10. Environment[1]

Environmental issues have become increasingly central to the analysis of the determinants of well-being of people and communities, both in terms of perception of the quality of the environment in which people live, and in terms of availability of natural resources and accessibility of different territorial contexts. Although significant progress has been made in the last decade, efforts have not been decisive and the environmental picture still presents critical aspects, with different situations in different areas of the country, which are not always related to the traditional gap between North and South and Islands. Europe has launched the Next Generation EU programme, one of the aims of which is to urge member states to carry out reforms to accelerate the ecological transition, providing them with the resources for the necessary investments.
Bes indicators show that the decrease in emissions of CO_2 and other greenhouse gases that began more than a decade ago is continuing, accompanied in recent years by a reduction in domestic material consumption. $PM_{2.5}$ air pollution is decreasing but remains high and without appreciable improvement in the areas where historically the phenomenon is more severe.
As a result of climate change, extreme weather and climate events such as heat waves, no precipitation and extreme rainfall are increasing. Phenomena that, among other things, increase the risk of populations exposed to landslides and floods. Major problems remain with regard to the distribution of drinking water, sewage collection and urban wastewater treatment.
The area of protected natural land, which covers more than a fifth of the national territory, and the availability of urban green areas *per capita* in Italian cities, have not improved substantially in recent years. Although at a slower pace than in past years, the increase in soil sealing from artificial land cover continues.
Production per capita of urban waste is falling as a result of the economic cycle and the reduction in the share still disposed of in landfills continues. The increase in the percentage of electricity from renewable sources in recent years has been confirmed.

$PM_{2.5}$ air pollution: a critical situation persists in the North, improvements in the Islands[2]

The World Health Organisation (WHO) classifies air pollution as the main environmental health risk globally[3].
Air pollution depends in a complex way on multiple factors at a micro[4], local and regional scale. This makes the selection of meaningful air quality indicators difficult. Generally, one focuses on those for which a link between exposure and short and long term health effects

1 This chapter was edited by Stefano Tersigni and Domenico Adamo, with contributions from: Raffaella Chiocchini, Luigi Costanzo, Elisabetta Del Bufalo, Aldo Femia, Flora Fullone, Silvana Garozzo, Antonino Laganà, Maria Rosaria Prisco, Simona Ramberti and Silvia Zannoni.
2 The analysis of the air quality dimension was carried out in collaboration with Ispra - Silvia Brini and Giorgio Cattani.
3 For further information: https://www.who.int/data/gho/data/themes/air-pollution/ambient-air-pollution.
4 The micro scale refers to a homogeneous portion of territory in terms of detection zone and main source of pollution, in some cases sub-municipal, monitored by a single station. Local and regional scales, on the other hand, mean portions of territory monitored by several stations with different main sources of pollution.

is recognised. Among these, particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2) and ground-level ozone (O_3) are the preferred components for monitoring.
The WHO considers $PM_{2.5}$ to be the most harmful air pollutant to health. Air concentrations of these substances reflect, at least in part, levels and temporal variability of concentrations of other pollutants.
The $PM_{2.5}$ indicator, which is suitable for the assessment of air pollution in urban as well as suburban and rural areas, is defined with reference to the percentage of valid measurements exceeding the threshold defined by the WHO (10 µg/m³)[5] out of the total number of valid measurements of annual average $PM_{2.5}$ concentrations for all station types, stratified by main source of pollution (traffic, background and industrial)[6] and location area (urban, suburban and rural).
It is worth noting that reference is made here to the WHO guideline value of 10 µg/m³ and not the one, introduced in 2021[7], of 5 µg/m³. The value of 10 µg/m³ in the new guidelines is still valid as an *interim* target, i.e. as an intermediate target to be achieved, in the knowledge that lowering the levels still further to 5 µg/m³ would lead to further benefits in terms of reducing exposure-related mortality. Given the widespread distribution of regional monitoring stations, the indicator is representative of the situation in the entire territory[8].
The percentage of valid measurements exceeding the WHO health reference value is shown in Figure 1. In Italy, in 2020, there was a decrease in the percentage of exceedances to 77.4% of the measurements taken - the lowest value of the indicator since 2010 - while in the pre-pandemic year it was 81.9%.
However, this trend towards the mitigation of $PM_{2.5}$ air pollution is not seen in the north-western and north-eastern regions where historically the highest values of the indicator were observed, which were stable in 2020 compared to the previous year (Figure 1).
However, trend analysis cannot disregard the evaluation of the role that meteorological conditions play in determining the differences that can be observed between the concentrations of one year and those of the previous year. This assessment cannot be made simply on the basis of observations, but a statistical analysis of the data must be implemented by applying correction methods that take the effect of seasonality into account. These methods, in fact, have shown for Italy (uniformly throughout the country) and for Europe that in the medium term, the number of measurement points where a statistically significant reduction trend in PM_{10}, $PM_{2.5}$ and NO_2 concentrations is observed is largely prevalent.
To try to understand the role of meteorology, it is worth observing the data on an indicator used by some regions in the Po basin[9] to assess the number of days throughout a season that are favourable to the accumulation of atmospheric particulate matter[10], which largely

5 https://www.who.int/publications/i/item/9789240034228.

6 *Traffic station*: a station located in such a position that the pollution level is mainly influenced by emissions from neighbouring roads. In other words, a sampling point representative of pollution levels determined predominantly by traffic emissions from neighbouring roads with medium to high traffic flows. *Background station*: a station located in such a position that the pollution level is not predominantly influenced by a single source or a single road. *Industrial station*: a station located in such a position that the pollution level is predominantly influenced by a single industrial source or neighbouring industrial area. For further information: https://www.istat.it/it/files//2021/12/Glossario-1.pdf.

7 https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution.

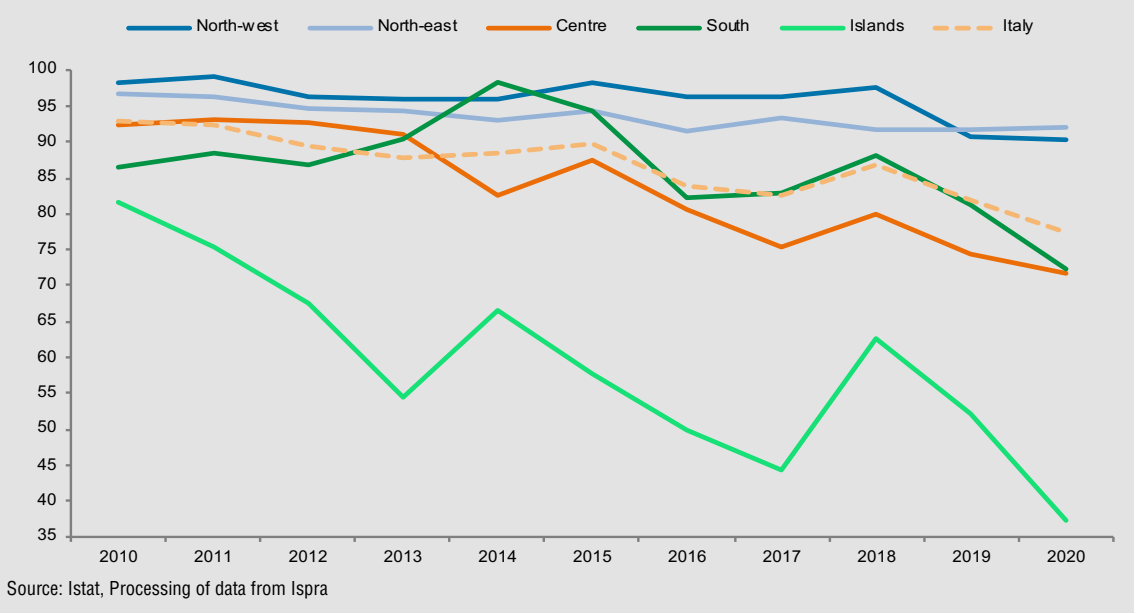
8 The representativeness of the indicator was also strengthened by estimating $PM_{2.5}$ concentrations at monitoring stations that only measured PM_{10}.

9 https://webbook.arpae.it/indicatore/Giorni-favorevoli-allaccumulo-di-PM10-00001/?id=670151aa-2fe2-11e2-95e1-11c9866a0f33.

10 Days favourable to PM_{10} accumulation: days in the cold season of the same reference year (January-March; October-

coincide with the days on which the 50 µg/m³ threshold for the daily average of PM_{10} is exceeded. In the Po basin, the percentage of favourable days exceeded 65% in some years (e.g. 2015 and 2017), while in others it remained below 50%. 2020 was the third-worst year in this respect in the 2003-2020 series. This is reflected in the comparison, by geographical area, of the levels recorded in 2020 with those of 2019 and the average of the period 2010-2019.
In the Centre, a slight improvement was observed (from 74.4% in 2019 to 71.7% in 2020). The improvement observed in the South (from 81.3% to 72.3%) and especially in the Islands (37.3%) was above average, where $PM_{2.5}$ exceedances were reduced by about 15 percentage points compared to 2019. The trend in the Islands with much lower percentage values compared to the other distributions should be highlighted (Figure 1).

Figure 1. Exceedances above the WHO health reference value (10 µg/m³) **out of the total number of valid measurements of annual average $PM_{2.5}$ concentrations by geographic area. Years 2010-2020. Per 100 valid measurements**

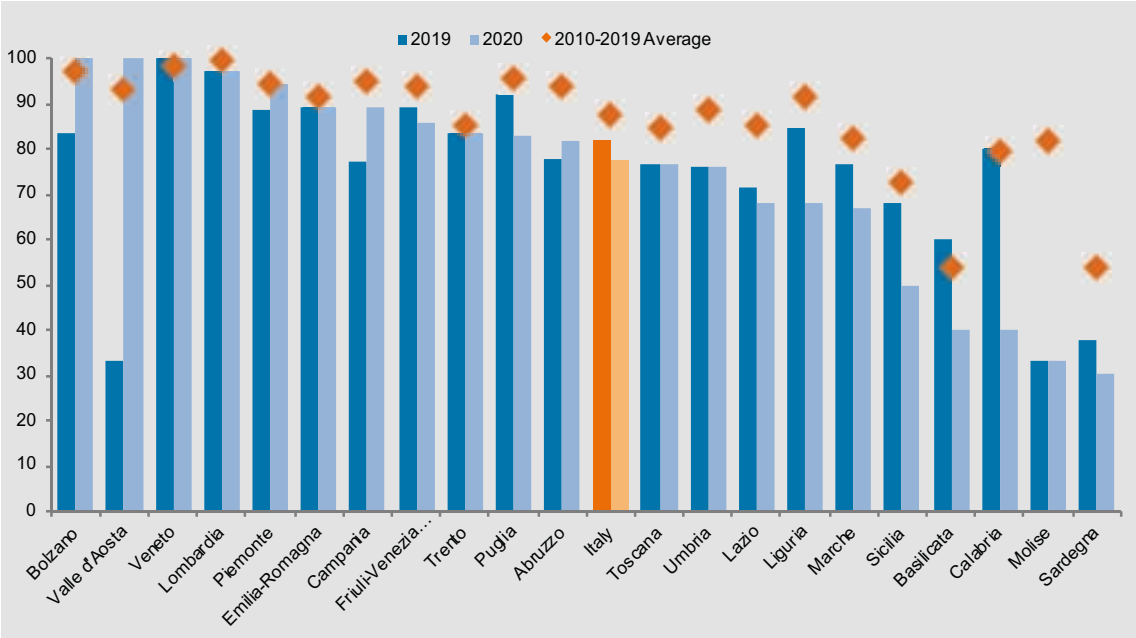


Source: Istat, Processing of data from Ispra

The regional detail of the indicator, compared to the pre-pandemic year and the average of the 2010-2019 period, highlights that in 2020 the northern regions, with the exception of Liguria, all had values above the average and had substantially stable levels compared to 2019 and the 2010-2019 average (Figure 2).

December) without rain (precipitation < 0.3 mm) on which the daily ventilation index, defined as the product of the average daily mixing height and the average daily wind intensity, is less than 800 m²/s.

Figure 2. Exceedances of the WHO health reference value (10 µg/m³) of annual average concentrations of $PM_{2.5}$ by region. Years 2019-2020 and 2010-2019 average. Per 100 valid measurements



Source: Istat, Processing of data from Ispra

Other pollutants also exceeding limits

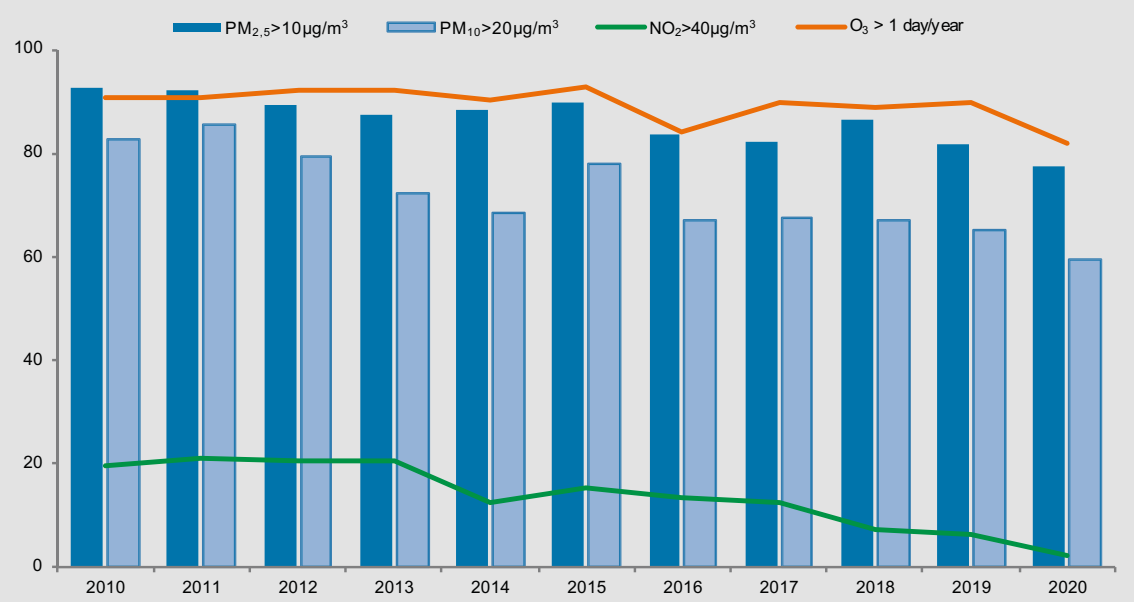
$PM_{2.5}$ is strongly correlated with PM_{10} (being a fraction of PM_{10} itself), and moderately so with NO_2. Comparing the time series (2010-2020) of the indicator with that of exceedances of PM_{10} with respect to the WHO reference value and of NO_2 with respect to the WHO and EU limit (which coincide), substantial consistency is observed between the trends. On the other hand, if we consider the indicator for ozone (relating to the failure to reach the long-term objective), a weak decreasing trend seems to emerge, probably attributable to the simultaneous reduction of its main precursors, i.e. nitrogen oxides and volatile organic compounds (Figure 3).

Due to repeated exceedances of PM_{10}, NO_2 and $PM_{2.5}$ limits, Italy is subject to infringement procedures under European[11] Directive 2008/50/EC[12]. One of the first infringement procedures opened by the European Commission against Italy was in 2014, due to the systematic and continuous exceeding of these parameters in different areas of the national territory. Moreover, according to the Commission, the measures envisaged by Italy are still not sufficient to shorten the period of exceedance and ensure compliance with the reference values.

11 Three infringement procedures are currently active: Procedure No. 2014/2174 for exceeding PM_{10} (already reached conviction); Procedure No. 2015/2043 for exceeding NO_2; Procedure No. 2020/2299 for $PM_{2.5}$.

12 Despite the fact that the $PM_{2.5}$ and PM_{10} limits set by European Directive 2008/50/EC (25 and 40 µg/m³ respectively) are higher than the WHO reference values (10 and 20 µg/m³ respectively), Italy is in the infringement procedure.

Figure 3. Exceedances of the annual average concentrations of $PM_{2.5}$, PM_{10} and NO_2 of the WHO reference values (10, 20 and 40 µg/m³ respectively) **and non-compliance with the long-term target for O_3** (>1 day/year exceeding the daily average limit of 120µg/m³)**. Years 2010-2020. Per 100 valid measurements**

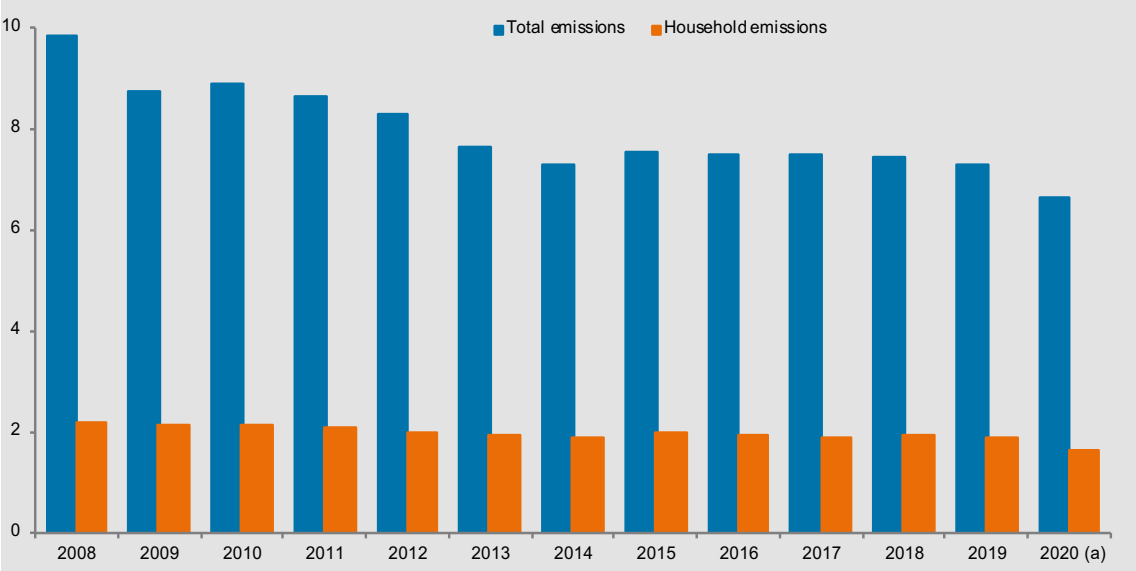


Source: Istat, Processing of data from Ispra

CO_2 and greenhouse gas emissions decreased, with about a quarter of the decrease due to households

Emissions of CO_2 and other greenhouse gases from economic activities and households fell sharply to 6.6 tonnes of CO_2 equivalent per inhabitant in 2020, due to the restrictions imposed during the lockdown period.
In 2019, emissions of CO_2 and other greenhouse gases per inhabitant were 7.1 tonnes of CO_2 equivalent. This confirms the decline that started in 2008, when the tonnes *per capita* emitted were 9.8 (Figure 4).
The contribution of emissions generated by households in 2020, mainly due to the consumption of fuels for private transport and domestic use, was 1.7 tonnes of CO_2 equivalent per inhabitant, the lowest recorded since 2008 and equivalent to a reduction in household emissions of about 15 million tonnes compared to 2019. Household emissions account for about 25% of total emissions.
The well-being and stability of local communities are highly dependent on climate change, both locally and globally, and on the effects of extreme weather events.
Climate change affects human health in multiple and complex ways, putting pressure on health systems that are often fragile and ill-equipped to cope with continuous and overlapping emergencies. Families and means of livelihood are put at risk by increases in the frequency and severity of extreme weather conditions. The distribution, exposure and effect of weather and climate events do not affect them in the same way everywhere, but the vulnerability of different contexts can amplify or mitigate the impacts.

Figure 4. Total emissions of CO_2 and other greenhouse gasses and share generated by households. Years 2008-2020 (a). Tonnes of CO_2 equivalent per capita



Source: Istat-Ispra, Accounts and air emissions inventory
(a) 2020 provisional data.

Average temperatures continue to rise[13]

The effects of climate change in terms of temperature and precipitation are increasingly evident. In 2021 the minimum and maximum temperatures were higher than the climatic average (reference period 1981-2010); at a national level, the anomalies were +0.7 °C and +0.8 °C respectively. This indication was confirmed in all Italian regions with positive differences between 0.4 and 1.1 °C in the Islands. As far as precipitation is concerned, the difference at the national level was +2%, but the situation was more heterogeneous and varied greatly with latitude, going from negative differences in the North (with peaks of more than -11% in Piemonte and Emilia-Romagna) and in part of the Centre, to widespread positive anomalies in the South and very high in the Islands (+27.6%).
With respect to 2020, although at the national level rainfall amounts were comparable, the spatial distribution of the deviations from the climatic average was substantially different, moving from +4.4% in 2020 to -4% in the North in 2021, from -1.1% to +7.5% in the South, and from -7% to +27.6% in the Islands. In the case of Insular Italy, moreover, it should be noted that the weather conditions were significantly different from those of the reference climatic period, both in terms of temperature and precipitation.
The comparison with the climatic average 1991-2020, shows smaller temperature anomalies and the same gradient, in relation to latitude, in the precipitation deviations, with more accentuated values in the negative deviations and lower values in the positive ones.
In order to examine these changes more specifically, which are among other things a source of discomfort for the population, the indicators measuring the changes, in frequency and

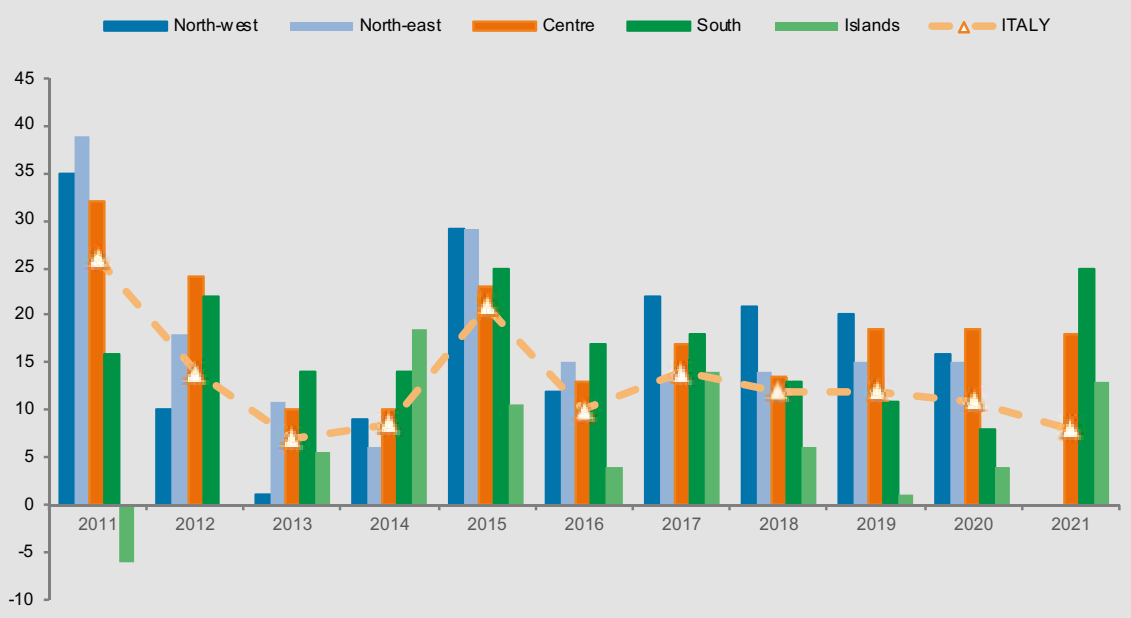
13 Analysis on climatic weather events was carried out in collaboration with CREA Agricoltura e Ambiente - Roberta Alilla, Flora De Natale, Barbara Parisse.

intensity, of extreme events have been updated.

Warm spells increase in the South and Islands

The *Warm Spell Duration Index* (WSDI), which represents the number of days in the year on which the maximum temperature is above the 90th percentile of the distribution over the reference climate period (1981-2010), for at least six consecutive days, allows to identify prolonged and intense periods of heat. Unlike indices based on a fixed threshold value, this index is representative of local climate changes. The WSDI identifies periods of heat in a relative sense, which can occur at any time of the year. For each geographic area, the index is calculated annually as an areal median.
The intensity of the hot days in the years 2011-2021 was always greater than the median of the 1981-2010 reference period in all the regions with the exception of the Islands in 2011 (- 6 days) and 2012 (zero difference). Compared to the previous year, in 2021 the phenomenon was absent in the North, stationary in the Centre (+18 days) and showed greater positive differences in the South (25 days) and in the Islands by 13 days (Figure 5).

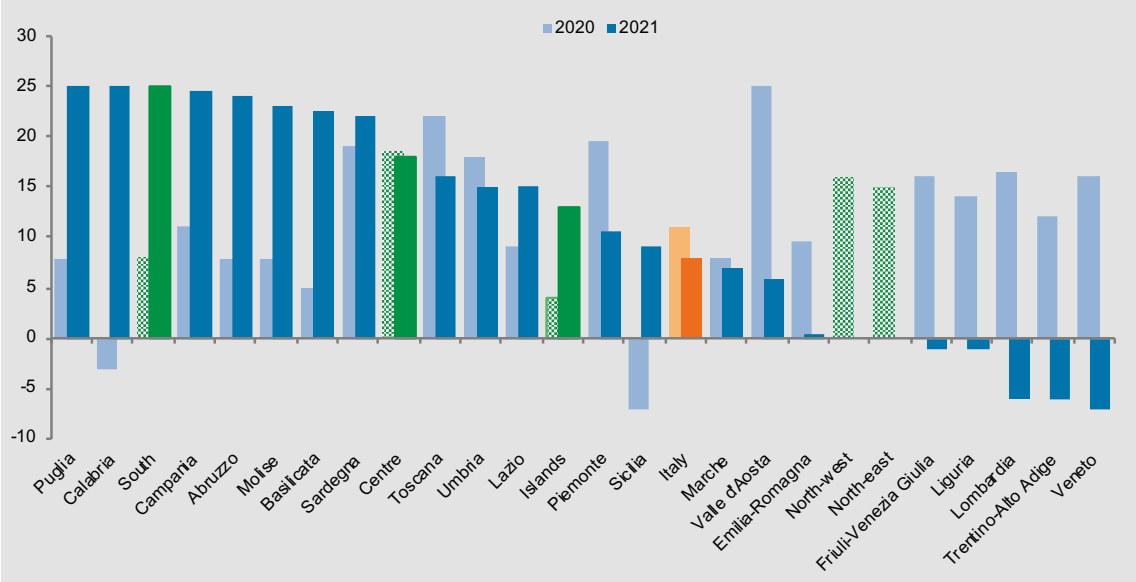
Figure 5. Warm spell duration index (WSDI): deviations from the climatic median (reference period 1981-2010) **by geographic area. Years 2011-2021**



Source: Copernicus - European Union's Earth Observation Programme, Gridded dataset of climate reanalysis, ERA5 hourly data

In the last two years (2020-2021), however, the variations with respect to the climatic value are always positive, with the exception of Calabria and Sicilia in 2020 and some northern regions in 2021: Veneto (- 7 days), Lombardia and Trentino-Alto Adige (- 6 days), Friuli-Venezia Giulia and Liguria (- 1 day). Overall, 2021 showed a higher incidence of heat waves compared to 2020, which were 17 and 9 days higher for the South and the Islands, respectively. At the national level, there was a decrease in the index, in the Centre, the phenomenon was less pronounced (Figure 6).

Figure 6. Warm spell duration index (WSDI): deviations from the climatic median (reference period 1981-2010) **by region and geographic area. Years 2020 - 2021.**

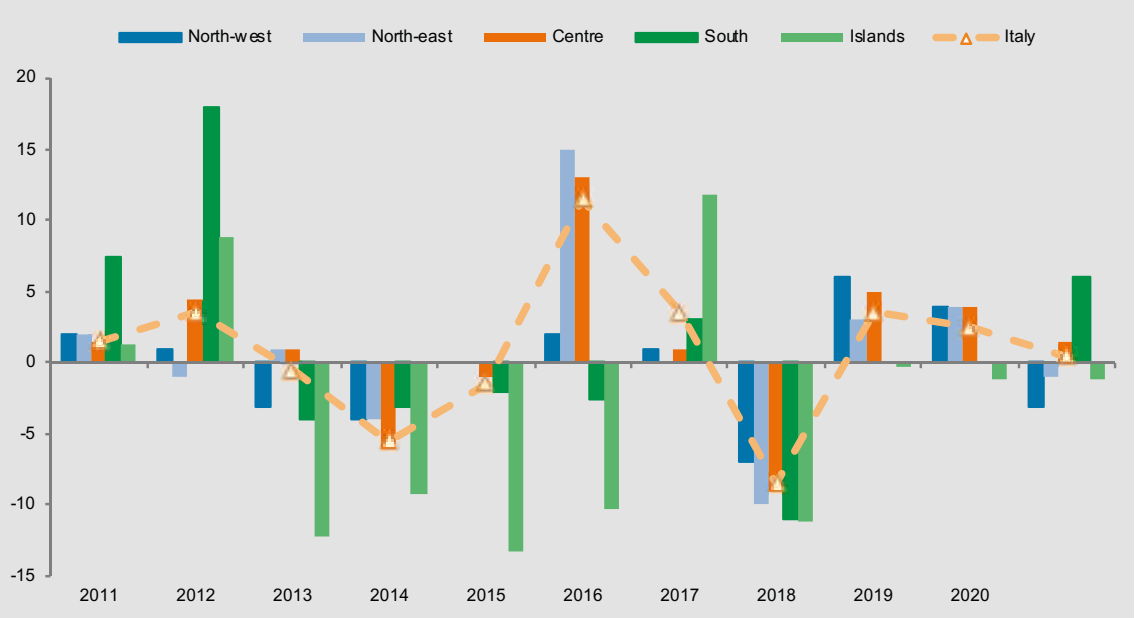


Source: Copernicus - European Union's Earth Observation Programme, Gridded dataset of climate reanalysis, ERA5 hourly data

Consecutive dry days are decreasing everywhere except in the South

The *Consecutive Dry Days* (CDD) index represents the maximum number of consecutive days without rain (i.e. with daily precipitation of less than 1 mm) during the year.
It is one of the most widely used indicators of extreme events to highlight drought periods, the effects of which also have an impact on the quality of the environment and thus on

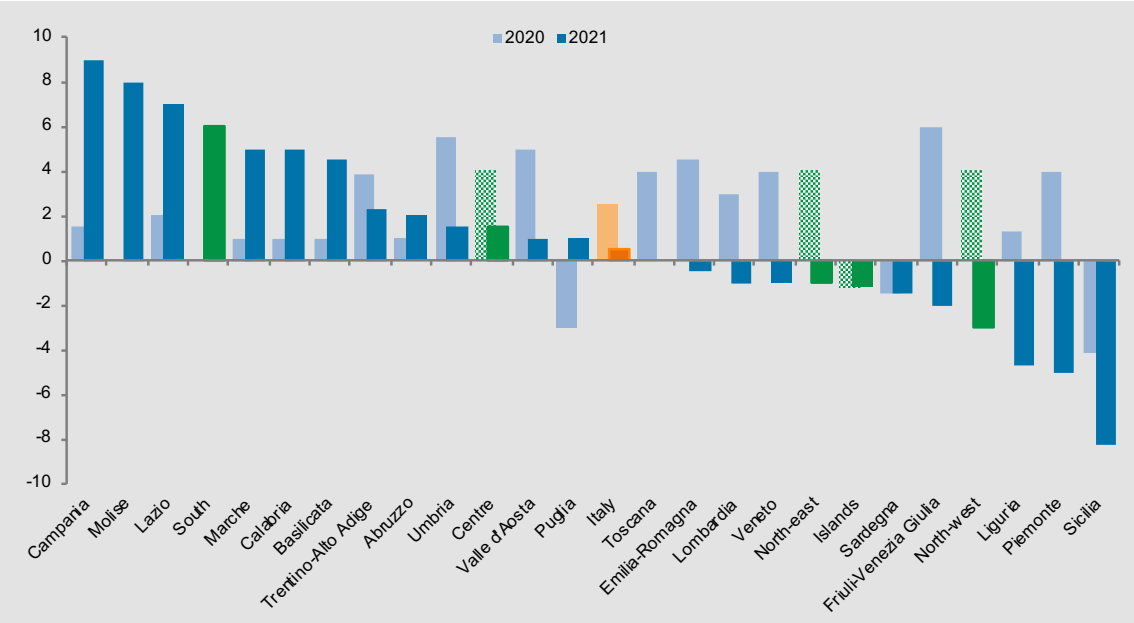
Figure 7. Consecutive Dry Days (CDD): deviations from the climatic median (reference period 1981-2010) **by geographic area. Years 2011-2021**



Source: Copernicus - European Union's Earth Observation Programme, Gridded dataset of climate reanalysis, ERA5 hourly data

people's health, by favouring the continuation of pollutant concentrations in the atmosphere and reducing the supply of water resources.
Figure 7 for 2021 shows a reduction in consecutive days without rain nationwide and a maximum positive difference in the South (+6 days). Negative index values affected the northern regions and Islands.
The phenomenon in 2021 differed substantially from the previous year with an increase of 6 consecutive dry days in the South and a significant reduction of 7 days in the North-west (Figure 8). On a national scale, the figure remained slightly above the climatic average, while on a regional level the highest deviations from 2020 were recorded in Campania (+9 days) and Sicilia (- 8.2 days).

Figure 8. Consecutive Dry Days (CDD): deviations from the climatic median (reference period 1981-2010) **by region and geographic area. Years 2020 and 2021**



Source: Copernicus - European Union's Earth Observation Programme, Gridded dataset of climate reanalysis, ERA5 hourly data

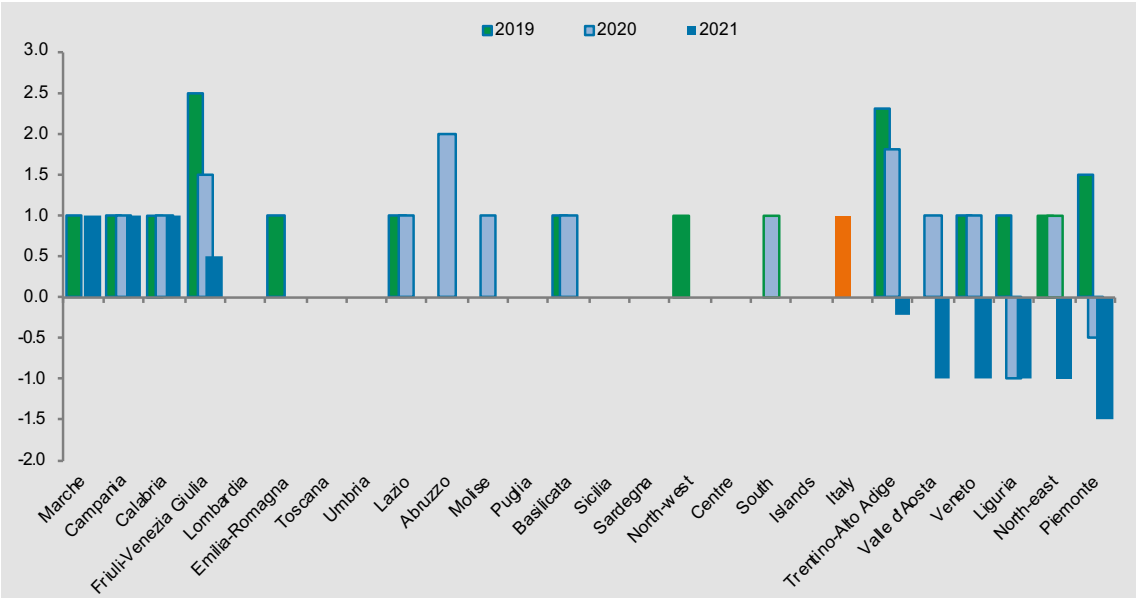
Slight increases in extreme rainfall

The index of very heavy rainfall (R50mm - *Number of severe rainfall days*) represents the number of days in the year when the total daily precipitation exceeds or equals 50 mm.
It is an index of extreme weather and climate conditions that measures days of very heavy rainfall[14] that have an impact on people's well-being and health. Flood and/or landslide disasters are often associated with such events in Italy. Most of the floods that have affected Italy have involved events with values above this limit.
In Italy, the R50mm index shows an increase compared to the climatic median (+1 day) in 6 of the 11 years observed. There is no reduction in the index except for the North-West in 2015 and the North-East in 2011, 2015 and 2021.

14 The precipitation value of 50 mm in one day is very high, corresponding to 50 litres of water poured on one square metre of surface, the effects of which can be disastrous.

In 2021, for more than half of the Italian regions the days of very intense precipitation did not differ from the climatic median (Figure 9). Compared to this, an increase was observed in Marche, Campania and Calabria (as in the two previous years) and to a lesser extent in Friuli-Venezia Giulia, while negative values were concentrated in the North, with a minimum of - 1.5 days in Piemonte.

Figure 9. Extreme precipitation events (R50mm)**: deviations from the climatic median** (reference period 1981-2010) **by region and geographic area. Years 2019-2020**



Source: Copernicus - European Union's Earth Observation Programme, Gridded dataset of climate reanalysis, ERA5 hourly data

14% of the population lives in hydrogeological risk areas

Due to the geomorphological characteristics of Italy, the hydrogeological risk caused by landslides and flooding events is widespread throughout the territory, with local changes, even in terms of danger to human life.
The increasing frequency of extreme weather events, and in particular of intense and localised rainfall, only accentuates this risk. Human activities that exacerbate the vulnerability of the territory are overbuilding, illegal building rate, the abandonment of highlands, the excavation of quarries, non-eco-sustainable cultivation techniques, the lack of maintenance of watercourses and invasive and careless interventions on them. The results of the Ispra 2020 Mapping show that 13.7% of the Italian population lives in areas classified as high or very high landslide hazard (2.2%), and in areas of medium and high hydraulic hazard (11.5%), i.e. periodically subject to flooding, with return times varying between 100 and 200 years. The population most exposed to the risk of landslides was mainly that living in Valle d'Aosta (12.1%), followed by Basilicata (7%) and Molise (6.1%). The region with the highest percentage values for flood risk was Emilia-Romagna (62.5%), followed by Toscana (25.5%) and Trentino-Alto Adige (18%).

Total losses in drinking water distribution networks are still high in provincial capitals

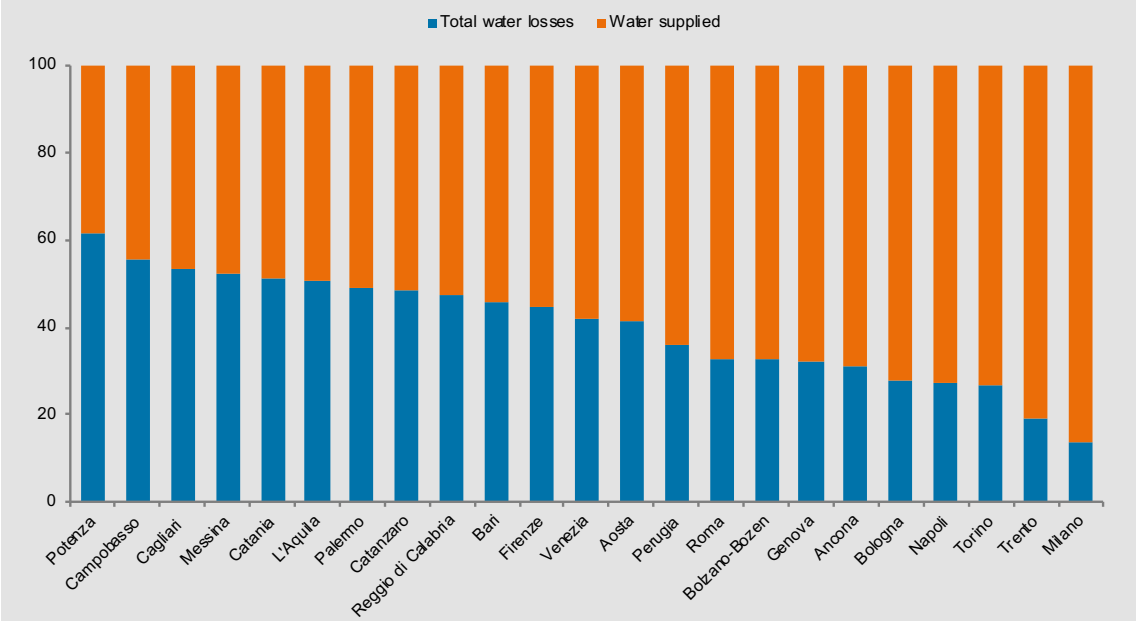
In 2020, a total of 370 litres per inhabitant per day, i.e. 2.4 billion cubic metres of water, were pumped into the drinking water distribution networks in the provincial capitals, and 236 litres per inhabitant per day (1.5 billion cubic metres per day) were supplied for authorised uses to end-users.
The supply of drinking water largely depends on the often very different infrastructural and socio-economic characteristics between municipalities, which inevitably affect the use of water resources by individual users. Volumes supplied in excess of 300 litres per inhabitant per day were found in Milano, Isernia, Cosenza, L'Aquila, Pavia, Brescia and Venezia. On the other hand, the municipalities where there is less supply, with quantities below 150 litres per inhabitant per day, are: Barletta, Arezzo, Agrigento, Andria and Caltanissetta.
Not all the water pumped into municipal distribution networks reaches the end-users. Total network losses generate important environmental, social and economic repercussions, especially in the increasingly frequent periods of water shortages. In particular, in 2020, in the capital municipalities, 36.2% of the water pumped into the network was lost (it was 37.3% in 2018), with a daily loss of 42 cubic metres per km of network (in line with 2018). In over one in three capitals, total losses exceeded 45%, a similar proportion to that recorded in 2018. The most critical conditions, with values above 65%, were recorded in Chieti (71.7%), Latina (70.1%), Belluno (68.1%) and Siracusa (67.6%). On the contrary, a better infrastructural situation, with total water losses below 25%, was recorded in about one in five municipalities, a ratio that increased slightly compared to 2018. In seven regional capitals we find the lowest values of the indicator, below 15%: Macerata (9.8%), Pavia (11.8%), Como (12.2%), Biella (12.8%), Milano (13.5%), Livorno (13.5%) and Pordenone (14.3%).
Compared to 2018, there was a reduction in the volumes handled in the municipal networks of the capitals. The volumes pumped into the network decreased by more than 4%, compared to -1.6% of the volumes supplied. This resulted in a reduction in total network losses of about 1 percentage point, continuing the trend of previous years.
The changes may depend both on actual changes in the water supply and on changes in the criteria for calculating the volumes consumed and not measured at the meter. The pandemic may also have generated changes in the volumes dispensed. In fact, in some municipalities with a strong tourist vocation, such as Rimini and Venezia, there was a significant reduction in the volumes dispensed, 11.8 and 13.9% compared to 2018.
In 2020, eleven regional capitals in Southern Italy resorted to water distribution rationing measures due to the obsolescence of the water infrastructure. Interventions to suspend and reduce drinking water supply were adopted in almost all the Sicilian regional capitals (involving almost 217 thousand citizens, equal to 13.9% of the region's residents), in two in Calabria (Reggio Calabria and Cosenza), in one in Abruzzo (Pescara) and in Campania (Avellino).

Lack of public sewage treatment service persists for about three out of ten residents

Urban wastewater treatment plants are essential infrastructures for reducing pollution of surface and groundwater bodies, thus safeguarding the environment in terms of water protection, biodiversity conservation, land and landscape enhancement and public health protection. In 2018, the public urban wastewater treatment service, guaranteed by 18,140

plants in operation, treated an average annual pollutant load of approximately 68 million population equivalents. 65.5% of the civil and industrial pollutant load was treated in plants with advanced-type treatment, 29.5% in secondary-type plants, and the remaining 5% in primary-type plants and Imhoff tanks[15]. The North-west and the South together account for

Figure 10. Water supplied for authorised uses and total water losses in public water supply networks by regional capital cities. Year 2020. Percentage values of water input into supply network



Source: Istat - Urban Water Census

more than 50% of the pollutant load treated by plants nationwide. The estimated population connected to urban wastewater treatment plants alone was approximately 70% of the resident population (42.3 million inhabitants). The remaining part of the population (approximately 18 million inhabitants) is therefore not connected to the public sewage service and resides in municipalities that are either completely deprived of the service (339 municipalities, corresponding to 2.7% of the resident population) or in municipalities that are only partially treated. Sicilia, where 6.4% of the population resides in 25 municipalities completely lacking a public sewage service and 13.3% in 80 municipalities lacking a wastewater treatment service, is the main recipient of the four infringement procedures against Italy, initiated between 2004 and 2017 in the sewage-wastewater treatment field and due to the failure of the agglomerations to comply with the EU wastewater directive. Significant situations of non-compliance also exist in Campania, where 7.8% of the population live in municipalities with no public sewage service.

15 Imhoff tank: septic tanks that allow the clarification of domestic sewage from small civil settlements. The tanks are proportioned and constructed so that the holding time of the spilled sewage is approximately 4-6 hours; the settled sludge undergoes anaerobic sedimentation.

Protected natural areas cover over one-fifth of the national territory

The Natura 2000 Network and the areas on the Official List of Protected Natural Areas (EUAP) constitute the main protected, marine and terrestrial areas in the Country and represent the main measure for the conservation of biodiversity.
All terrestrial protected natural areas cover 21.6% of the national territory, a value that has remained unchanged since 2012[16]. The most significant percentages of regional protected areas are found in the South: in particular in Abruzzo (36.6%) and Campania (35.3%). Marine protected areas cover about 11 thousand square kilometres of sea surface, mainly in Sicilia, Toscana, Sardegna and Puglia.
In 2021 the availability of urban green areas in Italian cities was 31 square metres per inhabitant. Since 2011, this value, although on the rise, has changed only slightly (+0.4% per year). However, public green areas are not evenly distributed among the 109 capital municipalities, since about 50% of the total surface area is concentrated in only 13 cities and one city in ten does not reach the minimum standard, required by law, of 9 square metres per inhabitant. At the territorial level, the indicator is on average higher in the regional capitals of the North-East (62.2 m^2 per inhabitant) and in particular in Bolzano, Trento, Pordenone, Gorizia and Trieste, but in general, the availability of urban green areas is highly heterogeneous in the various urban realities.

Modest increase in soil consumption

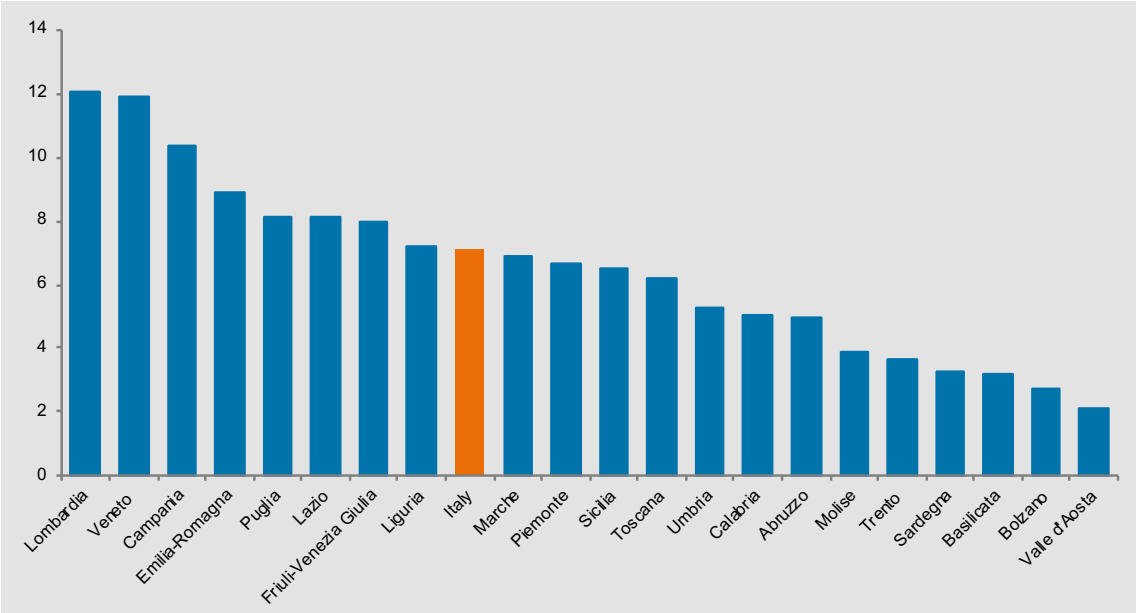
In 2020, the increase in impermeable artificial cover producing "soil consumption"[17] amounted to 56.7 km^2. Compared to 2019, the increase in artificial surfaces was only partly compensated by the restoration of additional agricultural, natural or semi-natural areas of 5 km^2. This is not yet fully sufficient to reach the target of zero net soil consumption[18], which in 2021 amounted to 51.7 km^2, of which 9.8 km^2 was permanent consumption. The rate of net soil consumption remains in line with those of recent years, at 14 hectares per day, and is still a long way from the EU targets, which should bring net consumption to zero by 2050.
Ispra estimates show that in 2020, impermeable surfaces will cover 7.1% of the national territory. The changes observed in the last year are concentrated in some areas of the Country: they are particularly high in Lombardia, Veneto and Campania (Figure 11). The phenomenon remains very intense along the coasts of Sicilia and southern Puglia and in the metropolitan areas of Rome, Milano, Napoli, Bari and Bologna. High degrees of change persist along almost the entire Adriatic coast. The greatest density of change has been recorded along the coastal strip within one kilometre from the sea, in lowland areas, in cities and in urban and peri-urban areas of the main poles and belt municipalities at the expense, mainly, of formerly agricultural soils and herbaceous vegetation.

16 The indicator considers, net of overlaps, only the land surfaces of the sites included in the Official List of Protected Natural Areas published by the MATTM and those belonging to the Natura 2000 Network. The latter include the Sites of Community Importance (SCIs), identified by the Regions and subsequently designated as Special Areas of Conservation (SACs) according to the Directive 92/43/EEC "Habitat", and the Special Protection Areas (SPAs) established according to the Directive 2009/147/EC "Birds".

17 Soil consumption is defined as the change from non-artificial land cover (non-consumed soil) to artificial land cover (consumed soil).

18 Net soil consumption is assessed through the balance between soil consumption and the increase of agricultural, natural and semi-natural areas due to reclamation, demolition, removal of sealing, renaturation or other interventions (European Commission, 2012).

Figure 11. Soil sealed by region. Year 2020. Percentage value of the regional area



Source: Ispra - Soil consumption, territorial dynamics and ecosystem services

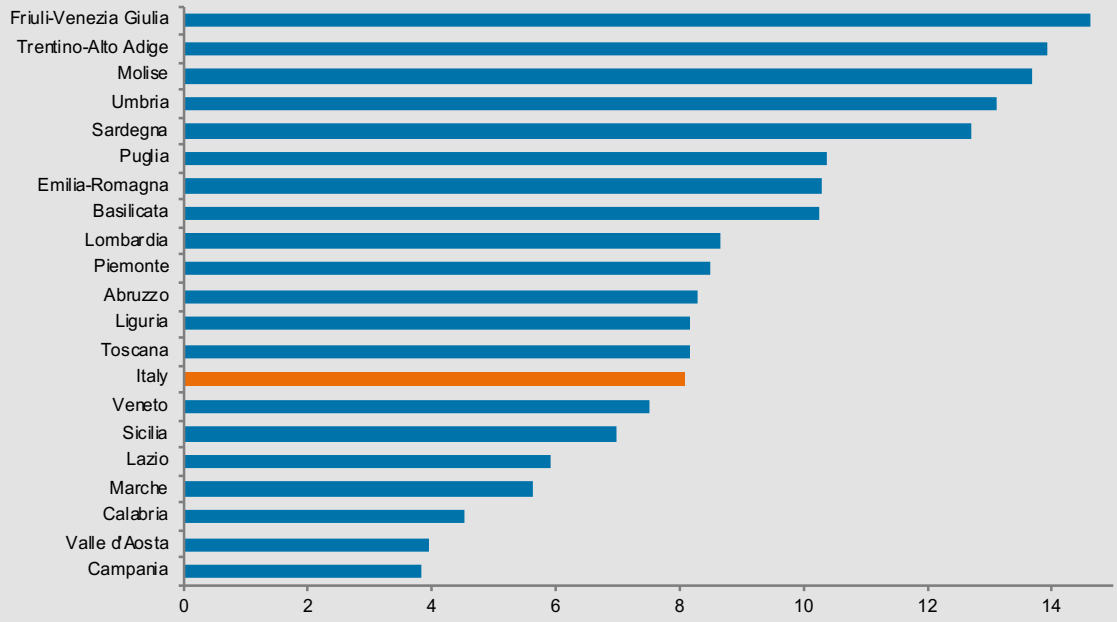
Domestic material consumption reduced by 8% in 2020

Domestic material consumption (Dmc)[19] offers a representation of the pressures that the environmental system undergoes in the face of the country's socio-economic dynamics.
In general, the use of material resources characterises the way in which the metabolism of the socio-economic system fits into natural cycles: historically, mostly by interrupting and unbalancing them; in perspective, hopefully, in an increasingly ecologically sustainable manner.
In 2020, 459[20] million tonnes of matter were consumed, about 8% less than in the previous year and in contrast to the gradual growth recorded in 2017-2019.
In 2018, the Dmc was geographically distributed with the highest values in the North-west (28%) and the lowest in the Islands (11.4%). At the regional level, there were significant differences related to the main regional socio-economic indicators. Lombardia recorded the highest value of 87 million tonnes, followed by Emilia-Romagna (46 million tonnes), Puglia (42 million tonnes) and Piemonte (37 million tonnes).
The *per capita* Dmc was lowest in Campania, at 3.8 tonnes per inhabitant, and highest in Trentino-Alto Adige and Friuli-Venezia Giulia, with 13.9 and 14.7 tonnes *per capita* (Figure 12).
Considering consumption per hectare, Valle d'Aosta and Basilicata, the least densely populated regions, had the lowest values (1.5 and 5.8 tonnes per hectare, respectively), Liguria and Lombardia (with the highest population density) the highest values (23.5 and 36.5 tonnes per hectare).

19 Domestic Material Consumption measures the quantity of matter, other than water and air, that is released into the environment (incorporated into emissions or effluents) or accumulated in new anthropogenic stocks (both capital and other durable goods and waste), calculated indirectly as the sum of domestic extraction (UMDEXT) and net imports (PTB equals IMP-EXP).

20 Provisional data.

Figure 12. Domestic material consumption per capita by region. Year 2018. Tonnes per capita



Source: Istat - Material flow accounts

Decline in annual municipal waste production

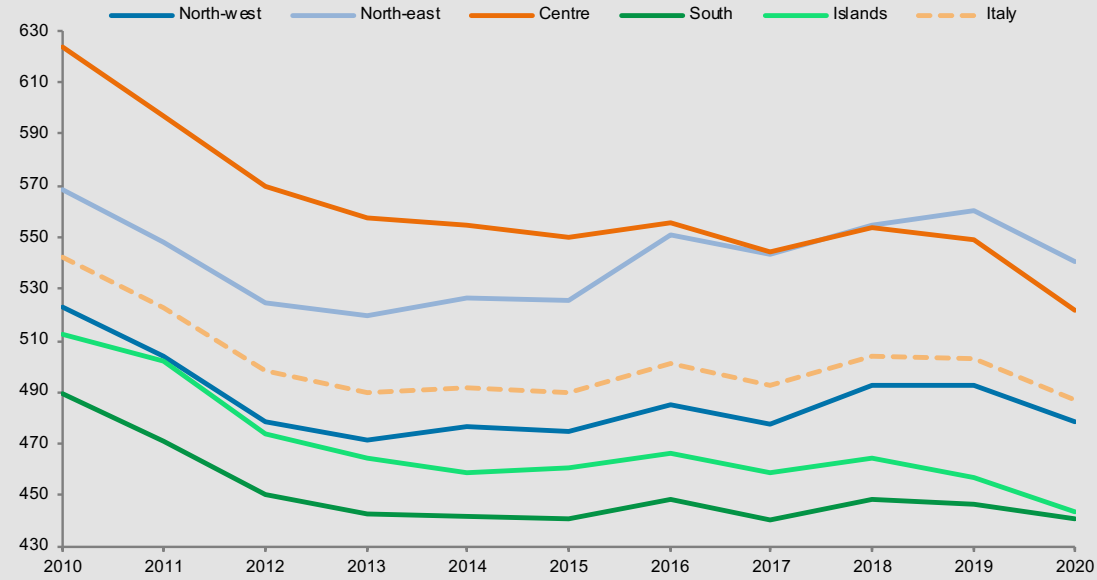
Waste production has a major impact on the environment, at all the different stages of the chain - collection, recycling, incineration (with or without energy recovery), landfilling - and therefore on human health (urban hygiene, soil pollution, emissions from incinerators/terminators, emissions from transport/processing/storage).

As required by European objectives[21], municipal waste production will have to be reduced in the future as a result of policies and consequent actions aimed at improving environmental quality with a view to the circular economy, thus decoupling the trend of waste production from that of economic growth. During the pandemic period, the reduction in waste generation was mainly due to the economic crisis rather than to environmental sustainability policies.

In 2020, compared to the pre-pandemic year, the production of municipal waste in Italy fell to 28.9 million tonnes (- 3.6% of the total amount compared to 2019), equal to 487 kilograms per inhabitant (- 16 kilograms *per capita*) almost returning to the lowest *per capita* value since 2010, recorded in 2015 (486.2). Compared to 2019, the reduction in waste production, both in terms of total tonnes and *per capita* value, was most significant in the North-east (- 3.7% tonnes and - 20 kilograms per inhabitant) and especially in the Centre with a reduction of 5.4% tonnes and 28 kilograms *per capita* (Figure 13).

21 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008, establishes measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste, putting prevention first, in order to reduce the amount of waste generated. This Directive, which also included the target of preparing for re-use and recycling of municipal waste at least 50% by 2020, was amended by Directive (EU) 2018/851, included in the Circular Economy Package that came into force on 4 July 2018 and implemented by Legislative Decree No 116 of 3 September 2020, which sets new targets of preparing for re-use and recycling of municipal waste to be achieved by 2025 (55%), 2030 (60%) and 2035 (65%).

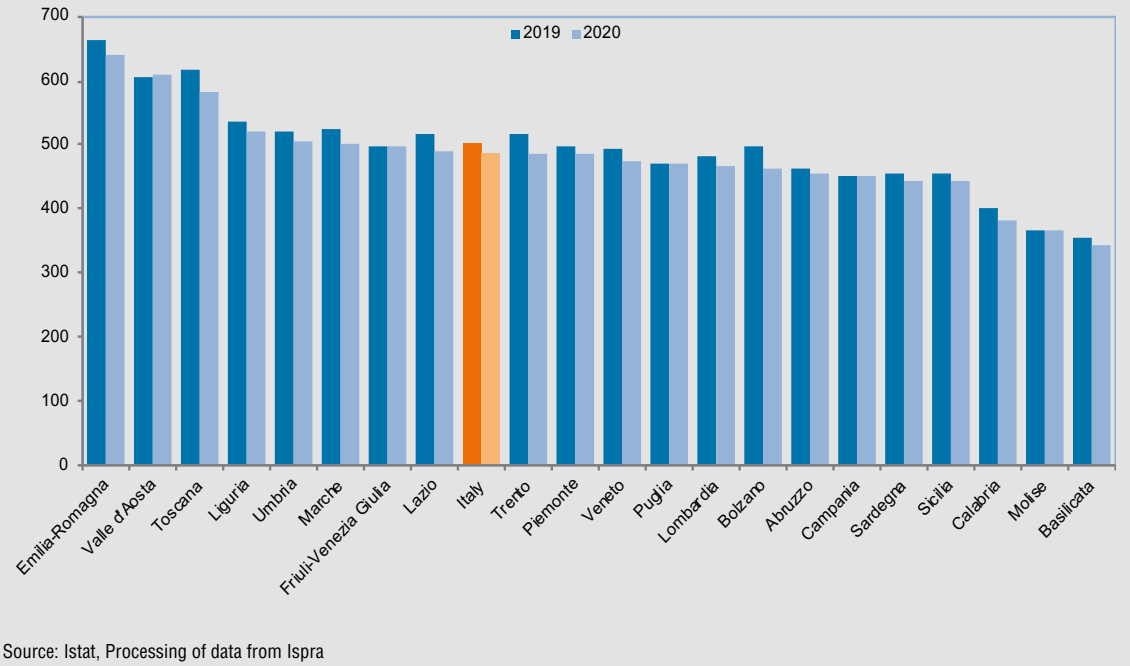
Figure 13. Municipal waste generated by geographic area. Years 2010-2020. Kilograms per inhabitant



Source: Istat, Processing of data from Ispra

Considering the territorial detail, compared to 2019, a reduction in *per capita* waste production was confirmed in all regions and autonomous provinces. In Toscana and in the autonomous provinces of Bolzano and Trento, it was twice the average (more than 32 kilograms *per capita* less compared to 16). The significantly higher *per capita* values were maintained in Emilia-Romagna (639 kilograms per inhabitant), Valle d'Aosta (609.2) and Toscana, with 583.1 kg *per capita* (Figure 14).

Figure 14. Municipal waste generated by region. Years 2019 and 2020. Kilograms per inhabitant

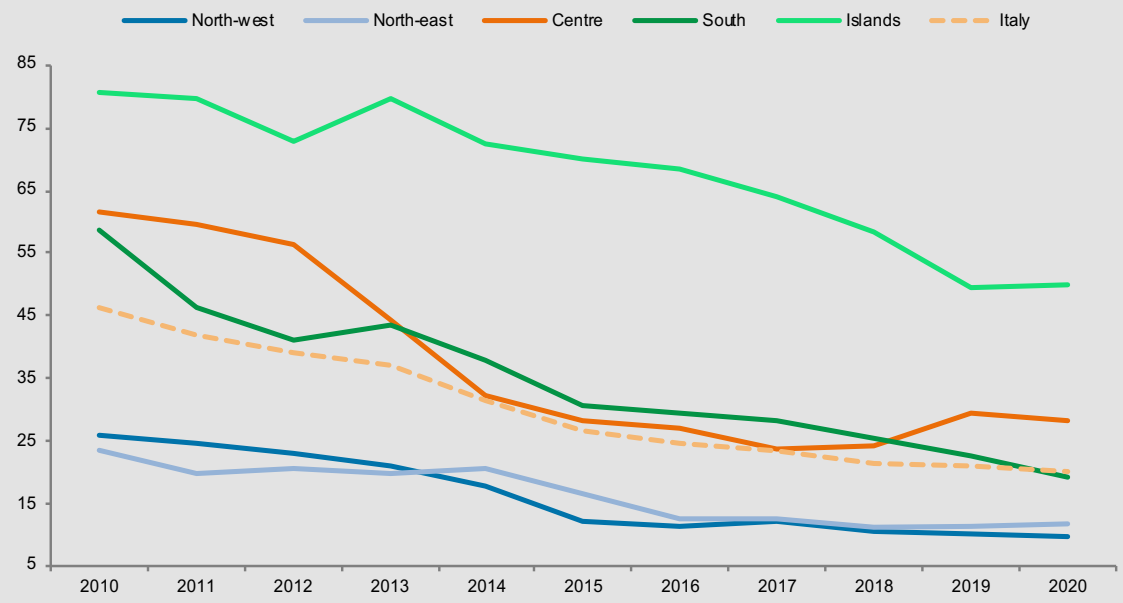


Source: Istat, Processing of data from Ispra

Landfilling of waste in decrease, but still twice the EU 2035 target

Waste that cannot be further utilised is disposed of by incineration without energy recovery or by landfill, the latter being in theory the last option in the waste management hierarchy[22]. The EU target is to landfill no more than 10% of municipal waste by 2035[23]. Since the percentages recorded in the different territories are the result of regional waste management policies and the effect of extra-regional waste inflows and outflows, the assessment with reference to the 10% target is only applicable at national level.
Over the past 10 years, the percentage of municipal waste going to landfills, which has a high impact on the environment and human health, has more than halved at an average annual rate of - 2.4%. In 2020, 20.1% of total municipal waste was landfilled; it was 20.9% in 2019 and 46.3% in 2010 (Figure 15).
The share was well below the average in the North-west and the North-east, the Centre and the South had trends and values closer to the average, while the Islands had much higher shares; these values, as mentioned above, are gross of inflows and outflows from the regions and subdivisions and therefore do not allow an assessment of the performance of the territories.

Figure 15. Municipal waste sent to landfills by geographic area. Years 2010-2020. Percentage values



Source: Istat, Processing of data from Ispra

22 Directive 2008/98/EC establishes a hierarchy of priorities in waste management for measures to protect the environment and human health and also to reduce the overall impacts of resource use. The hierarchy ranges from prevention, preparation for re-use, recycling, other recovery (e.g. energy) to disposal.

23 As stipulated in Directive 2018/850/EU, of the circular economy package, amending Directive 1999/31/EC on the landfill of waste, transposed by Legislative Decree No. 121 of 03/09/2020.

Complete overview of contaminated sites still difficult

In 2020, there were 31,686 sites in Italy contaminated[24] by substances such as asbestos, dioxins, hydrocarbons, pesticides, PFAS (perfluoroalkyl substances), of which 31,645 were under regional jurisdiction and 42 under national jurisdiction (Sites of National Interest).
Contaminated areas amount to 237,136 hectares, distributed over all Italian regions, although the phenomenon tends to polarise between the North (152,586 hectares) and the South and Islands (64,716 hectares). In absolute terms, Piemonte is the region with the largest extension of contaminated surface area (108,277 hectares) followed by Sardegna, Lombardia, Friuli-Venezia Giulia, Puglia and Toscana, which have contaminated surfaces of more than 10,000 hectares. In relative terms, on the other hand, while Piemonte is confirmed as the region with the highest percentage of contaminated territory in relation to the total surface area (4.27%), significant portions of contaminated areas can also be found in Friuli-Venezia Giulia (1.84%), Sardegna (1.24%) and Lombardia (0.93%), with values above the national average (0.79%).
Again with reference to the year 2020, in all Italian regions (with the exception of the autonomous province of Bolzano and Molise) 42 Sites of National Interest were identified for an extension of 171,211 hectares of contaminated land surface. These are, in most cases, areas affected by the impacts of pre-existing or still active industrial and mining activities. Compared to 2019, a new Site was identified[25], although not yet defined, in the Campania region, called "Area vasta di Giugliano".
The Sites of National Interest were concentrated in the North with 20 sites and 116,234 hectares of contaminated surfaces, and in the Southern Italy with 17 sites and 45,509 hectares of contaminated surfaces, among which the most important in terms of extension were the site of Casale Monferrato (73,895 hectares) in Piemonte, the site of Cengio e Saliceto (22,249 hectares) in Liguria and the site of the Sulcis-Iglesiente-Guspinese mining district (19,751 hectares) in Sardegna.
Despite their undoubted informative power at national and local level, even for the year 2020 the data provided by the relevant regional authorities were incomplete and did not provide an exhaustive picture of contamination in Italy in terms of both the progress of remediation and the extent of the areas, particularly for sites under regional jurisdiction in Piemonte, Veneto, Liguria, Abruzzo, Calabria and Sicilia.

The share of renewable energy continued to increase in 2020

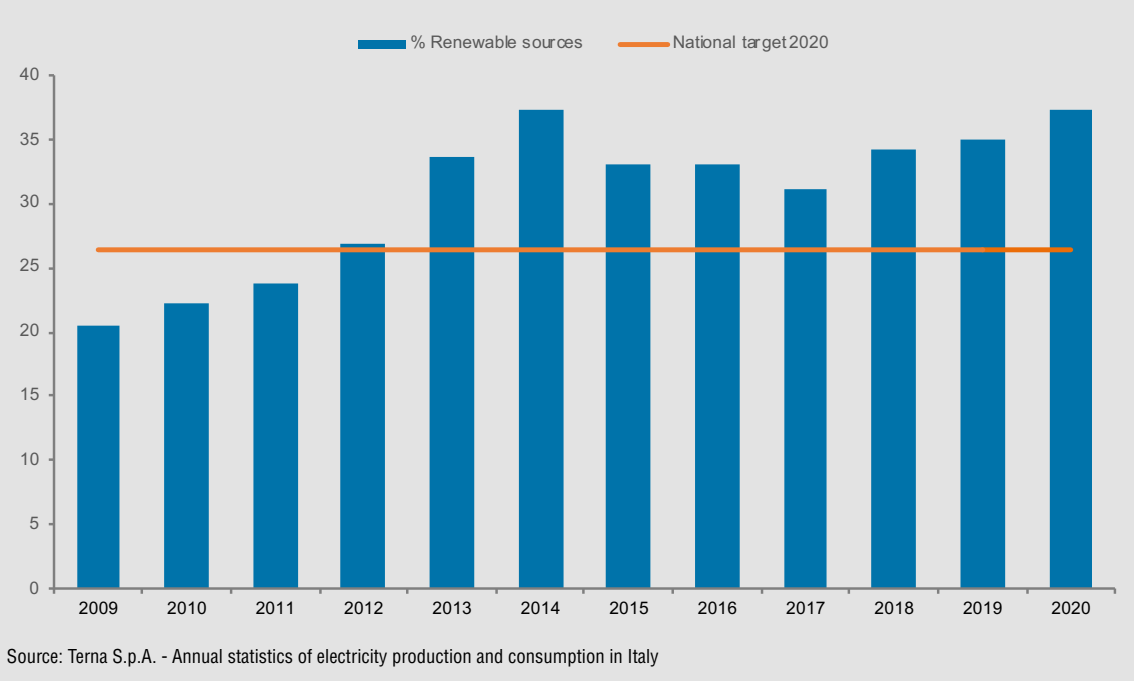
Since 2017, the consumption of electricity generated from renewable energy sources (hydroelectric, biomass thermal, geothermal, wind and photovoltaic) as a percentage of gross domestic electricity consumption has been steadily increasing, reaching 37.4% in 2020. The target of 26.4% set for 2020 has therefore been far exceeded[26] (Figure 16).

24 The identification, definition of the perimeter and remediation of contaminated sites are the responsibility of the Regions. The competence of the sites defined as being of "national interest" (Nis) for the purposes of remediation, identified by Article 252, paragraph 1 of Legislative Decree 152/06 and subsequent amendments and additions, is delegated to the Ministry of Ecological Transition in relation to the characteristics of the area, the quantity and hazardousness of the pollutants present and the significance of the impact on the surrounding environment in terms of health and ecological risk.

25 Law no. 120 of 11.09.2020.

26 The target is set by the National Renewable Energy Action Plan (NREAP), which complies with Directive 2009/28/EC.

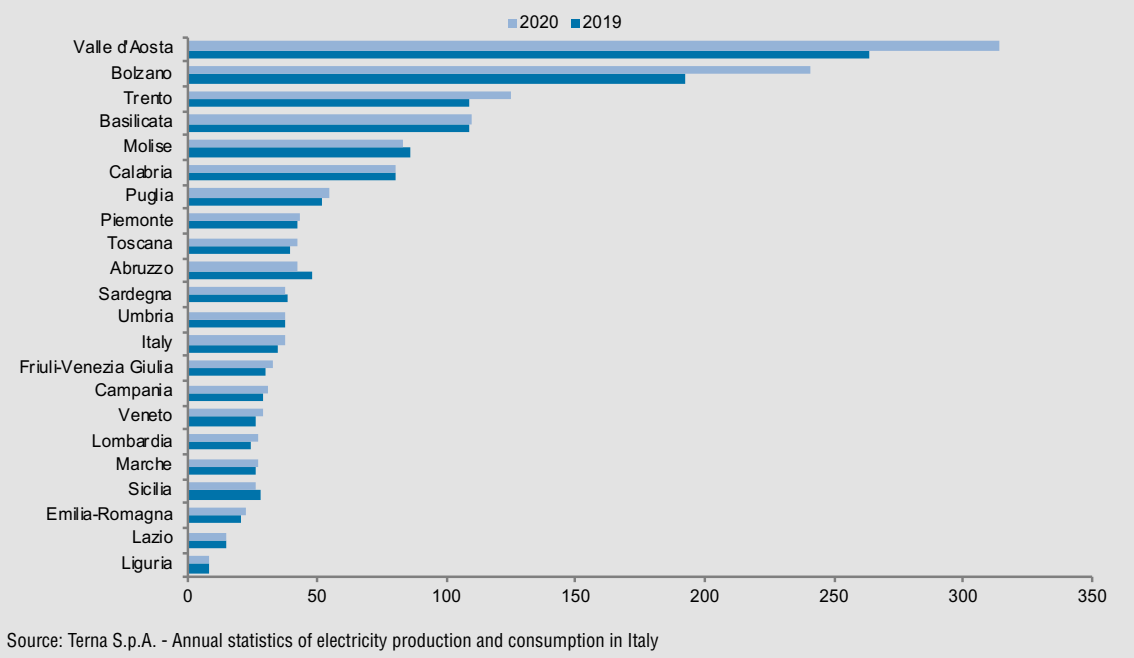
Figure 16. Electricity consumption from renewable sources. Years 2009-2020. Percentage values on the gross domestic consumption of electricity



Source: Terna S.p.A. - Annual statistics of electricity production and consumption in Italy

In 2020, the demand for electricity (302.7 TWh) was lower overall (-5.3%) than in 2019[27], production from renewable sources increased by about 1%, mainly due to the increase in photovoltaic energy production.
Figure 17 shows the regional distribution of electricity consumption from renewable energy

Figure 17. Electricity consumption from renewable energy sources by region. Year 2019 and 2020. Percentage values on the gross domestic consumption of electricity



Source: Terna S.p.A. - Annual statistics of electricity production and consumption in Italy

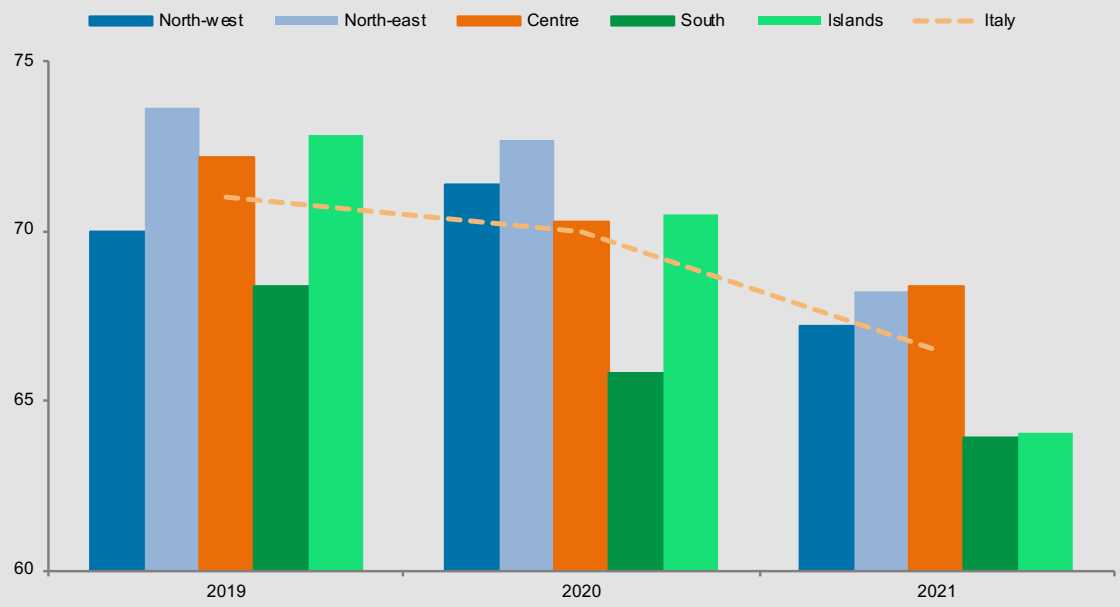
27 Terna S.p.A. - Monthly Report on the Electricity System, December 2020.

sources for the years 2019 and 2020. In Valle d'Aosta, the autonomous provinces of Bolzano and Trento and Basilicata, this consumption exceeds the gross domestic energy consumption mainly due to the high hydroelectric energy production in these territories.

Concern for climate change and the greenhouse effect drops to 2018 levels

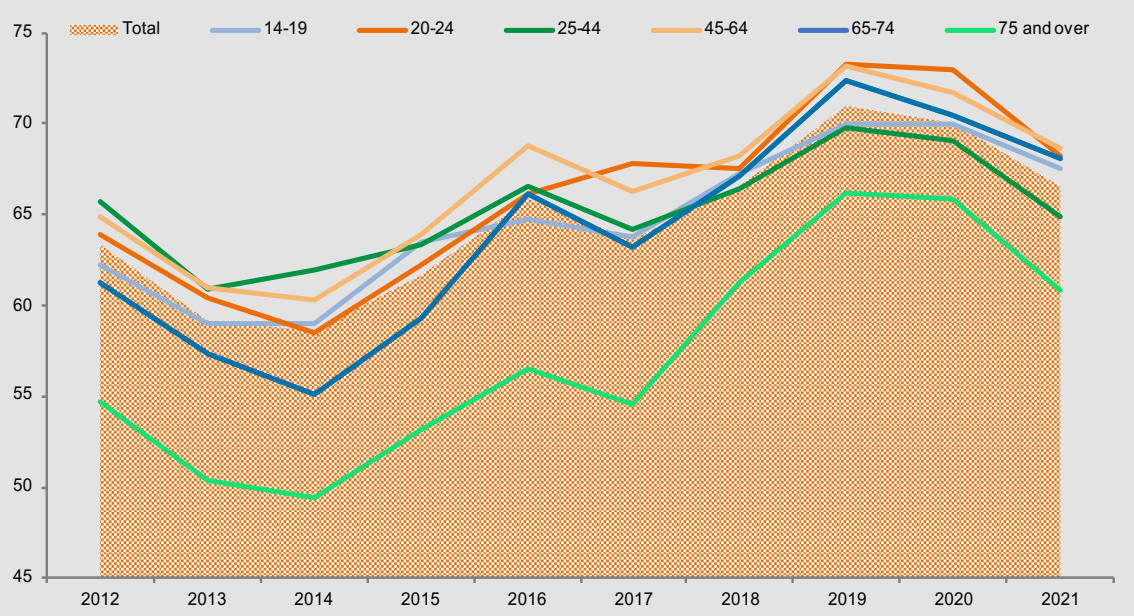
The effects of climate change and the increasing greenhouse effect are one of the environmental problems that people are most concerned about. However, while until the pre-pandemic year (2019) the percentage of people who consider this to be one of the main environmental problems was steadily increasing, there is a reversal in the 2020-2021 period (from 71% in 2019 to 66.5% in 2021 of people aged 14 and over). This decrease was most significant in the North-east from 73.6% to 68.2% and in the Islands, it decreased from 72.8% to 64.1% (Figure 18).
In 2021, the level of interest in these issues returned to that recorded in 2018 (66.6%), showing an increase in attention in conjunction with the global protest movements of 2019-2020. Furthermore, it is reasonable to assume that concerns about the pandemic and consequently the economic crisis were preponderant.
The greatest sensitivity to climate change issues was observed in the regions of the Centre (68.3%, with Toscana at 70.1%) and the North-east (68.2%, with the Autonomous Province of Trento at 69.5%), while concern was lower in the regions of the South (63.8%), with Campania (61.6%) and Calabria (60.4%) having the lowest shares, Molise standing out with 70.3%.
The differences between age groups regarding concern for these environmental issues among those aged 14 to 64 have been decreasing over the years and were insignificant in 2021. On the other hand, people aged 75 and over showed a consistently lower percentage

Figure 18. Concern about climate change and/or the increase in the greenhouse effect by geographic area. Years 2019-2021. Per 100 persons aged 14 and over



Source: Istat, Survey on Aspects of daily life

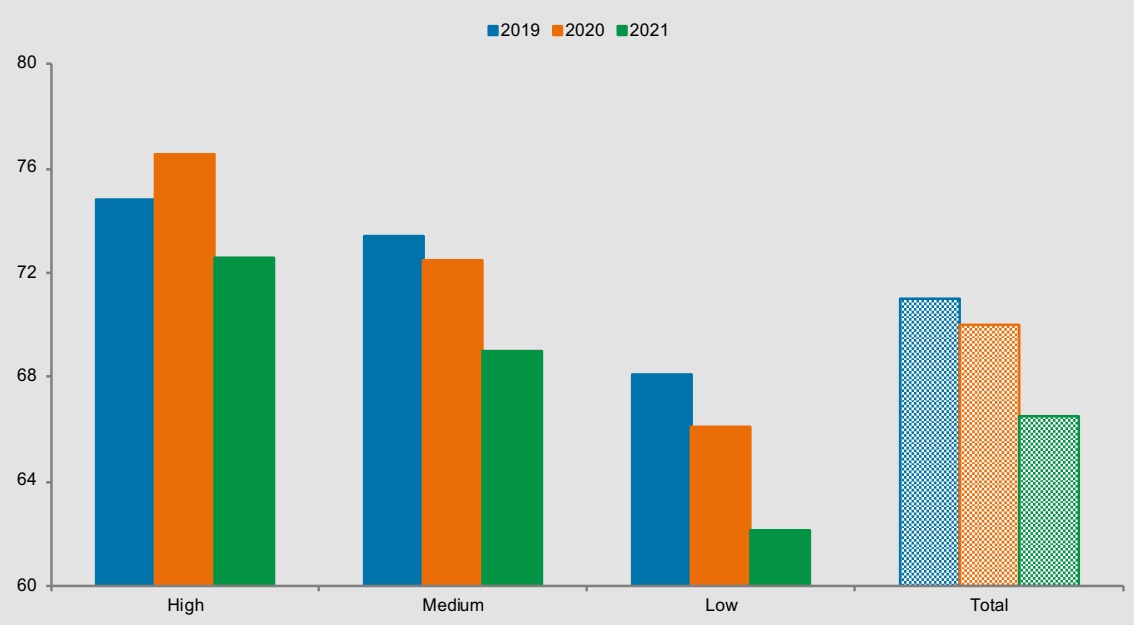
Figure 19. Concern about climate change and/or the increase in the greenhouse effect by age group. Years 2012-2021. Per 100 persons aged 14 and over



Source: Istat, Survey on Aspects of daily life

of interest in these issues than the average (Figure 19).
Concern for climate change was strongly associated with educational attainment, and the decline in such sensitivity over the pandemic period was greater among those aged 14 and over with low educational attainment (- 6 percentage points) than among those with medium and high educational attainment (Figure 20).

Figure 20. Concerned about climate change and/or the increase in the greenhouse effect by level of education. Years 2019-2021. Per 100 persons aged 14 and over



Source: Istat, Survey on Aspects of daily life

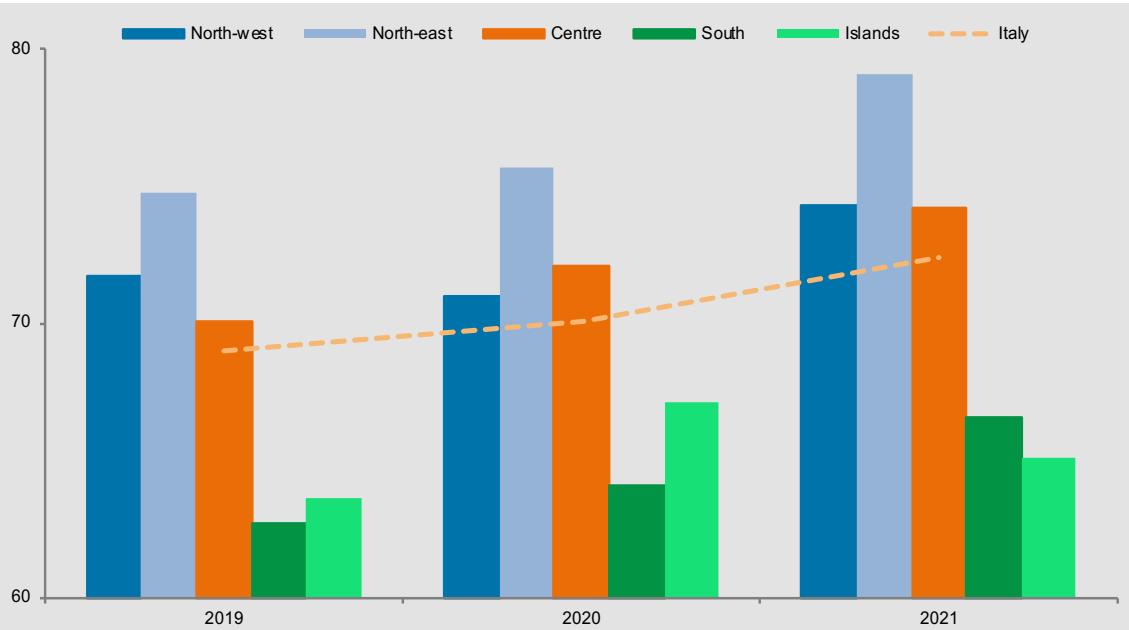
Satisfaction with the environmental situation of the area where people live is increasing

Compared to the pre-pandemic year, in 2021 the growth already recorded in 2020 in the percentage of populations declaring themselves to be very or fairly satisfied with the environmental situation in the area where they live continued (72.4% and 70.1% respectively, compared to 69% in 2019).

Satisfaction that in 2021 was expressed by about eight out of ten North-eastern residents, especially in the autonomous provinces of Trento and Bolzano (91.5% and 85.6% respectively) and in Friuli-Venezia Giulia (86.5%). In the North-west and the Centre, on the other hand, the share was slightly above average, while in the South and the Islands it was still below 70% with the lowest percentages in Campania (60.2%), Sicilia (60.5%) and 63.9% in Puglia (Figure 21).

Significant, though not very marked, differences related to age and gender: satisfaction was more widespread among 14-19-year-olds (76.7%) and especially among males (77.9%), while no significant differences emerged in relation to the respondents' educational qualifications.

Figure 21. Satisfaction with the environmental situation in the area where people live by geographic area. Years 2019-2021. Per 100 persons aged 14 and over



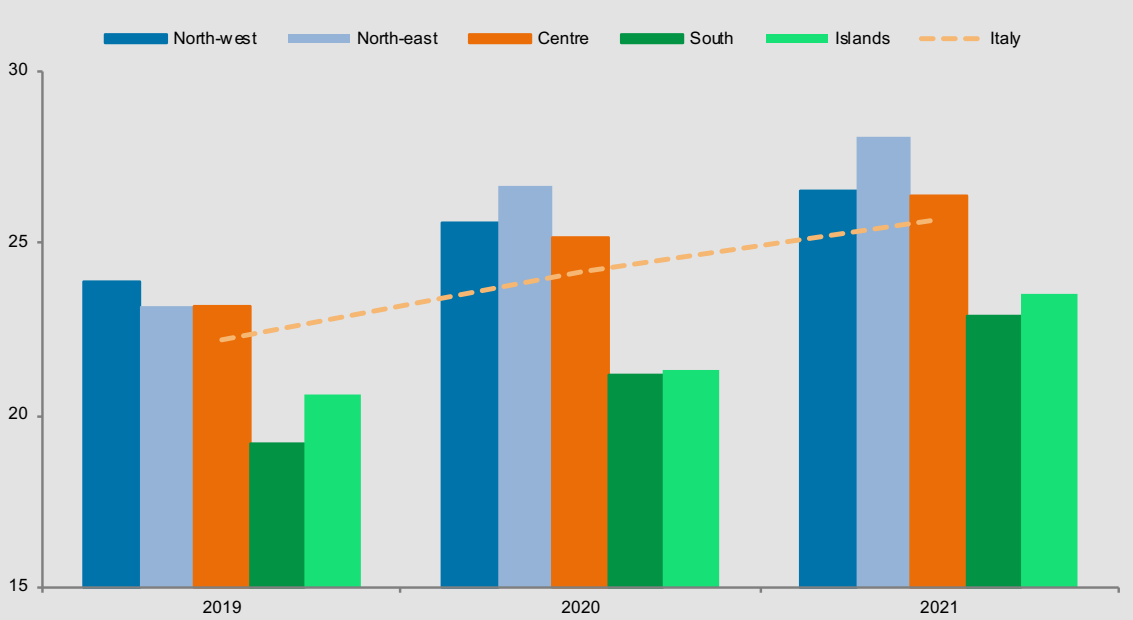
Source: Istat, Survey on Aspects of daily life

Slowly growing concern for biodiversity loss

The slow growth in the percentage of people aged 14 and over who were concerned for biodiversity loss, i.e. the disappearance of animal and plant species, continued in 2021 (25.7%, it was 24.2% in 2020 and 22.2% in 2019). This increase was observed with almost homogeneous intensity in all areas of the Country, even if the highest percentages were found in the North-east regions, followed by those in the North-west and the Centre, while those in the South and the Islands were below average (Figure 22).

With decreasing age and increasing educational qualifications, sensitivity to the issue of biodiversity loss increases. With respect to age, an upward trend was observed in all age

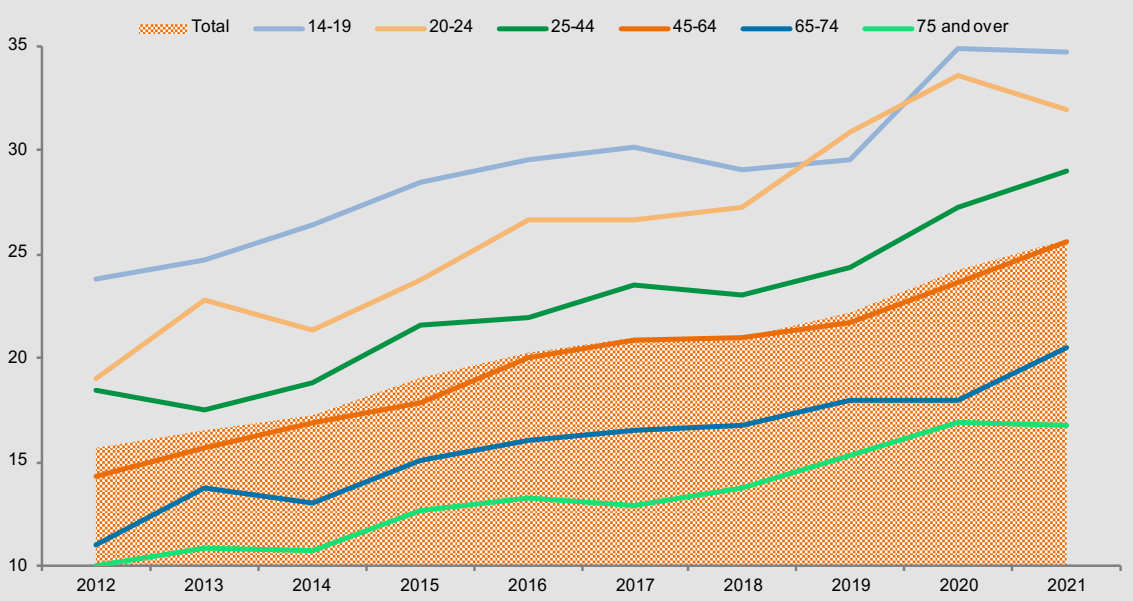
Figure 22. Concern about biodiversity loss by geographic area. Years 2019-2021. Per 100 persons aged 14 and over



Source: Istat, Survey on Aspects of daily life

groups up to 2020, in 2021 the growth continued only for the percentage of people between 25 and 74 years of age, while substantial stability was observed among younger and older people (Figure 23).

Figure 23. Concern about biodiversity loss by age group. Years 2012-2021. Per 100 persons aged 14 and over



Source: Istat, Survey on Aspects of daily life

Indicators

1. **Air quality - $PM_{2.5}$:** Percentage of valid measurements above the WHO health reference value (10 µg/m³) out of the total number of valid measurements of annual average $PM_{2.5}$ concentrations for all station types (urban and suburban traffic, urban and suburban industrial, urban and suburban background, rural).
   Source: Istat - Processing of data from Ispra
2. **Emissions of CO2 and other greenhouse gases:** Emissions of CO_2 and other greenhouse gases of the Italian economy expressed in tons of CO_2 equivalent per capita). Source: Istat-Ispra - Accounts and air emissions inventory.
   Source: Istat-Ispra - Accounts and air emissions inventory
3. **Warm Spell Duration Index:** Warm spell duration index (WSDI) is defined as annual or seasonal count of days with at least 6 consecutive days when the daily maximum T exceeds the 90th percentile in the calendar 5-day window for the base period 1981-2010.
   Source: Copernicus - European Union's Earth Observation Programme - Gridded dataset of climate reanalysis, ERA5 hourly data
4. **Extreme precipitation events:** Frequency of daily rainfall exceeding 50 mm/day.
   Source: Copernicus - European Union's Earth Observation Programme - Gridded dataset of climate reanalysis, ERA5 hourly data
5. **Consecutive Dry Days:** Maximum number of consecutive dry days per time period with daily precipitation amount of less than 1 mm.
   Source: Copernicus - European Union's Earth Observation Programme - Gridded dataset of climate reanalysis, ERA5 hourly data
6. **Population at risk of landslides:** Percentage of population resident in areas subject to high and very high landslide hazard, identified on the basis of the ISPRA National Mosaicature of the Hydrogeological Planning Plans (PAI) and its updates. The population considered is that of the 2011 Census.
   Source: Ispra - Hydrogeological instability in Italy: hazard and risk indicators
7. **Population at risk of flood:** Percentage of population resident in medium flood hazard zones (Return period 100-200 years; D. Lgs. 49/2010), identified on the basis of the ISPRA National Mosaicature of the Hydrogeological Planning Plans (PAI) and its updates, with reference to risk scenario P2. The population considered is that of the 2011 Census.
   Source: Ispra - Hydrogeological instability in Italy: hazard and risk indicators
8. **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) on total water input.
   Source: Istat - Urban Water Census
9. **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 - Urban Water census; Survey on urban environmental data
10. **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 Ministry of the Ecological Transition
11. **Coastal bathing waters:** Percentage of authorized coastal bathing waters on the total of the coastal line in accordance with the regulations in force.
    Source: Istat - Processing of data from Ministry of Health
12. **Urban green:** Square meters of urban parks and gardens per inhabitants in provincial capital Municipalities.
    Source: Istat - Survey on urban environmental data
13. **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
14. **Domestic material consumption:** Domestic material consumption measures the quantity of matter, other than water and air, used every year by the socio-economic system and released into the environment (incorporated into emissions or effluents) or accumulated in new anthropogenic stocks (both capital goods and other durable goods and waste).
    Source: Istat - Material flow accounts
15. **Municipal waste generated:** Municipal waste generated per capita (in Kg).
    Source: Istat - Processing of data from Ispra
16 **Landfill of waste:** Percentage of municipal waste sent to landfill on total municipal waste collected.
    Source: Ispra - Waste statistics
17 **Contaminated sites:** Size of contaminated sites.
    Source: Ministry of the Ecological Transition - Processing of data from Ministry of the Ecological Transition and Ispra
18. **Electricity from renewable sources:** Percentage of energy consumption provided by renewable sources on gross electricity consumption. The indicator is calculated as the ratio between the gross electricity production from RES (actual, non-normalized) and the gross domestic consumption of electricity (e.g. the gross production of electricity, including pumping, plus trade balance).
    Source: Terna S.p.A. - Annual statistics of electricity production and consumption in Italy
19. **Concern for climate change:** Percentage of people aged 14 and over who believe that climate change, greenhouse effect and ozone hole are among the five most important environmental problems.
    Source: Istat - Survey on Aspects of daily life
20. **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
21. **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

Indicators by region and geographic area

REGIONS GEOGRAPHIC AREAS	Air quality - $PM_{2.5}$ (a) 2020	Emissions of CO_2 and other green-house gases (b) 2020 (*)	Warm Spell Duration Index (c) 2021	Extreme precipita-tion events (c) 2021	Consec-utive Dry Days (c) 2021	Popo-lation at risk landslide (d) 2020	Popolation at risk of flood (d) 2020	Water losses in urban supply system (e) 2018	Sewage treatment (f) 2015
Piemonte	94.3	....	12.0	-	16.0	1.9	4.9	36.0	69.7
Valle d'Aosta/Vallée d'Aoste	100.0	....	12.0	-	16.0	12.1	9.1	22.1	66.0
Liguria	67.9	....	5.0	1.0	16.5	5.9	17.4	40.6	61.2
Lombardia	97.0	....	-	1.0	21.0	0.5	4.4	29.8	62.9
Trentino-Alto Adige/ Südtirol	91.7	....	-	-	21.5	2.1	18.0	31.1	78.9
Bolzano/Bozen	*100.0*	....	-	-	*19.0*	*2.3*	*9.8*	*26.9*	*99.7*
Trento	*83.3*	....	*3.0*	*0.5*	*22.5*	*2.0*	*25.9*	*33.9*	*63.6*
Veneto	100.0	....	-	-	21.0	0.1	11.7	40.9	49.4
Friuli-Venezia Giulia	85.7	....	6.0	3.0	18.0	0.4	9.9	45.7	50.7
Emilia-Romagna	89.4	....	7.0	-	21.0	2.0	62.5	31.2	67.7
Toscana	76.5	....	22.0	-	22.0	4.2	25.5	42.8	49.5
Umbria	76.2	....	21.0	-	22.0	2.0	7.2	54.6	68.7
Marche	66.7	....	7.0	1.0	24.0	2.2	5.2	33.9	48.5
Lazio	68.0	....	21.0	-	31.0	1.6	3.2	53.1	67.0
Abruzzo	81.8	....	24.0	-	20.0	5.6	7.2	55.6	63.9
Molise	33.3	....	23.0	-	28.0	6.1	2.3	45.6	58.0
Campania	89.3	....	24.5	1.0	35.0	5.0	5.1	45.5	60.5
Puglia	83.0	....	25.0	-	30.0	1.4	3.4	45.1	68.3
Basilicata	40.0	....	24.0	-	31.5	7.0	1.1	45.1	67.2
Calabria	40.0	....	28.0	1.0	34.0	3.3	12.8	44.9	46.0
Sicilia	50.0	....	16.0	-	39.0	1.8	2.6	50.5	43.9
Sardegna	30.3	....	22.0	-	47.0	1.3	7.5	51.2	58.8
North	91.1	....	6.0	-	20.0	1.3	16.6	34.3	62.4
North-west	90.3	....	6.0	1.0	18.0	1.5	5.9	32.5	64.6
North-east	92.0	....	6.0	-	21.0	1.0	31.4	32.5	59.6
Centre	71.7	....	21.0	-	23.5	2.5	10.8	48.7	58.5
South and Islands	61.8	....	23.0	-	36.0	3.2	5.1	47.9	56.7
South	72.3	....	25.0	-	32.0	3.9	5.6	46.5	60.9
Islands	37.3	....	19.0	-	46.0	1.7	3.8	50.7	47.8
Italy	77.4	6.6	14.0	-	24.0	2.2	11.5	42.0	59.6

(a) Percentage of valid measurements above the WHO defined reference value (10 µg/m³) of total valid measurements of annual average concentrations of $PM_{2.5}$;
(b) Tonnes of CO_2 equivalent per capita;
(c) Number of days;
(d) Percentage on total population;
(e) Percentage of water input into the network;
(f) Percentage of the urban pollution loads generated;
(g) Percentage of land area;
(h) Percentage of authorized bathing waters on the total of the coastline;
(i) Square meters per capita;

Protected natural areas (g)	Costal bathing waters (h)	Urban green (i)	Soil sealing from artificial land cover (l)	Domestic material consumption (m)	Municipal waste production (n)	Landfill of urban waste (o)	Contaminated sites (p)	Electricity from renewable sources (q)	Concern for climate change (r)	Satisfacion for the environment (r)	Concern for biodiversity loss (r)
2017	2019	2020	2020	2020 (*)	2020	2020	2020	2020	2021	2021	2021
16.7	-	26.4	6.7	....	486	12.6	42.7	43.5	66.2	73.8	26.5
30.3	-	19.1	2.1	....	609	38.2	0.7	314.5	64.9	86.2	28.9
27.2	57.4	18.3	7.2	....	520	36.2	5.1	8.3	65.3	76.8	28.3
16.1	-	26.6	12.1	....	468	3.5	8.2	27.3	67.9	74.1	26.2
26.4	-	300.3	3.1	....	475	12.3	0.4	180.1	66.9	88.6	29.9
24.5	-	*193.7*	*2.7*	....	*464*	*2.2*	*0.3*	*241.1*	*64.1*	*85.6*	*31.1*
28.7	-	*396.2*	*3.7*	....	*486*	*21.8*	*0.6*	*125.3*	*69.5*	*91.5*	*28.7*
23.0	64.2	34.0	11.9	....	476	14.7	1.7	29.3	68.6	77.8	28.3
19.3	42.2	65.0	8.0	....	496	11.4	18.4	33.1	67.3	86.5	26.8
12.2	61.7	45.5	8.9	....	639	9.2	1.7	22.1	68.2	76.3	27.9
15.2	71.3	23.7	6.2	....	583	36.4	5.1	42.7	70.1	78.0	28.4
17.5	-	99.3	5.3	....	506	37.0	0.8	37.6	66.5	76.7	27.7
18.8	73.2	31.9	6.9	....	500	48.1	0.2	26.8	69.3	82.0	25.0
27.9	69.5	21.7	8.1	....	490	15.7	4.2	15.3	67.2	69.3	25.5
36.6	75.5	27.3	5.0	....	454	29.2	0.6	42.4	67.5	80.8	28.4
26.4	71.9	10.1	3.9	....	367	79.3	0.3	83.0	70.3	82.7	24.6
35.3	70.0	14.3	10.4	....	452	1.6	5.8	31.4	61.6	60.2	23.2
24.5	74.7	9.5	8.2	....	469	33.7	6.5	54.7	66.8	63.9	21.3
22.8	90.8	103.0	3.2	....	344	19.0	4.0	109.6	64.3	76.3	20.8
26.6	85.3	41.8	5.1	....	381	27.4	0.7	80.1	60.4	75.7	22.3
20.2	50.8	15.3	6.5	....	443	58.9	3.2	26.0	63.3	60.4	21.2
19.9	64.9	37.1	3.3	....	445	23.4	12.4	37.6	66.3	78.7	30.1
18.8	56.9	40.8	8.6	....	505	10.6	12.7	27.3	67.6	76.3	27.2
18.1	57.4	25.1	8.7	....	479	9.7	22.6	....	67.2	74.3	26.5
19.7	56.5	62.2	8.4	....	541	11.7	3.5	....	68.2	79.1	28.1
20.0	71.1	27.2	6.7	....	522	28.4	3.4	30.2	68.3	74.2	26.5
25.2	65.8	20.3	5.9	....	442	29.2	5.2	45.6	63.9	66.1	23.1
29.0	77.0	20.8	6.5	....	444	19.2	3.6	....	63.8	66.5	22.9
19.6	58.5	19.5	5.0	....	441	50.1	7.6	....	64.1	65.0	23.4
21.6	**65.5**	**31.0**	**7.1**	**458.7**	**487**	**20.1**	**7.9**	**37.4**	**66.5**	**72.4**	**25.7**

(l) Percentage of land area;
(m) Milions tonnes;
(n) Kilograms per capita;
(o) Percentage of total municipal waste collected;
(p) Land area affected, values per 1,000;
(q) Percentage of total internal consumption;
(r) Per 100 persons aged 14 anni and over;
(*) Provisional data.