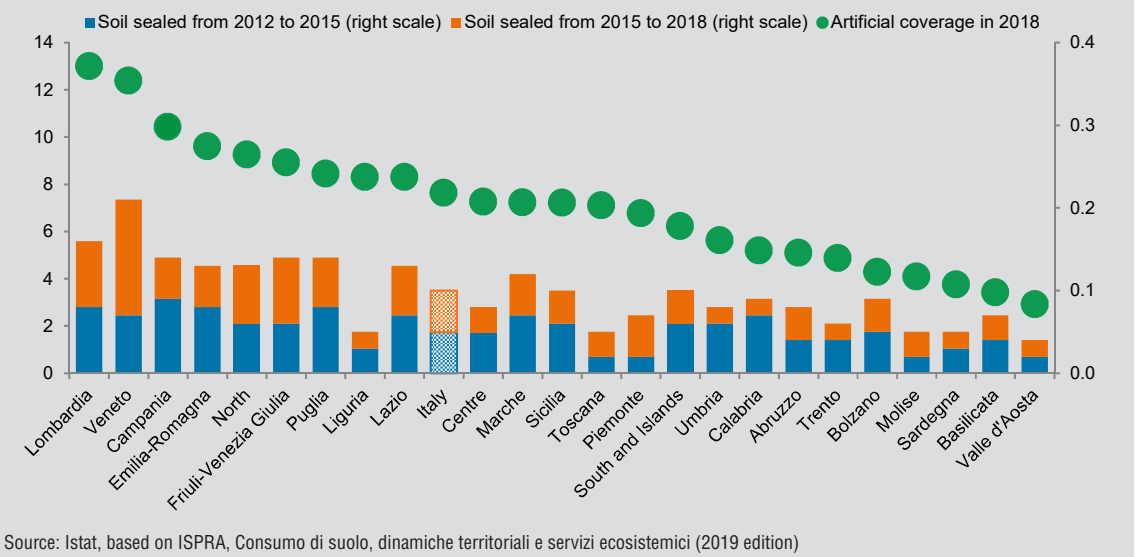
16 This indicator considers both the Contaminated sites of national interest (SIN), referred to in Legislative Decree no.152 of 3/4/2006 (which are in charge to the Ministry of environment), and those in charge to the Regions, according to the Ministerial Decree (Environment) of 11/1/2013. SINs and regional sites include industrial areas (abandoned, under conversion, or in activity); former asbestos extraction sites and processing plants; harbors; areas affected by accidents involving the release of chemical pollutants; former mines, quarries and landfills found illegal or no longer complying with the regulations in force.

17 The criteria for issuing a bathing prohibition are defined by the Ministerial Decree (Health) of 30/3/2010, implementing the Legislative Decree no. 116 of 30/5/2008, which enacted the Directive 2006/7/CE.

18 Vegetal biomass includes agri-food products, timber and, in general, all plant organisms and the material they produce during their life cycle.

sealing is also connected to the loss of biodiversity, hydrogeological instability, and the degradation of urban and rural landscapes. Therefore, a measure of the pressure exerted on the environment by the expansion of soil sealing due to artificial land cover can be seen as an indicator of the soil consumption – a phenomenon virtually irreversible in the short run, which can be assimilated to other forms of consumption of non-renewable resources. In Italy, soil consumption has slowed down in recent years, mostly because of the slowdown of building production, which is its main driving force. Nevertheless, the goal proposed by the European Commission since 2006 – to bring the soil consumption to zero by 2050 – still seems very ambitious.[19] According to Ispra's estimates, 48.2 sq.kms of land were sealed during 2018, so bringing artificial land cover to 7.6% of the national territory (9.3% in the North, 7.3% in the Centre, 6.2% in South and Islands).[20] Artificial cover exceeds 10% in Lombardia, Veneto and Campania, while it is less than 5% in Valle d'Aosta, Molise, Basilicata, Sardegna, and in the provinces of Trento and Bolzano (Figure 11). In recent years, the most significant increases were recorded in Veneto (+0.21 percentage points since 2012, with an acceleration in the period 2015-2018) and in Lombardia (+0.16 points, with constant intensity in 2012-2015 and 2015-2018). The halt in population growth and the crisis of the construction sector are likely to have contributed to curbing the expansion of sealed surfaces, which in 2018 increased at a speed of 13.2 hectares a day (compared to 15.4 of 2012-2015). Besides, such dynamics are not uniform over the territory. The Centre, where soil consumption is more limited and continues to slow down since 2012, is in the

Figure 11. Soil sealing from artificial land cover by region and geographical area. Year 2018. Percentage values: total coverage (2018) and progress made in the periods 2012-2015 and 2015-2018 (right scale)



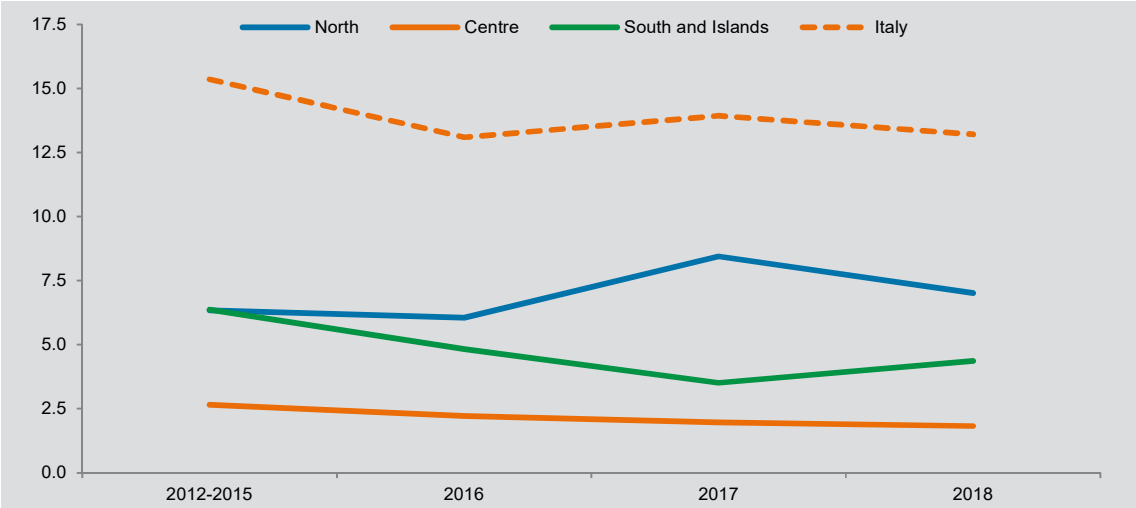
Source: Istat, based on ISPRA, Consumo di suolo, dinamiche territoriali e servizi ecosistemici (2019 edition)

19 This objective is part of the Thematic Strategy for Soil Protection (2006). It was reaffirmed by the 7th Environment Action Programme, adopted in 2013 by the Decision no.1386/2013/EU of the European Parliament and of the Council (General Union Environment Action Programme to 2020 "Living well, within the limits of our planet"). In Italy, the National Strategy for Sustainable Development (2017), anticipates to 2030 the commitment to stop the soil consumption and combat desertification (Strategic objective II.2).

20 This indicator is calculated by Ispra, based on the cartography produced by the monitoring network of the National Environmental Protection System (Snpa), using the satellite imagery made available by the European Programme "Copernicus". With the 2019 edition of the Ispra Report on soil consumption, new estimates were released, together with a revision of the time series starting from 2012.

best situation, and a similar trend is observed in South and Islands (with an acceleration, however, in the last year). In the North, although the situation has been improving in 2018, soil consumption remains much higher, and there is no clear downward trend (Figure 12).

Figure 12. Soil sealing from artificial land cover by geographical area. Years 2012-2018. Average daily increase in hectares



Source: Istat, based on ISPRA, Consumo di suolo, dinamiche territoriali e servizi ecosistemici (2019 edition)

More than one Italian in ten lives in areas at risk of landslides or floods

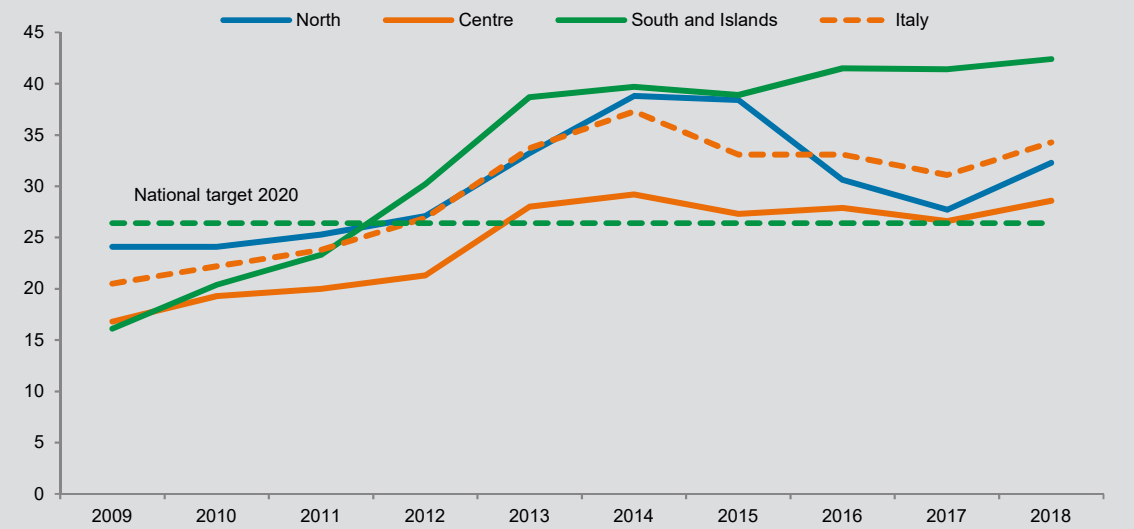
The increasing frequency of extreme climate events, in particular intense and localized precipitation, threatens to worsen the state of hydrogeological vulnerability affecting a large part of the Italian territory. In 2017, according to Ispra estimates, 2.2% of the Italian population live in areas classified at high or very high risk of landslide, and 10.4% in areas at medium risk of flood (i.e. periodically subject to flooding, with return times between 100 and 200 years).[21] Compared to the estimates based on the 2015 mapping, the indicators show a worsening on both fronts. The population exposed to the risk of landslides, whose proportion is higher in South and Islands (3.2%), has increased especially in Umbria, Calabria and the province of Bolzano (by 1.1 to 1.4 percentage points). On the other hand, the proportion of the population exposed to flood risk is higher in the North (15.6%), and has increased most in Lombardia, Liguria, Lazio and Sardegna (by 1.2 to 1.5 points).

21 In 2018, Ispra updated the National mappings of the hydrogeological risks. The areas at risk of landslides are identified by the Basin Authorities in the Hydrogeological Management Plans (PIA), and classified by 5 categories: P4 (very high risk), P3 (high risk), P2 (medium risk), P1 (moderate risk), and AA (attention areas). The same Authorities identify also the areas at risk of flood in the Flood Risk Management Plans (PGRA), which define 3 scenarios: P3 (high probability of occurrence), P2 (medium probability) and P1 (low probability). The indicator of landslide risk considers the population living in P3 and P4 areas, based on the results of the 2011 Census. The indicator of flood risk considers, on the same basis, the population living in the areas concerned by the P2 scenario. Unlike landslide risk classes, flood risk scenarios are overlapping: P1 areas are the wider ones (potentially concerned by the worst scenario, which is less likely to occur) and include P2 and P3 areas, smaller but potentially concerned by more likely events.

Renewable sources are growing, and account for more than a third of electricity consumption

As regards response indicators[22], the share of electricity consumption covered by renewable sources rose again, in 2018, to 34.3% – more than 3 points over the previous year. After reaching a peak of 37.3% in 2014, the renewables' share had fallen to 31.1% in 2017 (a figure, however, already well above the target of 26.4% set for 2020)[23]. The share of renewable sources is larger in South and Islands (42.4%, compared to 32.3% of the North and 28.6% of the Centre). South and Islands is also the area where most progress has been made in this field over the last decade: 26.3 points more compared to 2009, against 11.2 points more of the Centre and 8.2 of the North (Figure 13).

Figure 13. Share of renewable sources in electricity consumption by geographical area. Years 2009-2018. Percentage values



Source: Istat, based on Terna data

Insufficient progress in waste cycle management

An important contribution to reducing pressures on the environment also comes from an ecologically efficient management of the cycle of waste, integrated into a circular economy model. In 2018, the share of separate collection of municipal waste reached 58.1%, advancing by almost 3 percentage points compared to the previous year, but it is still far from the target of 65%, which should have been achieved by 2012 throughout the country.[24] Therefore, Italy is seriously behind schedule in the implementation of this programme, as the threshold of 65% has been reached so far only in seven regions (Lombardia, Veneto,

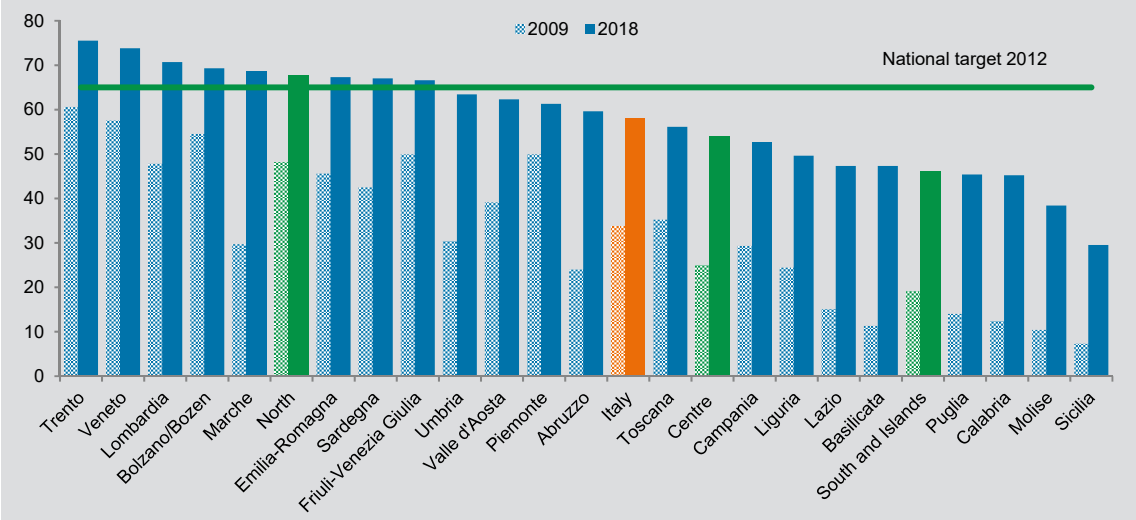
22 With reference to the DPSIR model (Driving forces-Pressure-State-Impact-Response), adopted for the classification of environmental indicators, response indicators are those referring to the policies (of contrast, mitigation or adaptation) implemented by individuals or institutions to reduce the pressures generated on the environment by the human system, and the negative effects (impacts) resulting from them.

23 This target was set by the National Renewable Energy Action Plan (PAN), which complies with the Directive 2009/28/CE.

24 Art. 205 of Legislative Decree 152/2006 establishes that in each Optimal Territorial Area (ATO) separate collection of urban waste must be ensured, in order to achieve the following objectives: 35% by 2006, 45% by 2008 and 65% by 2012. ATOs are identified by the Regions as catchment areas for integrated public utilities, such as water supply or waste collection.

Friuli-Venezia Giulia, Emilia-Romagna, Marche, Sardegna, and the provinces of Trento and Bolzano), while the average value in South and Islands still does not reach 50% (Figure 14). As a result, the share of urban waste disposed through landfill – the least efficient and potentially most dangerous form of waste management – remains very high, and in 2018 was still 21.5% of the total (10.7% in the North, 24.3% in the Centre and 36.2% in South and Islands).

Figure 14. Share of separate collection in municipal waste collection by region and geographical area. Years 2009 and 2018. Percentage values



Source: Istat, based on ISPRA data

In the South and Islands more natural protected areas, but less green areas in the cities

The Italian system of protected areas covers 21.6% of the national territory, a value unchanged since 2012. The widest coverage is found in South and Islands (more than a third of the territory in Abruzzo and Campania, more than a quarter in the whole area).[25]
In 2018, the availability of public green areas in Italian cities is 32.8 sq.m per capita, slightly increasing compared to the previous year. While this ratio shows only minimal fluctuations since 2011, the surface of green areas is growing slowly but steadily (by 0.6% per year, but only by 0.3% in South and Islands).[26] Public green areas, however, are not equally distributed among the 109 provincial capitals: about 50% of the total surface is concentrated in the first 10% (11 cities)[27], while one city out of ten (the last 10% of the distribution) does not reach the minimum standard of 9 sq.m per capita, required by law.[28] To point out territorial

25 This indicator considers, net of overlaps, the ground surfaces of the sites included in the Official List of Protected Natural Areas (EUAP) issued by the Ministry of Environment, and those of the sites belonging to the Natura 2000 Network. The latter include the Sites of Community Importance (SIC), identified by the Regions and subsequently designated as Special Conservation Zones (ZSC) according to Directive 92/43/CEE "Habitat", and Special Protection Zones (ZPS) according to Directive 2009/147/CE "Birds.

26 This indicator considers all the green areas held by public bodies in the provincial capitals' municipalities.

27 Torino, Milano, Trento, Trieste, Parma, Terni, Rieti, Roma, Matera, Reggio di Calabria and Napoli.

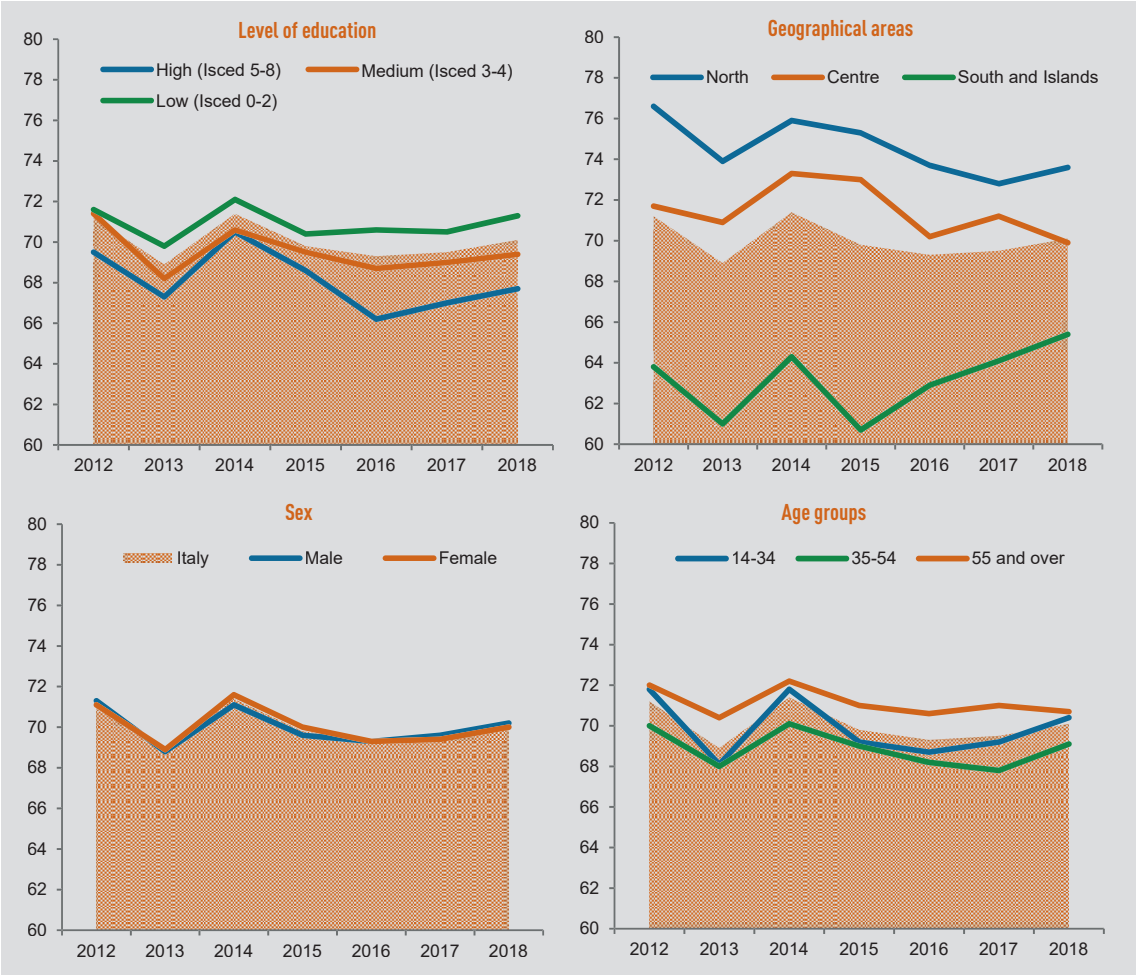
28 Ministerial Decree (Public Works) No. 1444 of 2/4/1968, which sets a minimum standard of 9 sq.m per capita of "public spaces equipped as parks and for play and sport, actually usable (...) with the exclusion of green areas along the roads". The cities that do not meet this standard are: Imperia, Genova, Chieti, Andria, Barletta, Trani, Bari, Crotone, Trapani, Caltanissetta and Siracusa.

differences, therefore, it is better to refer to median values, which are 25.8 sq.m per capita in the Northern cities, 25.3 in those of the Centre and 14.6 in those of the South and Islands (the national median value is 22.7).

Seven Italians in ten are satisfied with the state of the environment in the place of living

The satisfaction with the environmental situation remains substantially stable: in 2018, the Italians who state to be very or fairly satisfied with the state of the environment in the place where they live are 70.1% (the proportion was 69.4% in 2009). Variability depends mainly on the territory of residence: while in the North about three citizens out of four are satisfied, in the South the proportion drops to two out of three, but the gap tends to narrow in the last years. The differences related to age and educational attainment are smaller, but still significant: satisfaction is more widespread among the elderly (55 years and over) and those with lower educational attainment, while no difference emerges in relation to the sex of the interviewees (Figure 15).

Figure 15. Satisfaction for the state of environment in the place of living by sex, education level, age group and geographical area. Years 2012-2018. Per 100 people aged 14 and over

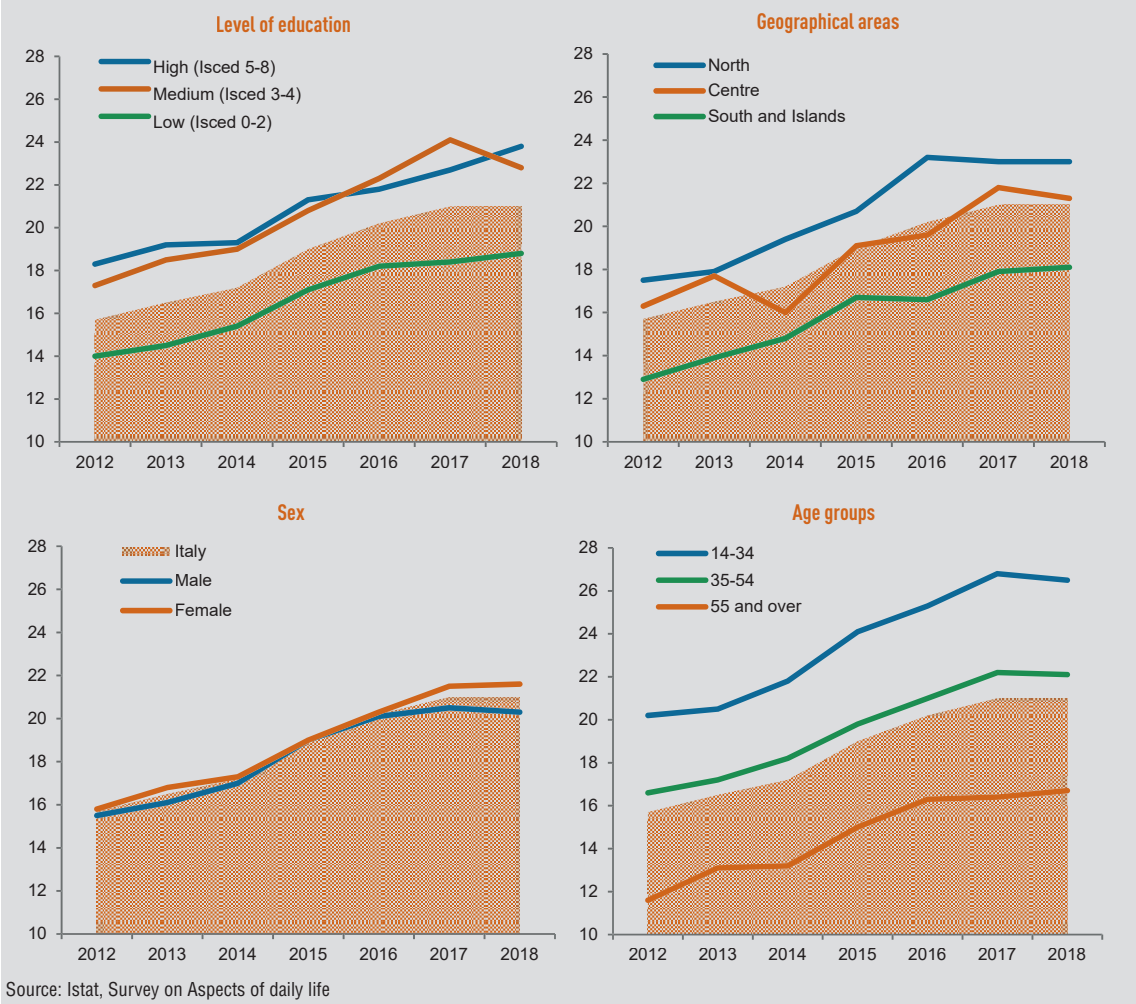


Source: Istat, Survey on Aspects of daily life

The concern for biodiversity loss is stable, and more prevalent among young people

In 2018, 21% of Italians expresses a concern about the loss of biodiversity – the same proportion of the previous year. After a systematic growth since 2012, observed all over the country and in all the sub-populations considered (genders, age groups, levels of education), this indicator marks a first setback: particularly among the men, the younger, the people with medium level of education, and those living in the North (Figure 16). The concern about biodiversity appears to be significantly linked to the educational attainment (the percentages are higher among people with a medium-high level of education), to the territory of residence (values are decreasing from North to South) and, most of all, to the age of respondents (26.5% among people aged 14-34, against 16.7% of people aged 55 and over). In brief, a more conscious attitude towards the protection of nature seems to be understandably more common among the younger and more educated people, even though these groups also show signs of a decreasing attention over the last year.

Figure 16. Concern for biodiversity loss by sex, education level, age groups and geographical area. Years 2012-2018. Per 100 people aged 14 and over



Source: Istat, Survey on Aspects of daily life

Indicators

1. **Emissions of CO_2 and other greenhouse gasses:** Tons of CO_2 equivalent per capita. Including emissions of carbon dioxide (CO_2, excluding emissions from biomass), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluorides (SF_6), the heating potential in relation to carbon dioxide: 1 for CO_2, 25 for CH_4, 298 for N_2O, 17200 for NF_3, 22800 for SF_6 and weights that vary according to specifications.
   Source: Istat, Ispra - Inventory and emissions accounts.
2. **Domestic material consumption:** Quantity of materials transformed in emissions, waste, or new stocks of the anthropic system.
   Source: Istat - Domestic material consumption accounts.
3. **Water losses in urban supply system:** Percentage of the total volume of water losses in municipal drinking water supply networks (difference between volumes fed into the network and supplied authorised volumes).
   Source: Istat - Urban Water Census.
4. **Landfill of waste:** Percentage of municipal waste sent to landfill (including municipal waste streams into and out of other regions) on total municipal waste collected.
   Source: Ispra - Waste statistics.
5. **Quality of urban air - PM_{10}:** Percentage of control units of provincial capitals with valid measurements that have exceeded the daily limit value for PM_{10} (50 micro g/m^3) for over 35 days in the year.
   Source: Istat - Survey on urban environmental data.
6. **Quality of urban air - nitrogen dioxide:** Percentage of control units of provincial capitals with valid measurements that exceeded the annual limit value for NO_2 (40 micro g/m^3).
   Source: Istat - Survey on urban environmental data.
7. **Coastal bathing waters:** Percentage of authorized coastal bathing waters on the total of the coastal line in accordance with the regulations in force. The indicator is calculated by subtracting from the bathing waters the stretches of coast forbidden for bathing during the entire bathing season due to levels of contaminants beyond the thresholds of health risk.
   Source: Istat - Processing on data from the Ministry of Health.
8. **Urban green:** Square meters of urban parks and gardens per inhabitants.
   Source: Istat - Survey on urban environmental data.
9. **Satisfaction for the environment:** Percentage of people aged 14 and over very or quite satisfied of the environmental situation (air, water, noise) of the area where they live.
   Source: Istat - Survey on Aspects of daily life.
10. **Contaminated sites:** Size of contaminated sites.
    Source: Ministry of Environment, Land and Sea.
11. **Population at risk of landslides:** Percentage of population living in areas subject to landslide on total population. The population considered is that of the 2011 Census. The Indicator is calculated on the basis of the ISPRA National Mosaicature of the Hydrogeological Plans (PAI). The areas considered also include the areas of possible evolution of current phenomena and those susceptible to new landslides.
    Source: Ispra - Hydrogeological instability in Italy: hazard and risk indicators.
12. **Population at risk of flood:** Population at flood risk resident in medium flood hazard zones (Return period 100-200 years; D. Lgs. 49/2010). The population considered is that of the 2011 Census. The Indicator is calculated on the basis of the ISPRA National Mosaicature of the Hydrogeological Plans (PAI), with reference to risk scenario P2.
    Source: Ispra - Hydrogeological instability in Italy: hazard and risk indicators.
13. **Sewage treatment:** Percentage of polluting loads collected in secondary or advanced plants, in equivalent inhabitants, compared to the total urban loads (Aetu) generated.
    Source: Istat - Water census.
14. **Protected natural areas:** Percentage share of terrestrial protected natural areas included in Italian Official List of Protected Areas (Euap) and Natura 2000 Network.
    Source: Istat - Processing of data from the Ministry of Environment, Land and Sea.
15. **Concern for biodiversity loss:** Percentage of people aged 14 and over who believe that biodiversity loss is among the five most important environmental problems.
    Source: Istat - Survey on Aspects of daily life.
16. **Electricity from renewable sources:** Percentage of energy consumptions provided by renewable sources on total internal consumptions.
    Source: Terna.
17. **Separate collection of municipal waste:** Percentage of municipal waste object of separate collection on total municipal waste.
    Source: Ispra - Waste statistics.
18. **Soil sealing from artificial land cover:** Percentage of soil sealed following a change from non-artificial to artificial coverage.
    Source: Ispra - Soil consumption, territorial dynamics and ecosystem services.

Indicators by region and geographic area

REGIONS AND GEOGRAPHIC AREAS	Emissions of CO_2 and other greenhouse gases (a) 2018	Domestic material consumption (b) 2016	Water losses in urban supply system (c) 2015	Landfill of waste (d) 2018	Quality of urban air - PM_{10} (e) 2018	Quality of urban air - Nitrogen dioxide (f) 2018	Coastal bathing waters (g) 2018	Urban green (h) 2018
Piemonte	....	35.3	35.2	14.9	35.7	18.8	-	25.7
Valle d'Aosta/Vallée d'Aoste	....	1.3	18.7	42.1	-	-	-	18.9
Liguria	....	3.3	32.8	31.0	-	31.6	58.4	7.2
Lombardia	....	88.2	28.7	4.3	61.5	19.2	-	28.2
Trentino-Alto Adige/Südtirol	....	17.1	29.8	8.6	-	20.0	-	222.9
Bolzano/Bozen	....	....	*25.9*	*1.3*	-	-	-	*21.5*
Trento	....	....	*32.4*	*15.5*	-	*50.0*	-	*406.2*
Veneto	....	39.3	40.0	13.5	86.4	4.8	64.2	30.1
Friuli-Venezia Giulia	....	13.7	47.8	6.7	-	-	42.2	67.3
Emilia-Romagna	....	54.5	30.7	10.7	33.3	3.7	61.7	43.1
Toscana	....	30.5	43.4	32.5	-	4.5	72.0	23.2
Umbria	....	8.9	46.8	39.7	37.5	-	-	98.6
Marche	....	8.2	34.1	38.4	-	-	73.2	31.4
Lazio	....	39.9	52.9	12.0	5.0	30.0	69.9	21.3
Abruzzo	....	9.3	47.9	37.7	-	-	77.5	27.2
Molise	....	3.0	47.4	101.8	-	-	71.9	12.4
Campania	....	25.7	46.7	2.8	12.5	30.8	69.3	13.4
Puglia	....	35.7	45.9	37.2	-	-	74.7	9.4
Basilicata	....	4.5	56.3	19.4	-	-	90.7	555.5
Calabria	....	10.7	41.1	52.4	-	-	85.2	60.7
Sicilia	....	33.3	50.0	69.1	-	19.0	55.4	15.9
Sardegna	....	22.1	55.6	25.4	9.1	-	64.7	40.5
North	....	252.9	33.2	10.7	43.4	13.4	57.5	36.7
Centre	....	87.4	48.2	24.3	7.8	13.0	71.5	26.7
South and Islands	....	144.2	47.9	36.2	3.3	9.0	67.0	32.9
Italy	**7.3**	**484.5**	**41.4**	**21.5**	**22.0**	**11.9**	**66.5**	**32.8**

(a) Tonnes of CO_2 equivalent per capita. Provisional data.
(b) Million tonnes. Istat estimate for Italy 2017 = 481.6.
(c) Percentage of volumes fed into the network.
(d) Percentage of total municipal waste collected.
(e) Percentage of monitoring stations located in the provincial capital municipalities with valid measurements that have detected exceedances of the daily limit set for PM_{10} (50 µg/m³) for more than 35 days.
(f) Percentage of monitoring stations located in the provincial capital municipalities with valid measurements that have detected exceedances of the yearly limit set for NO_2 (40 µg/m³).
(g) Percentage of authorized bathing waters on the total of the coastline.
(h) Sq.m per capita.
(i) Per 100 people aged 14 and over.
(l) Land area affected, values per 1,000.

Satisfaction for the environment (i)	Contaminated sites (l)	Population at risk of landslides (m)	Population at risk of flood (m)	Sewage treatment (n)	Protected natural areas (o)	Concern for biodiversity loss (i)	Electricity from renewable sources (p)	Separate collection of municipal waste (d)	Soil sealing from artificial land cover (o)
2018	2018	2017	2017	2015	2017	2018	2018	2018	2018
71.9	35.5	1.6	4.8	69.7	16.7	23.4	41.8	61.3	6.78
88.4	0.1	12.1	10.2	66.0	30.3	25.5	297.2	62.3	2.92
76.1	41.8	5.8	17.5	61.2	27.2	23.9	8.5	49.6	8.32
69.6	0.7	0.5	4.4	62.9	16.1	23.6	24.0	70.7	13.01
90.7	..	2.2	1.4	78.9	26.4	26.6	146.9	72.5	4.56
88.7	..	*1.6*	*2.0*	*99.7*	*24.5*	*30.5*	*180.7*	*69.3*	*4.29*
92.7	..	*2.9*	*0.8*	*63.6*	*28.7*	*22.9*	*113.2*	*75.5*	*4.88*
73.9	0.9	0.1	9.5	49.4	23.0	21.0	25.0	73.8	12.40
85.5	0.9	0.4	7.3	50.7	19.3	24.6	29.4	66.6	8.93
75.4	..	2.2	63.7	67.7	12.2	21.7	19.7	67.3	9.62
77.3	0.3	3.8	26.0	49.5	15.2	22.8	39.4	56.1	7.11
75.4	0.8	1.9	6.3	68.7	17.5	20.6	45.1	63.4	5.64
79.7	2.9	2.1	4.3	48.5	18.8	22.9	26.7	68.6	7.24
61.8	4.2	1.6	3.5	67.0	27.9	20.0	15.6	47.3	8.31
76.0	1.3	5.8	6.1	63.9	36.6	21.5	51.0	59.6	5.11
79.3	..	6.5	1.4	58.0	26.4	22.2	89.2	38.4	4.10
57.4	142.1	5.3	4.6	60.5	35.3	16.3	27.9	52.7	10.43
65.1	5.4	1.3	2.7	68.3	24.5	17.1	48.5	45.4	8.45
75.9	3.6	5.8	0.7	67.2	22.8	15.6	96.3	47.3	3.43
72.2	0.6	4.5	4.0	46.0	26.6	14.4	79.2	45.2	5.20
63.0	2.9	1.1	0.1	43.9	20.2	19.6	27.2	29.5	7.22
78.6	9.0	1.4	7.1	58.8	19.9	24.4	34.2	67.0	3.76
73.6	9.7	1.3	15.6	62.4	18.8	23.0	32.3	67.7	9.26
69.9	2.0	2.4	10.9	58.5	19.9	21.3	28.6	54.1	7.27
65.4	19.4	3.2	3.2	56.7	25.2	18.1	42.4	46.1	6.24
70.1	**12.2**	**2.2**	**10.4**	**59.6**	**21.6**	**21.0**	**34.3**	**58.1**	**7.64**

(m) Percentage of population living in areas classified at risk on total population.
(n) Percentage of the polluting loads generated.
(o) Percentage of land area.
(p) Percentage of total internal consumption.