ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

ITALIAN ENVIRONMENT

Trend and Legislation

STATO DELL'AMBIENTE

93 bis / 2020

SISTAN
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ITALIAN ENVIRONMENTAL DATA YEARBOOK 2019

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LEGAL NOTICE

As of 14 January 2017, Italian Institute for Environmental Protection and Research (ISPRA), and the 21 Regional and Provincial Agencies for the Protection of the Environment (ARPA/APPA), join the **National System for the Protection of the Environment** (SNPA), Act No 132, 28 June 2016.

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June 2020

Different information products have been produced starting from the database used for the Environmental Data Yearbook. The aim is to disseminate information to a wider audience of users such as public decision-makers, researchers, stakeholders, citizens. The 2019 Edition includes 8 releases:

- **Indicators Platform** – the online reference tool of the indicator sheets. The Platform allows to publish, manage and organize the contents related to the different editions of the Yearbook as well as to create customized versions (customized report creation), according to the information needs of individual users (https://annuario.isprambiente.it).
- **Environmental Data Yearbook** – the full version presents the indicator sheets populated throughout the 2019, organized by economic sectors, environmental conditions and answers. Digital format (PDF) available.
- **The Yearbook in figures** - this statistical leaflet, contains the most representative graphs of the environmental issues addressed in the Environmental Data Yearbook completed with comments, short information and particular relevant data. Paper version and digital format (PDF) available.
- **Italian Environment - Trend and Legislation** - the document is based on the time-series of the most significant variables in the Yearbook. The aim is to improve the evaluation of the phenomena trends described. Part 1: technical evaluation of environmental issues (integrated analysis of historical series with the targets set by legislation), Part 2: a study on aggregated and composite indicators for monitoring environmental issues.Paper version and digital format (PDF) available.
- **Summarising...the environment** – concise info brochure, showing some relevant environmental issues. Paper version and digital format (PDF) available.
- **Environmental Data** - the document presents an accurate selection of Environmental Data Yearbook indicators aimed at the monitoring of the main objectives of the Seventh Environmental Action Programme (7th EAP). The document is structured in 5 sections or chapters according to the first three priority objectives and sub-objectives 4a and 7a listed in the 7th EAP. Each chapter presents an introduction and a selection of the Environmental Data Yearbook indicators, based on the EEA (European Environmental Agency) equivalent indicators used to monitor adequately the achieving of the goals. Digital format (PDF) available.
- **Comic** – yearly addresses an environmental theme developed on a single table. In 2019 edition, the theme is "Waste". The product uses visual signs and graphics to reach a young audience of non-experts. Digital format (PDF) available.
- **Multimedia** - it presents the 2019 Edition of the Environmental Data Yearbook and briefly shows some environmental issues which are considered a priority for the reference target. Multimedia available on https://annuario.isprambiente.it

The brochure is distributed to institutions, international organizations, media and opinion leaders and is available at www.isprambiente.gov.it, https://annuario.isprambiente.it

Document created by Mariaconcetta Giunta, Giovanni Finocchiaro, Cristina Frizza, Alessandra Galosi, Renato Marra Campanale, Michele Mincarini, Raffaele Morelli in cooperation with the thematic coordinators (see general section Task Force Environmental Data Yearbook 2019).

Graphic design by Xenia Maiese and Matteo Salomone

Italy, Sentinel-3 image, September 28th, 2016 (ESA)

Italian Environment - Trend and Legislation

The document provides an overview of the environmental situation in Italy over the last twenty years through two keys: indicators with time-series and composite indices.
To evaluate the state and trend of the described phenomena, time-series of the most significant environmental variables are chosen. The observation of the environmental and territorial objective conditions together with the trend analysis in place, allow to point out the critical flaws which politicians and administrators should manage to achieve well-being and improvement goals. This, in accordance with European and international sustainable development such as UN Agenda 2030 or the latest EU *Communication The European Green Deal* (new reference point for European policies).
The 7th Environment Action Programme to 2020 *"Living well, within the limits of our planet"* is the framework of this document. The Programme outlines the overall vision of the environment and society up to 2050. By this year it is expected to:

"live well, within the planet's ecological limits. Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society's resilience. Our low-carbon growth has long been decoupled from resource use, setting the pace for a safe and sustainable global society."

The first part of the document describes environmental phenomena through time-series indicators. The topics covered are flanked by the respective normative references.
In particular, this part offers a picture of the environmental themes with respect to the introduction of specific regulatory measures. This helps to understand how the latter have contributed to achieving the targets set by the legislation.
Where the link does exists, the indicator includes a reference to the Agenda 2030 specific goals and to the European *Green Deal* relative issues.

Eight composite indicators are also featured. These indices provide the overall trend of some environmental phenomena, complex by their nature. They are taken from the ISPRA Environmental Data Yearbook.

If misinterpreted, composite indices could give back a misleading message. Nevertheless, they are more accessible to a non-experienced public. That's why are used in this document: providing a tool to encourage debate on the addressed topics.

The document considers three out of the nine priority objectives (with their sub-objectives) stated in the 7th Environment Action Programme to 2020 *"Living well, within the limits of our planet"*:

- *to protect, conserve and enhance the Union's natural capital;*
- *to turn the Union into a resource-efficient, green, and competitive low-carbon economy;*
- *to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing.*

The combined use of time-series and composite indices made it possible to summaries the trends of some indicators, taking into account the sub-objectives of the 7th Action Programme.

The first part of the document shows 41 indicators with time-series, whose environmental issues:

- refer to targets set by legislation;
- refer to regulations, but do not have specific targets;
- are considered to be important and emerging, although without regulatory references.

A symbol highlights the presence of a regulatory target. The graph shows the trend of the indicator and is flanked by the description of the main normative or target references plus a comment. Among the 41 indicators presented:

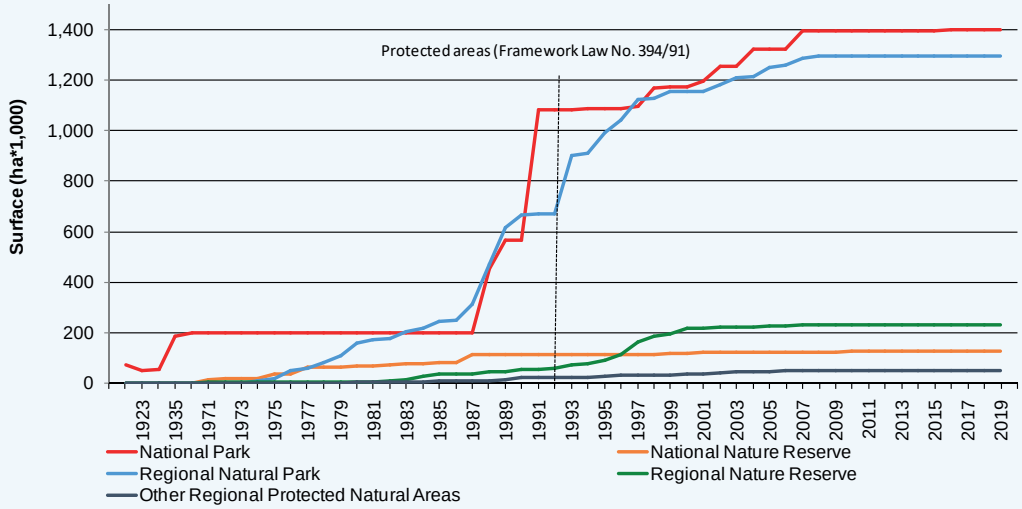
- 62.5% fully or partially meets the *Sustainable Development Goals* (SDG).Among these, 64% refers to one of these Goals: 11 *"Sustainable cities and communities"*, 12 "*Responsible Consumption and Production"*, 13 *"Climate Action"*;
- 50% has normative references to meet.

With respect to the European Green Deal issues:

- 32.5% concerns *"Zero pollution"*;
- 20% concerns *"Achieving Climate Change"*;
- 17.5% concerns both "*Preserving Europe's natural capital"* and *"Transition to a Circular Economy"*.

Composite indices are based on AMPI method (Adjusted Mazziotta-Pareto Index).
ISTAT uses this methodology for its BES report (BES stands for Fair and Sustainable Well-Being). ASVIS (Italian Alliance for Sustainable Development) also uses it in its annual reports to monitor the national situation about sustainable development goals.

7th EAP Priority Objective	Time-series indicator	7th EAP Sub-objective	Composite Index
To protect, conserve and enhance the Union's natural capital	-Territorial protected areas -Marine protected areas -Fishery -Land-take -Main landslides -Supply of fertilizers for agricultural use (compo sts, soil improvers, correctives) -Ammonia emissions from agricolture -Sustainable forest management certification -Wildfires -National forest contribution to global carbon cycle	"to halt the loss of biodiversity and the degradation of ecosystem services"	Biodiversity
		"to reduce the impact of pressures on marine waters to achieve or maintain good environmental status"	Fishery
		"to further reduce air pollution and its impacts on ecosystems and biodiversity"	Glacier front
To turn the Union into a resource-efficient, green, and competitive low-carbon economy	-GHGs emissions -GHGs emissions in ETS and ESD sectors -CO emissions -Emissions of tropospheric ozone precursors (NO_x and NMVOC) -Renewable energy share in final consumption -Power production from cogeneration plants -Primary & final energy intensity -Nitrogen oxides emissions (overall & from energy processes) -Sulphur dioxide emissions (overall & from ener gy processes) -White certificates -Final energy consumption (transport sector) -Air pollutant emissions (transport sector) -Domestic material consumption & resource productivity -Municipal waste generation -Waste generation from economic activities -Separated waste collection -Landfilled municipal waste (percentage) -Preparing for re-use and recycling (percentage) -Recycling/recovery of construction and demolition waste -Organic farming -Research & development expenditure	"to reduce the GHG emissions by 80 % to 95 % by mid-century, compared to 1990 levels, as part of a global effort to limit the average temperature increase to below 2 °C compared to pre-industrial levels"	Greenhouse effect
		"more efficient use of resources"	Resources use
		"to reduce the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors"	SCP
		"responsible waste management"	Waste
To safeguard the Union's citizens from environment-related pressures and risks to health and well-being.	-Average temperature -Air quality: Particulate Matter (PM10) – Daily limit value -Air quality: Particulate Matter (PM10) – Annual limit value -Air quality: Particulate Matter (PM2.5) -Air quality: Ozone (O_3) -Air quality: nitrogen dioxide (NO_2) -Contaminated Sites of National Interest -Noise: monitored sources -Implementation of noise zoning plans -Plant protection products provided for agricul tural use	"to improve air quality"	Air quality



Cumulated surface of the terrestrial protected areas (annual variation)

Data source: Ministry for Environment, Land and Sea Protection - EUAP, VI (2010) and superseding national and sub-national laws and measures establishing protected areas. Data processing by ISPRA

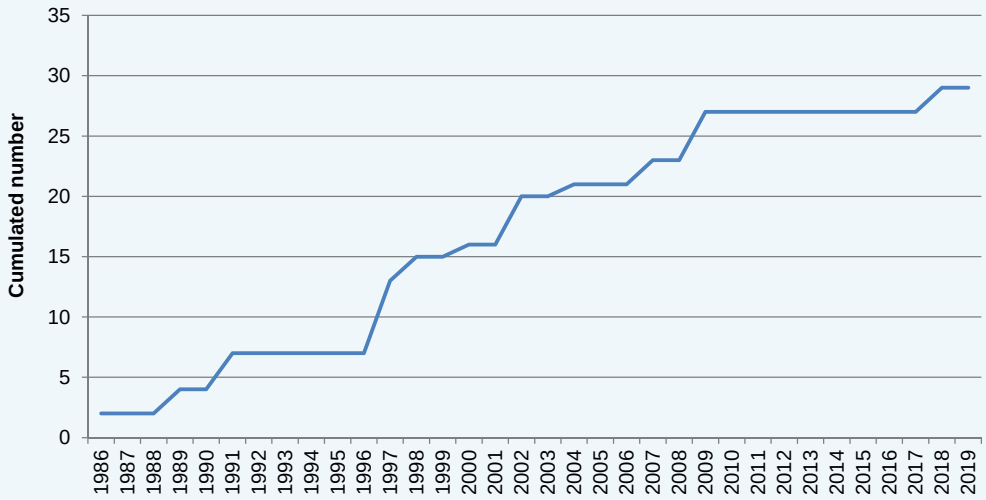
Preserving Europe's natural capital

Main normative/objective references

Direct and indirect means are used to contain biodiversity loss at the national and international levels.
Direct means: actions aimed at direct protection of species and ecosystems, such as protected areas institution (Framework Law 394/91) and Natura 2000 network (Habitats Directive 92/43/EEC e Birds Directive 2009/147/EC). Concerning the latter two measures, in recent years, the increase in protected areas has mainly concerned the marine environment.
Indirect means: actions to reduce pressure sources.

Trend analysis

The time series (1922-2019), shows a constantly positive trend as for the number and surface of protected areas, especially since the application of the 1991 Framework Law.
871 protected areas have been instituted in Italy, covering more than 3 million hectares, the 10.5% of National territorial surface (VI EUAP 2010 - Official list of protected areas).
Nevertheless, data (by themself) do not allow to evaluate the effectiveness of biodiversity conservation as a direct result of governance/management in the protected areas.
To strengthen the management capabilities in these areas, it should be necessary to speed up the approval procedure of management tools. Moreover, the Official list of protected areas update is expected. The last update was in 2010. Since then, protected areas (number and surfaces) have risen due to new institutions.



Annual change in cumulated number of the 29 protected marine areas

Data source: EUAP and MATTM. Data processing by ISPRA.

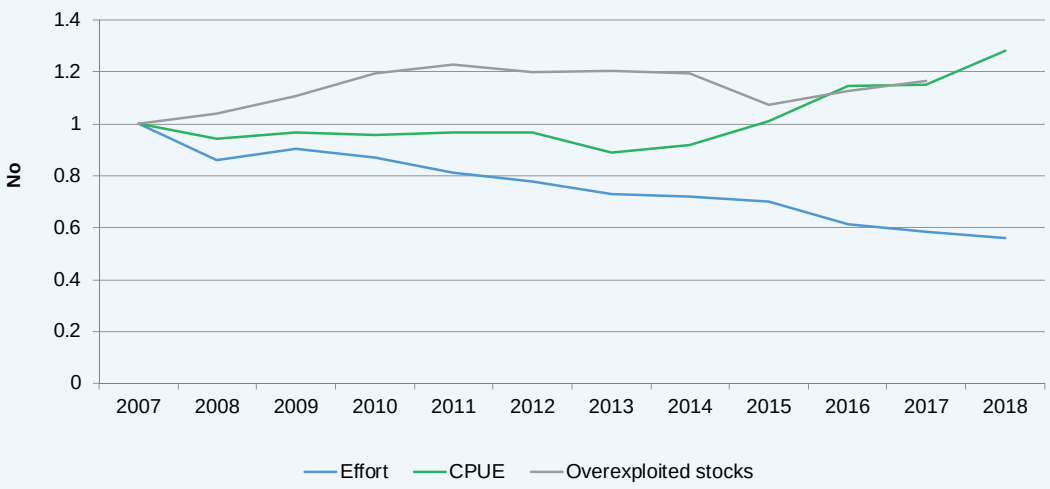
Preserving Europe's natural capital

Main normative/objective references

Direct and indirect means are used to contain biodiversity loss at the national and international levels.
Direct means: actions aimed at direct protection of species and ecosystems, such as protected areas institution (Framework law 394/91) and Natura 2000 network (Habitats Directive 92/43/EEC e Birds Directive 2009/147/EC). Concerning the latter two measures, in recent years, the increase in protected areas has mainly concerned the marine environment. Indirect means: actions to reduce pressure sources.

Trend analysis

Observing the process of setting up the 29 marine protected areas between 1986 and 2019, there has been a stronger boost since the 1990s. Nevertheless, data do not allow (by themself) to evaluate the effectiveness in terms of biodiversity conservation as a direct result of governance/management in the protected areas.
To strengthen the management capabilities in these areas, it should be necessary to speed up the approval procedure of management tools. Moreover, the Official list of protected areas update is expected. The last update was in 2010. Since then, protected areas (number and surfaces) have risen due to new institutions.



Trend of the main national indicators relating to fishing pressure

Data source: STECF & CGPM international stock assessment; Mably; Mipaaf - National fisheries data collection programme. Data processing by ISPRA.

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European Green Deal

Preserving Europe's natural capital

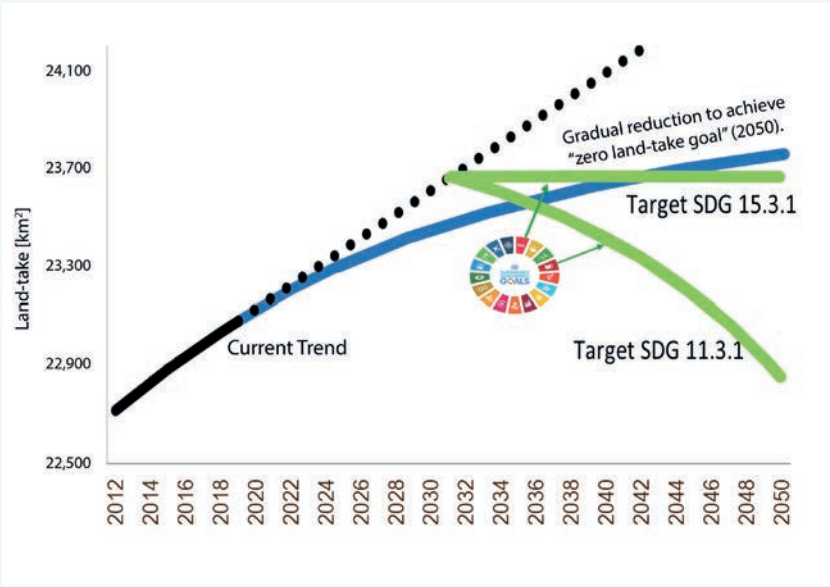
Target

Main normative/objective references

Council Regulation (EC) No 2371/2002 concerning *"conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy"*; objective: to balance fishing capacity with fishing opportunities.
Council Regulation (EC) No 1967/2006 concerning *"management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea"*, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94.
Regulation (EU) No 1380/2013 of the European Parliament and the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. Objective: *"to reach the objective of progressively restoring and maintaining populations of fish stocks above biomass levels capable of producing maximum sustainable yield, the maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and, on a progressive, incremental basis at the latest by 2020 for all stocks"*.
Ministerial decree 30 January 2018 (and subsequent changes), concerning the adoption of National Management Plans for demersal fishing fleets (GSA 9, 10, 11, 16, 17, 18 e 19).

Trend analysis

During the period 2007-2017 it is noted that the vast majority of the stocks assessed are in a state of overfishing due to the fishing activity. This exploitation increased from 77.8% to 93.6% (2007-2013), showing a state of overfishing for the majority of the stock evaluated. Recently the percentage of overfished stocks has been reduced, reaching 83.7% in 2015 and 90.7% in 2017.
The fishing effort has declined steadily since 2004, increased between 2008 and 2009 and finally resumed to decrease until, in 2018, lower values of 40% compared to 2007 levels. Since 2015 CPUE (Catches per unit effort) are above 2007 levels and continue to increase to 11.7 kg/day in 2018.



Land-take trend

Data source: ISPRA

Preserving Europe's natural capital

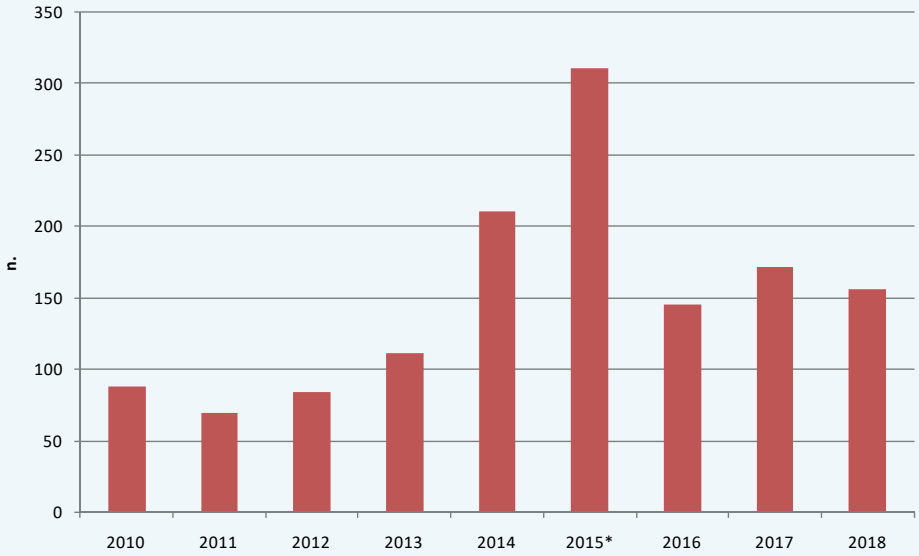
Main normative/objective references

The European environmental action programmes and Agenda 21 aim to sustainable land use, nature protection and biodiversity conservation, by the way. The European Commission has been committed to promoting more sustainable soil and land use for years. Zero land-take goal had been defined in Soil Thematic Strategy, (COM (2006) 231, later withdrawn).
By 2020, European Commission policies should take into account their direct and indirect impacts on land-take.
The Roadmap to a Resource Efficient Europe (COM (2011)571), sets the milestone of *"no net land take in Europe by 2050"*.
This aim is strengthened by the approval of the 7th Environmental Action Programme (European Parliament, 2013).
The European Commission has set out the priorities for action and how to achieve this objective. Guidelines on best practice to limit, mitigate or compensate soil sealing (SWD (2012) 101) were published in 2012.
Land monitoring is also present in the UN Global Agenda for Sustainable Development and its Sustainable Development Goals (Sustainable Development Goals - SDGs), to be achieved by 2030. Some of the latter concern soil sealing and land-take (Goal 11 *"Make cities and human settlements inclusive, safe, resilient and sustainable"*; Goal 15 *"Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"*).
Since there is no national reference law, there are no specific objectives. However, Italy is required to respect the Community objectives and those set out in Agenda 2030.

Trend analysis

At the current transformation rate, land-take will amount to 1,461 km² (2019-2050); 1,741 km² (the same last three-year rate); about 8,000 km² (maximum rate registered in the 2000s).
A gradual (hypothetical) decrease in the transformation rate of 15% every three years, would lead to an increase of artificial areas of 677 km² ("zero quota" by 2050).
All these figures are far from the Agenda 2030 sustainable goals which, on the ground of the current demographical forecast, entail a negative balance in land-take. It means that since 2030, the development of *"sustainability"* would ask for a net increase in natural areas (between 309 km² and 970 km²) to be recovered since 2019 and to ensure a sustainable development.

MAIN LANDSLIDES



Main landslides

Data source: ISPRA

* high numerical values in 2015 are due to the experimental contribute of Autonomous Regions/Provinces

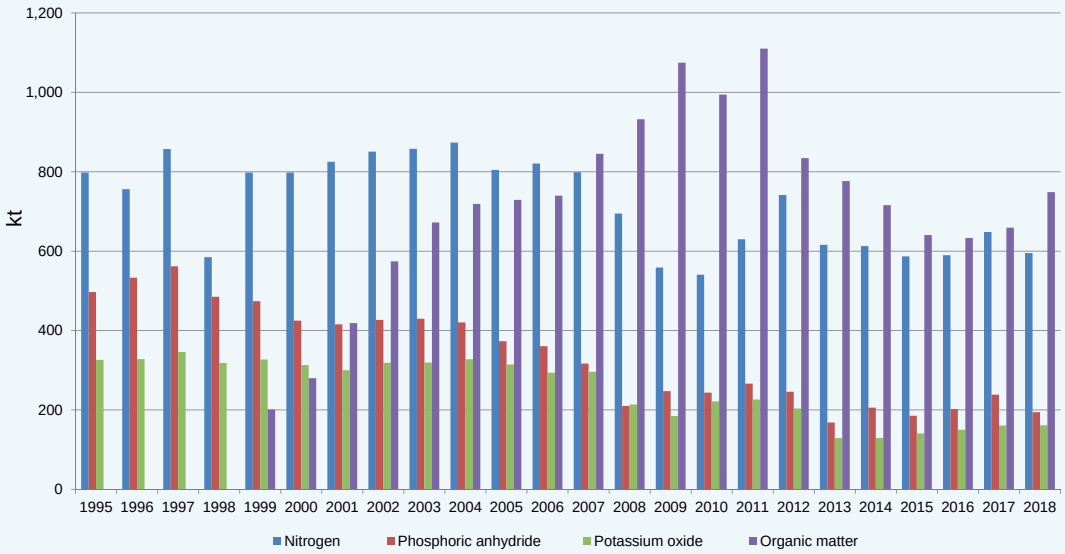
Main normative/objective references

Except for the Royal Decree No 3267, (December 1923), which is focused on hydro-geological restrains, forest management and hydrological and forest set-up of mountain basins, Italy has been late for a long time on laws promulgation requiring to consider natural phenomena, such as landslides and floods, through the territorial/urban planning.
Law No 183, 18 May 1989, is the first organic standard for a functional organization of soil protection. It identifies the hydrological basin as the reference territorial base to the hydro-geological protection and the Basin Authority as the institution responsible for drafting the basin plan. The latter is essential with regard to territorial planning and arranging works scheduling. It is considered as of higher validity than regional, provincial or local acts. However, Law 183/89 has not been fully implemented until Sarno catastrophic event (5 May 1998). The Decree-Law No 180/1998, converted into Law 267/1998, sped up seeking, surrounding and classifying hydrogeological hazard/risk areas, with regard to landslides and floods; as well as the adoption of hydrogeological basin plans (PAIs) and safeguard measures.
PAIs issued by District Basin Authorities (former Basin Authorities) are essential for proper territory planning since they set out the application of land use legal constraints and regulations. Law No 183/89 has been repealed and (partially) incorporated in Decree No 152/2006. PAIs consist in dynamic tools, so they have been integrated and modified by Basin Authorities (as a result of new studies and surveys, as well as new hydrogeological events) by the end of structural risk mitigation actions or at local Authority request.

Trend analysis

Main landslides are considered to be the cause of: casualties, injuries, evacuations and damage to buildings, cultural heritage, linear primary communication infrastructure and service networks on national territory throughout the year.
The above graph shows the phenomena trend (2010-2017). 2015 data are anomalous due to a different information collecting methodology. In 2015 Autonomous Regions/Provinces gave an experimental contribution to the indicator.
It can be observed a growing trend (2010-2017) regarding landslide events with significant consequences.

SUPPLY OF FERTILIZERS FOR AGRICULTURAL USE (COMPOSTS, SOIL IMPROVERS, CORRECTIVES)



Plant nutrients contained in fertilizers

Data source: ISTAT

2 ZERO HUNGER | European Green Deal: Preserving Europe's natural capital | European Green Deal: Farm to fork | Target

Main normative/objective references

Legislative Decree No 75/2010 (and subsequent amendments) regulates fertilisers production and placing on the market.

Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources. It also introduces specific measures regarding *"land-application of all nitrogen-containing fertilizers and in particular, specific limits for the application of livestock manure and nitrate concentration in freshwaters"*.

Based on the Council Directive: Ministerial Decree 19 April 1999 *"Code of good agricultural practice"*, provides addresses for proper use of nitrogen fertilisers; Ministerial Decree 25 February 2016 lays down technical rules on manure, sewage and digestate uses.

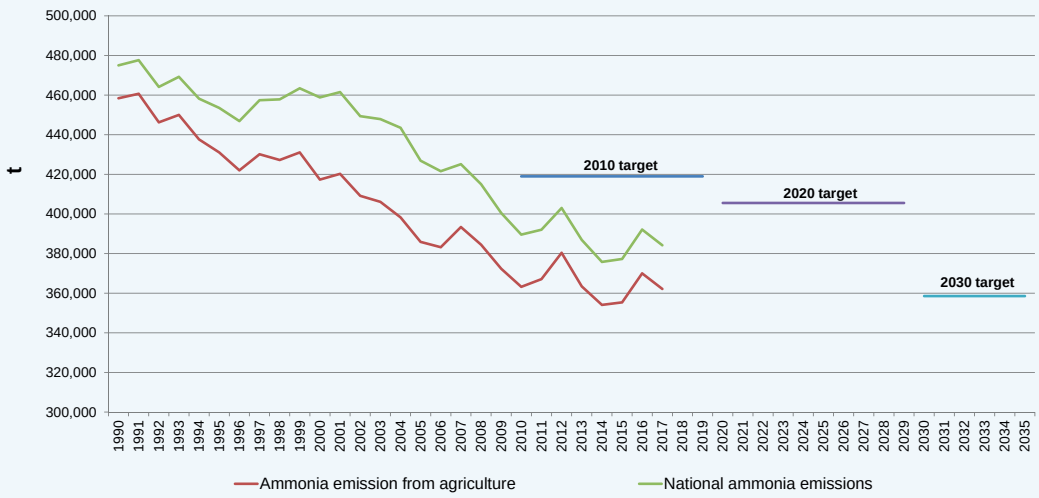
With regard to the circular economy development, it is seen as essential the Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products, amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009, repealing Regulation (EC) No 2003/2003 (amending since July 2022). In order to *"not have an adverse effect on human, animal or plant health, on safety, or on the environment"*, this Regulation stresses the *"need to make use of recycled or organic materials for fertilising purposes"*, beside inorganic/chemicals fertilisers.

Trend analysis

Between 2000 and 2018, nutrients that directly affect the fertility of soil and plants (nitrogen, phosphorus and potassium) tend to differently decrease for each element; while organic matter present in organic fertilizers grows.

In 2018 were distributed about 595 kt of nitrogen, 194 kt of phosphoric anhydride, 161 kt potassium oxide and 749 kt of organic matter. With respect to the national fertilisable surface (no reference to specific nutritional needs of crops or environmental variables), 65 kilograms of nitrogen, 21 kilograms of phosphorus, 18 kilograms of potassium and 83 kilograms of organic matter have been allocated per hectare.

AMMONIA EMISSIONS FROM AGRICULTURE



Ammonia emission trend

Data source: ISPRA

A zero pollution Europe

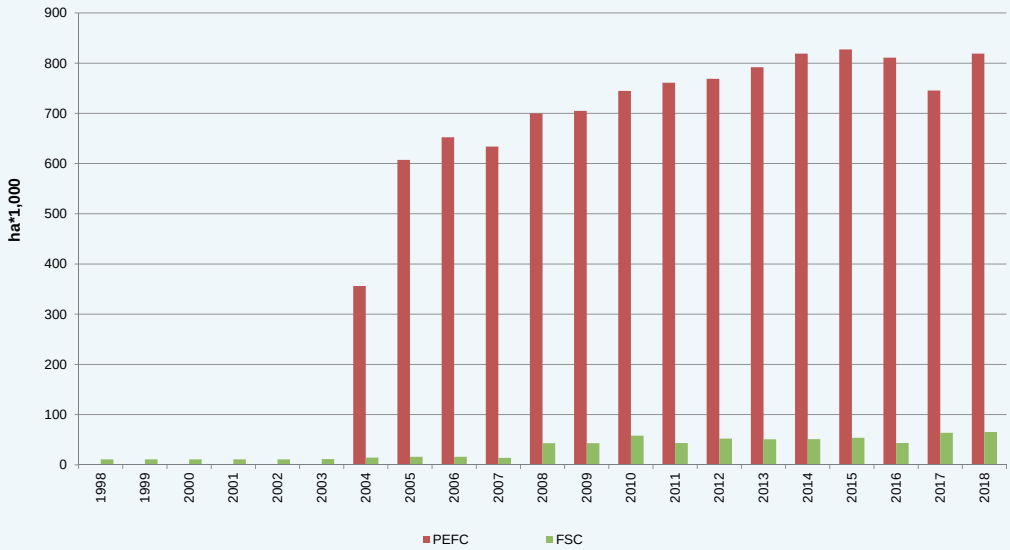
Target

Main normative/objective references

Convention on Long-Range Transboundary Air Pollution (CLRTAP);
Legislative Decree No 81/18, transposing Directive NEC (2016/2284/EU);
Directive NEC (2016/2284/EU) states the target for reducing ammonia emissions by 5% for any year from 2020 to 2029 (as set out by the 2012 update of Göteborg Protocol) and 16% since 2030, compared to 2005 emissions.
Göteborg Protocol (1999), in the context of UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP) and Directive 2001/81/EC (implemented by Legislative Decree 171/04) stated the target for emissions-reducing to 419 thousand tons in 2010.

Trend analysis

With regard to Directive 2001/81/EC *"of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants"*, Italy had already respected in 2008 the national emission threshold of ammonia to be achieved by 2010. This is mostly due to agricultural emissions (about 90% of total ammonia emissions).
Replacing earlier legislation, (Directive 2001/81/EC), the new NEC Directive (2016/2284) sets 2020 and 2030 emission reduction commitments. Italian objectives are as follows: 405.51 thousand tons of ammonia national emissions by 2020 (calculated as a 5% reduction in emissions compared to 2005) and 358.56 thousand tons of ammonia national emissions by 2030 (calculated as a 16% reduction in emissions compared to 2005).
In 2017, the farming sector is responsible for the emission of 362.18 thousand tons of NH_3 in the atmosphere (94.3% of the total national amount), down by 6.2% compared to 2005. That's a remarkable contribution to the achievement of the 2020 objective set for total ammonia. NH_3 emissions trend is in keeping with the targets set.



Italian forest areas certified by PEFC and FSC schemes

Data source: FSC (Forest Stewardship Council); PEFC (Pan-European Forest Certification Council). Data processing by ISPRA.

Preserving Europe's natural capital

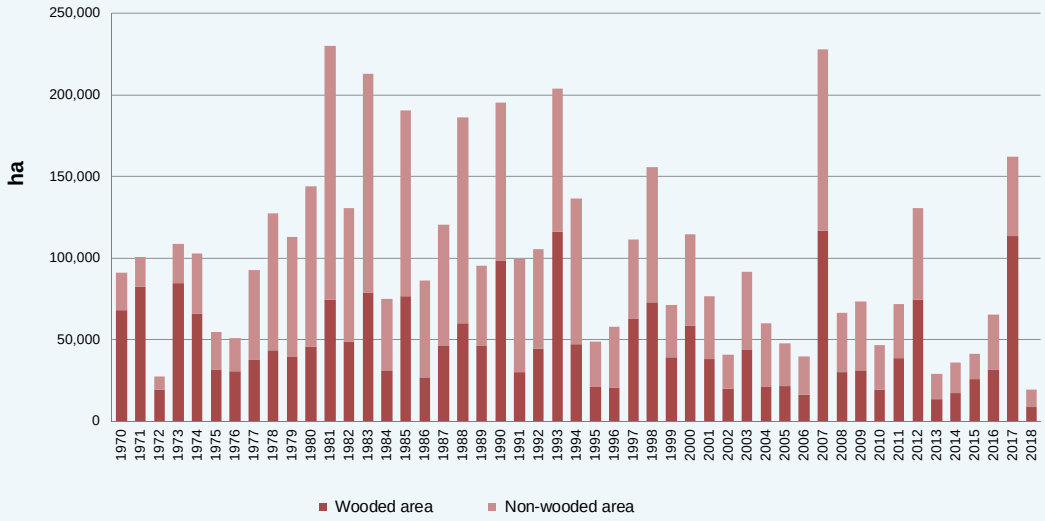
Main normative/objective references

Governments, non-governmental organisations, public opinion, forest heritage companies promote actions for the adoption of international certification schemes.
Compliance with current international, national and regional legislation in the forestry sector is essential to obtain the certification.
Namely:

- Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market, and implementing acts.
- Council Regulation (EC) No 1100/98 of 25 May 1998 amending Regulation (EEC) No 1615/89 establishing a European forestry information and communication system (EFICS)
- Legislative Decree No 34/2018 "Forestry consolidated text", came into force on 5 May 2018.

Trend analysis

By the 31st of December 2018, the Italian forest area certified by P*rogramme for Endorsement of Forest Certification schemes* (PEFC™) amounted to 819,021 hectares; forest area certified by *Forest Stewardship Council®* (FSC®) amounted to 65,427 hectares, while double certified forest area (PEFC-FSC) amounted to 52,067 hectares.
Compared to previous year PEFC certification has risen by 10%, due to new adherent regions (Lazio and Marche), while FSC certification has risen by almost 3%. Time-series analysis shows a steady increase in PEFC certified area till 2015 (excepted for 2007), then a downturn occurred in 2016-2017. FSC certified area got a fluctuated trend with a peak in 2018 (65 thousand hectares).



Wooded and non-wooded area covered by fire

Data source: CFS - Corpo Forestale dello Stato; CUFA - Comando Unità Forestali Ambientali e Agroalimentari dell'Arma dei Carabinieri

13 CLIMATE ACTION

European Green Deal

Preserving Europe's natural capital

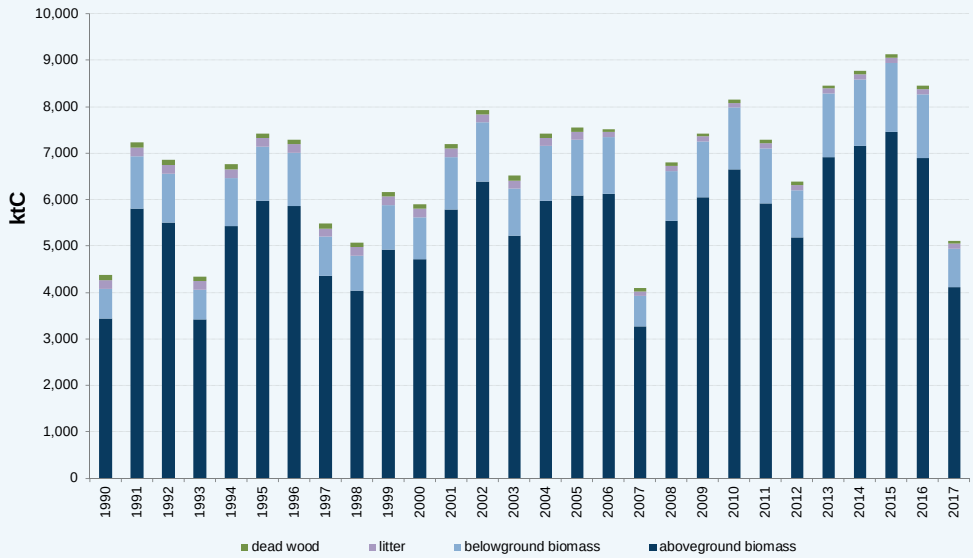
Main normative/objective references

Law No 47 1 March 1975 "Supplementary rules for forest fire protection"
Decree No 428 10 July 1982, converted into Law No 547 12 August 1982 "Urgent measures for civil protection".
Law No 353, 21 November 2000 "Framework law on forest wildfire". That's the reference law and prioritises foresight and prevention activities than fire-fighting ones.
The key point is the "Regional forecast, prevention, and forest fires fight plan" (AIB plan), to be carried out by regions, responsible for spatial planning and management of all available resources.
Decree 20 December 2001 "Guidelines on scheduling regional forecast, prevention, and forest fires fight plans" by Council of Ministers Presidency, Civil Protection Department.
2018 Guidelines by Ministry for Environment, Land and Sea Protection (as an implementation of Law No 353, 21 November 2000) "on scheduling forecast, prevention and forest fires fight" into National Parks and National Nature Reserve.

Trend analysis

A fluctuated trend is observed. The mid 80's has been a very critical period. During the following years the levels keep on overall high. Since 2001 it occurred ongoing mitigation. Just two critical years: 2007 and 2012.
2013 and 2014 data have been far below historical averages. Later a resurgence of the phenomenon has been observed (high point in 2017). A significant attenuation is observed in 2018, both respect previous years and averages.

NATIONAL FOREST CONTRIBUTION TO GLOBAL CARBON CYCLE



Carbon stocks change in forest carbon pools

Data source: ISPRA

Preserving Europe's natural capital

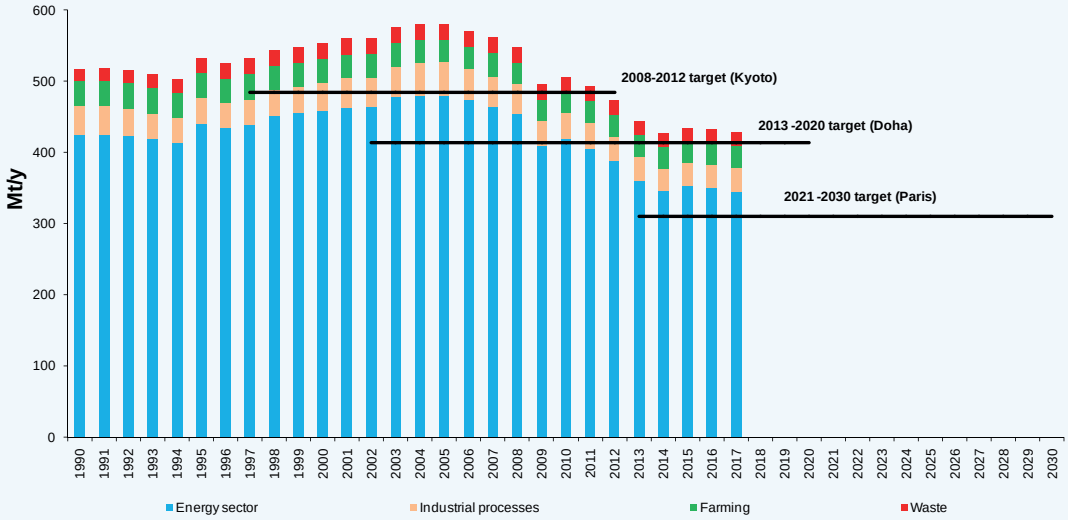
Achieving Climate Neutraly

Main normative/objective references

UNFCCC recognises climate change as one of the most critical threats for humanity and has defined an operating framework to slow down the atmospheric GHGs concentration. The United Nations Framework Convention on Climate Change (UNFCCC), in recognizing climate change as a serious threat, urged countries to take up measures to enhance and conserve ecosystems such as forests that act as reservoirs and sinks of GHGs. In compliance with the United Nations Framework Convention on Climate Change and Kyoto Protocol, Annex I Parties *are required to provide the annual National inventories of emissions and removals of greenhouse gas, not controlled by the Montreal Protocol*, suppling the National Inventory Report (NIR) with emission time-series (since 1990), in compliance with IPCC guidelines adopted by the Conference of the Parties (COP). LULUCF (Land Use, Land Use Change and Forestry) sector of the IPCC, provides estimates of removals and greenhouse gas emissions from land use, land-use change and forestry.
Forestry is the most relevant of land uses.

Trend analysis

Italian forestry carbon stock increases. The balance between greenhouse gas emissions and removals is positive (*carbon sink*).
This is due to forest conservation and protection policy (low deforestation rate) as well as to decreasing wood harvest volumes depending on socio-economic reasons. A significant positive trend is seen in converted into forest areas, because of afforestation and reforestation interventions, both intentional and natural (natural colonization by forest species on former croplands or other). The carbon sink is strongly influenced by the annual incidence of fires and the consequent decrease in carbon removals.
The effect of biomass losses on carbon sink trend (due to fires in 1990, 1993, 2007 and 2017) is clear.
Forests' contribution to climate change mitigation is therefore strongly linked to the planning of effective monitoring, prevention and management of extreme events.
2017 Carbon stock amounted to 611.8 million tons of carbon (MtC): 473.7 MtC (77.4% of total amount) are sinked in aboveground biomass , 95.3 MtC (15.6% of total amount) in belowground biomass, 15.9 MtC in deadwood (2.6% of total amount) and 26.9 MtC in forest litter (4.4% of total amount).



GHGs domestic emissions in CO_2-eq by sector (IPCC classification)

Data source: ISPRA

13 CLIMATE ACTION

European Green Deal

Achieving Climate Neutraly

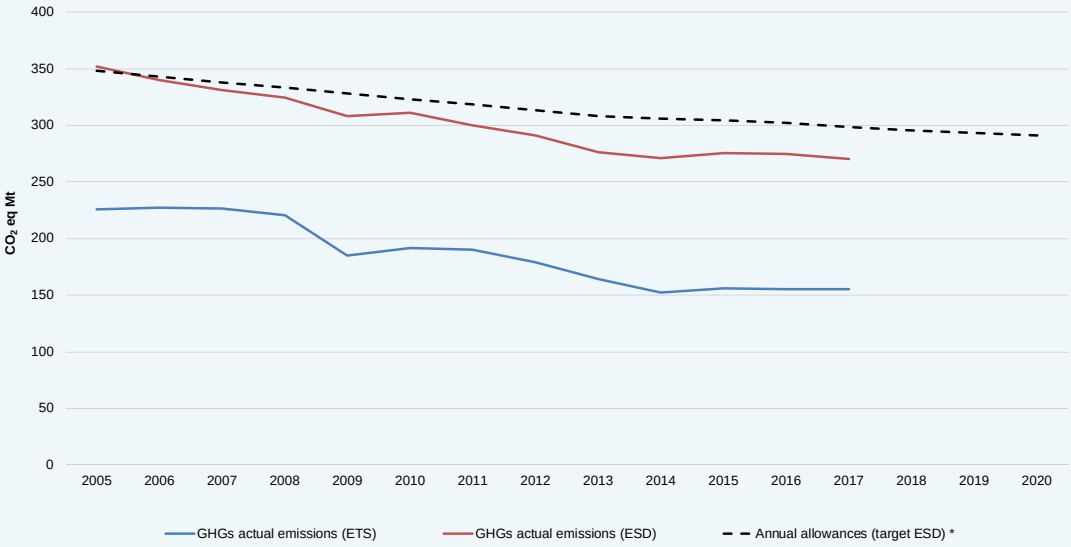
Target

Main normative references/objectives

The Kyoto Protocol signed in 1997, ratified by L 120/2002, in force since 2005, is the enabling tool of the United Nations Framework Convention on Climate Change (UNFCCC). Italy has pledged to reduce its aggregate GHGs emissions by 6.5% compared to 1990 levels in the period 2008-2012.
CIPE Deliberation No 123 (19 December 2002) establishes a GHGs emissions Technical Committee to monitor the implementation of emission reduction policies. In Italy, ISPRA ensures GHGs emission monitoring, in compliance with Legislative Decree No 51 (7 March 2008) and Legislative Decree No 30 (13 March 2013).
Doha Amendment to the Kyoto Protocol has been adopted on the 8 December 2012 to bridge the gap 2013-2020.
A new global agreement has been reached in Paris (December 2015) as for 2020 onwards.
European total GHGs emission reduction targets have been set in Regulation (EU) No 525/2013, on a mechanism for monitoring and reporting greenhouse gas emissions at the national and Union level (up to 2020), and in "2030 Climate & Energy Framework" (by 2030).
EU and its member states agreed to meet – jointly – a 20% reduction target (by 2020) and a 40% reduction target (by 2030), compared to 1990.

Trend analysis

Total GHGs emissions decreased by 17.4%, from 517.7 down to 427.7 million tonnes of CO_2 eq (1990-2017).
It is estimated a 1% decrease from 2016 to 2017. The GHGs overall trend is positive concerning the 2020 target, and it mainly comes from the Energy sector (which represents about four-fifth of total CO_2 emissions during the period 1990-2017).
In 2017, energy sector emissions decreased by 27.9% compared to 2005 and 18.7% compared to 1990.



GHG's emissions trend (ETS & ESD sectors)

* 2006-2012 targets are an interpolation of 2005 and 2013 data. They do not represent the national targets.
Data source: ISPRA

13 CLIMATE ACTION

European Green Deal

Achieving Climate Neutraly

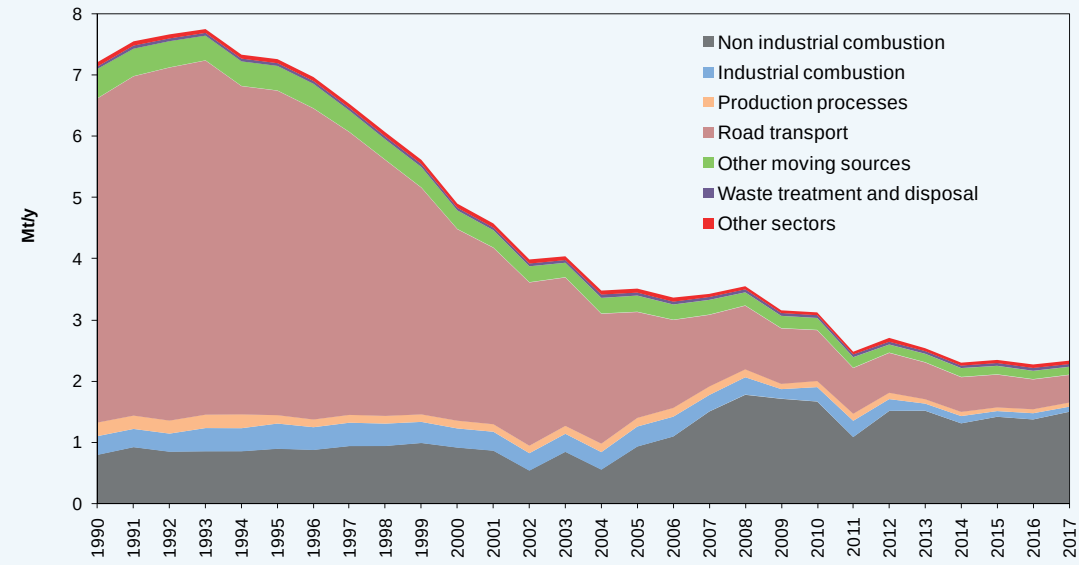
Target

Main normative references/objectives

"Directive 2009/29/EC of the European Parliament and Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (EU-ETS)", setting a single EU threshold with regard to the emission allowances, since 2013. *"The annual decrease of allowances should be equal to 1,74 % of the allowances issued by Member States pursuant to Commission Decisions on Member States' national allocation plans for the period from 2008 to 2012, so that the Community scheme contributes cost-effectively to achieving the commitment of the Community to an overall reduction in emissions of at least 20 % by 2020"*.
Decision 406/2009/EC assigns Italy the target to reduce GHGs emissions by 13% in 2020 compared to 2005 greenhouse gas emissions levels for Annex I sectors: Energy (fuel combustion, fugitive emissions from fuels), Industrial processes, Solvent and other product use, Agriculture, Waste.
Decision 406/2009/EC sets that each Member State has an annual allowance to respect, from 2013 to 2020 (298.3 Mt CO_2 eq in 2017).
Europe updated its climate policy framework as follows: -40% GHGs emissions by 2030 compared to 1990, at least 32% of renewable energy share, at least 32.5% improvement in energy efficiency. The last two targets will be probably upgraded as a consequence of the 2023 review.
In order to achieve the GHGs reduction goals EU-ETS sectors are required to decrease their emissions by 43% (compared to 2005); non-ETS sectors are required to decrease their emissions by 30% (compared to 2005).
Regulation (EU) 2018/842 makes these objectives binding. "Under the ESR proposal, Italy is assigned a 33% emission reduction target in non-ETS sectors to be achieved by 2030 compared to 2005 levels".

Trend analysis

ETS sector emissions decreased by 31.3% in 2017, while ESD sector emissions decreased by 23.2% both compared to 2005.
That's a significant reduction, coming from reducing the impact of industrial sectors and improving efficiency in the civil field as well as from the economic downturn which heavily hit some sectors responsible for the high level of GHGs emissions. In 2017 (compared to 2016) emission grows by 0.2% in ETS sector and decrease by 1.7% in ESD sector.
The emission trend shows that the Country is on track to reach its reduction target by 2020.



Domestic CO emissions by sector

Data source: ISPRA

A zero pollution Europe

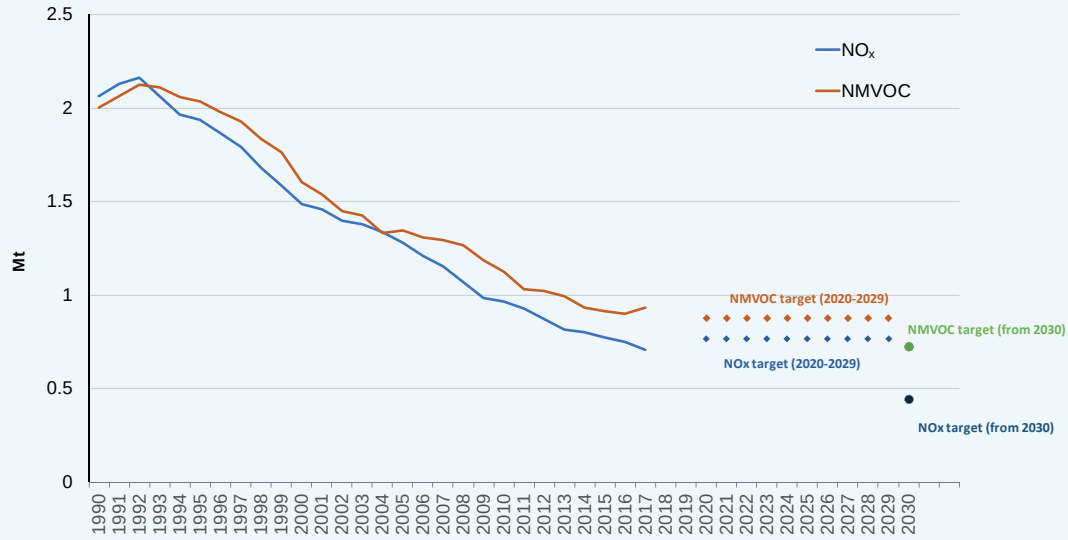
Main normative references/objectives

Italy, as part of UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP), is requested to yearly update the atmospheric emission inventory, which also includes carbon monoxide (CO), *inter alia*.
Legislative Decree No 152, 3 April 2006 ("Environmental Regulations"), part five, regulates air protection and atmospheric pollution reduction. Part five, Annex-I establishes emission limit values to carbon monoxide from production plants. This Decree has been updated by Legislative Decrees No 128/2010 and No 46/2014.
In order to reduce road traffic emissions, many Directives have been issued over the years at European level, leading to a significant reduction.

Trend analysis

CO emissions decrease on the whole, especially since the early '90s (-67.7% between 1990 and 2017), mostly due to road transport emissions (-91.5%).
Despite an overall decreasing trend, sectorial analysis shows some increases: emissions from residential heating systems rose sharply since 1990 (+88.3%) because of wood combustion. That's a critical aspect, especially with regard to urban settings.

EMISSIONS OF TROPOSPHERIC OZONE PRECURSORS (NOx and NMVOC)



Persistent organic pollutants emissions trend

Data source: ISPRA

13 CLIMATE ACTION

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Target

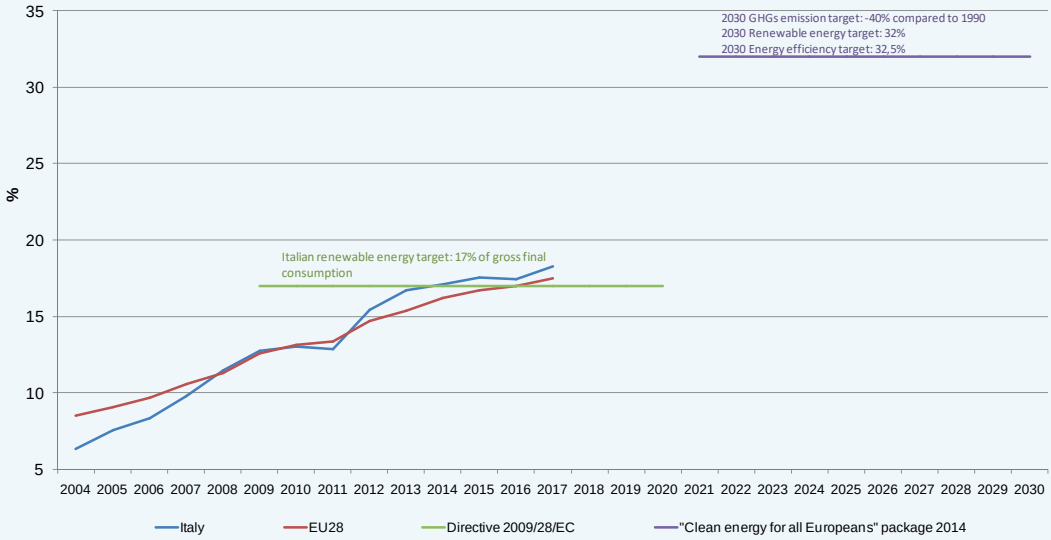
Main normative references/objectives

The Göteborg Protocol (1999) and the Convention on long-range transboundary air pollution (1979, amended in 2012), concern acidification, eutrophication and tropospheric ozone reduction (the European Community adheres the Protocol by Council Decision 2003/507/EC).
Directive 2015/2193/EU (transposed by Legislative Decree No 183/2017) concerns medium combustion plants and laying down rules for air emission control of sulphur dioxide (SO_2), nitrogen oxides (NO_x) and particulates, in order to reduce air emission and potential risks to human health and environment. Directive 2001/81/EC is repealed with effect from 1st July 2018. Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants (transposed by Legislative Decree No 81/2018), sets out *"national emission reduction commitments for any year from 2020 to 2029 and 2030 onwards"* (compared to 2005). With regard to these deadlines, NO_x reduction commitments are -40% and -65% respectively; NMVOC reduction commitments are -35% and -46% respectively.

Trend analysis

Between 1990 and 2017 the emissions of tropospheric ozone precursors are drastically reduced (NO_x -65.6%, NMVOC -53.3%), due to transport sectors (road transport, other moving sources). The percentage of nitrogen oxides reduction defined by Directive 2016/2284 (-40%) has been achieved since 2016: estimated reductions in 2016 and 2017 are respectively -41.3% and -44.6% (compared to 2005 value). However, NMVOC still exceeds the limit, since the decrement achieved in 2017 has been -30.7%, while the reduction percentage requested is -35% (compared to 2005 value).

RENEWABLE ENERGY SHARE IN FINAL CONSUMPTION



Renewable energy share in final consumption

Data source: ISPRA

7 AFFORDABLE AND CLEAN ENERGY

European Green Deal

Achieving Climate Neutraly

Target

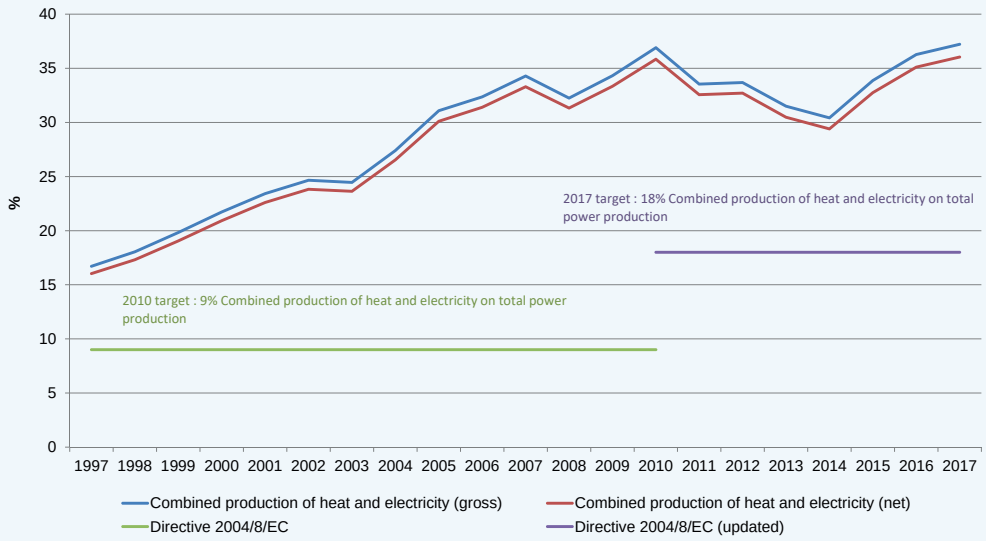
Main normative references/objectives

Directive 2003/30/EC *"on the promotion of the use of biofuels or other renewable fuels for transport"*
Directive 2009/28/EC sets out *"targets for energy from renewable sources, which are expressed as a percentage of gross final consumption of energy" by 2020 for each Member State; consumption for "electricity, heating and cooling or transport fuels from renewable energy sources"* is included.
The Directive *"lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources"*.
Italian *"target for share of energy from renewable sources in gross final consumption of energy, 2020"* is 17%.
Law No 13/2009 (conversion into law with amendment of Decree No 208, 30 December 2008), sets out extraordinary measures concerning water resources and environmental protection.
Legislative Decree No 28/2011 (implementation of the Directive 2009/28/EC), lays down criteria for the implementation of the renewable source by promoting and simplifying the approval procedures.
Current European targets to deal with climate change: -40% GHGs emissions compared to 1990, 32% renewable energy share and 32.5% improvement of energy efficiency.

Trend analysis

Renewable energy use is constantly increasing in the EU: the share is doubled compared to 2004 when it was only 8.5% of gross final energy consumption. Between 2004 and 2016 this share has risen by 0.7% on average each year.
Nationally, renewable energy use share has almost tripled compared to 2004 when it was 6.3% of gross final energy consumption, attesting itself to 18.3% in 2017 (over the 17% to be achieved by 2020).
In order to achieve the long-term target, Italy has to keep its renewable energy share of final consumption to 2014-2017 levels. Up to 2017 Italy was among the few countries to exceed the target.

POWER PRODUCTION FROM COGENERATION PLANTS



Power production from cogeneration plants

Data source: ISPRA

Achieving Climate Neutraly

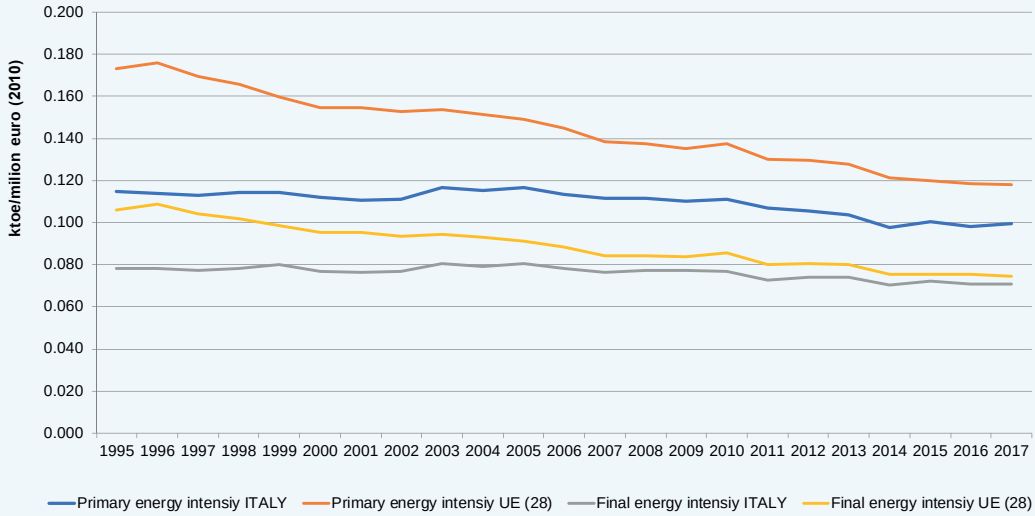
Target

Main normative references/objectives

Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market, and sets *"an overall indicative Community target of doubling the share of electricity production from cogeneration in total EU electricity production from 9% in 1994 to 18% by 2010"*. In Italy, the Directive has been transposed into Legislative Decree No 20/2007.
Decree 05/09/2011 (by Ministry of Economic Development), lays down measures concerning High-Efficiency Cogeneration (CAR). Decree 04/08/2011 complements Legislative Decree No 20/2007, in order to define the criteria to recognise the CAR qualification, since 1st January 2011.
Legislative Decree No 102, 4 July 2014 is the implementation of Directive 2012/27/EU *"on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC"*
7th EAP - Decision No 1386/2013/EU of the European Parliament and the Council.

Trend analysis

Cogeneration share, compared to gross thermal electricity generation, got its highest point in 2017: 52.7% (37.2% of gross total power production). Since 2007, thermal electricity generation began to decrease as a consequence of the economic crisis, reaching the lowest point in 2014 (-33.7% compared to 2007). Since 2015 thermal production is back on the rise and in 2017 there is an increase of 19% compared to 2014; this grow concerns cogeneration plants (29.3%) and (to a lesser degree) the electricity-only plants (9.2%). Cogeneration share compared to the net power production arises from 21.3% to 53.4%. It's easy to observe how net and gross percentages go hand-in-hand.



Primary & final energy intensity

Data source: ISPRA

Achieving Climate Neutraly

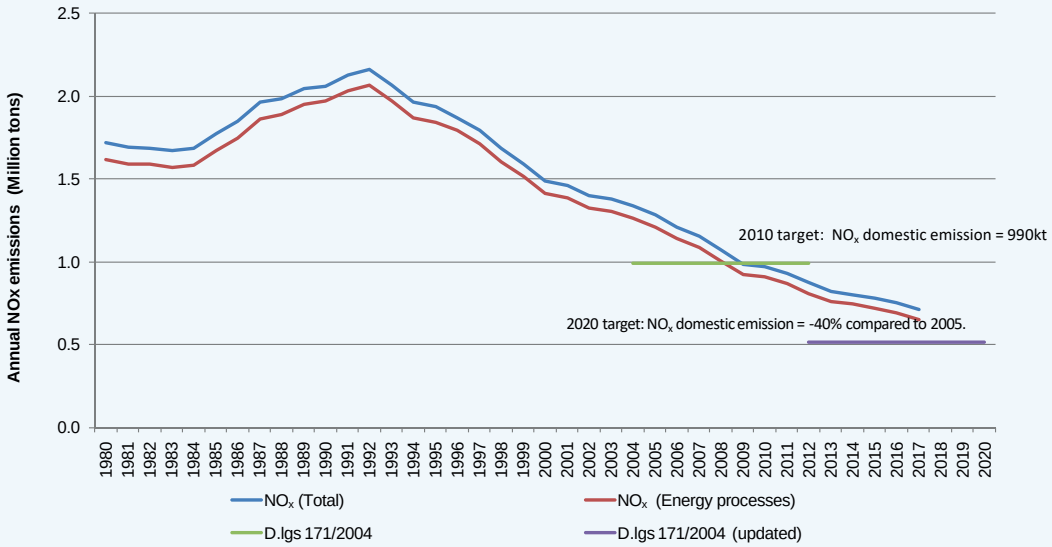
Main normative references/objectives

7th EAP - Decision No 1386/2013/EU of the European Parliament and the Council

Trend analysis

While the year-to-year variation is significant, in the long term a final energy intensity decrease is observed, due to a lesser amount of energy used per GDP unit. On the whole, final energy intensity (1995-2017) dropped by 9.6%.
Both Italian primary and final energy intensity are lower than the European average as a result of the historical lack of primary resources. This led to sparing behaviours and infrastructures with regard to energy use and productive facility (not too energy-intensive), taxation (increasing the cost of end-user energy sources far beyond the average of other Countries), lesser per capita income, relatively warm climate.
Energy intensity time-series shows that European figures are closing to the national ones. Italy is 6th for primary energy intensity in EU ranking.

NITROGEN OXIDES EMISSIONS (OVERALL & FROM ENERGY PROCESSES)



Nitrogen oxides emissions (overall & from energy processes)

Data source: ISPRA

A zero pollution Europe

Target

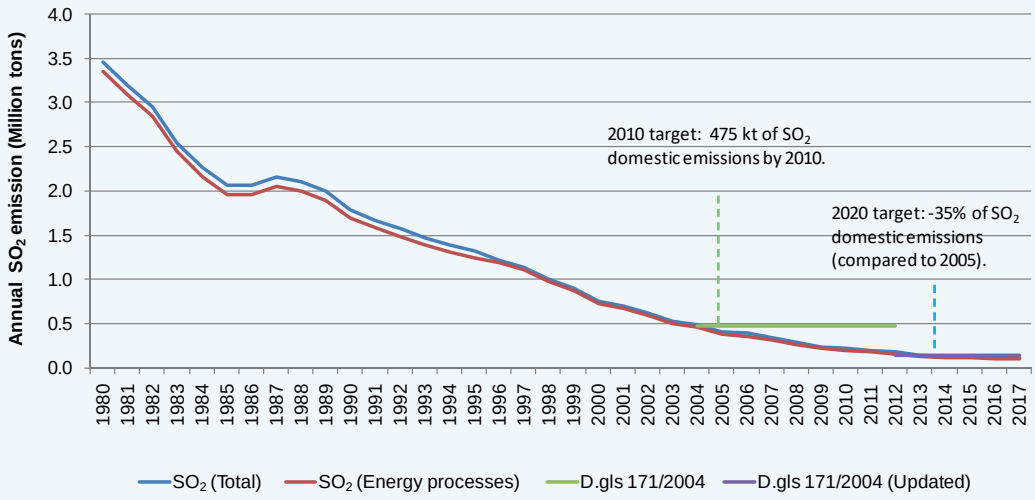
Main normative references/objectives

Convention on long-range transboundary air pollution (Geneva, 1979); Helsinki Protocol on the Reduction of Sulphur Emissions (1985); Sofia Protocol (1988); Oslo Protocol (1994); Göteborg Protocol (1999). Directive NEC 2001/81/EC. In Italy this Directive has been transposed by Legislative Decree No 171/2004 which set out the NO_x national emission limit in 990 kt (by 2010). Directive NEC 2001/81/EC is the transposition at Eu level of the Göteborg Protocol (1999) "*to abate acidification, eutrophication, and ground-level ozone*".
This Protocol has been updated in 2012 with a new NO_x national emission limit (to be reached by 2020).
The target is no longer expressed in absolute value but as a percentage (40% compared to 2005 emission level).
Directive (EU) 2016/2284, reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

Trend analysis

NO_x emission from energy processes decreases (-67.1% in 2017 compared to 1990), because of emission abatement devices in stationary and (mainly) mobile installations.
In 2017, total emissions are 44.6% lower than in 2005, in accordance with international protocols on acidification.
The share of NO_x emission from energy processes (compared to total emissions) is gradually decreasing from 1996 until 2017, from 95.3% to 91.5%.

SULPHUR DIOXIDE EMISSIONS (OVERALL & FROM ENERGY PROCESSES)



EECs and energy savings time-series

Data source: ISPRA

A zero pollution Europe

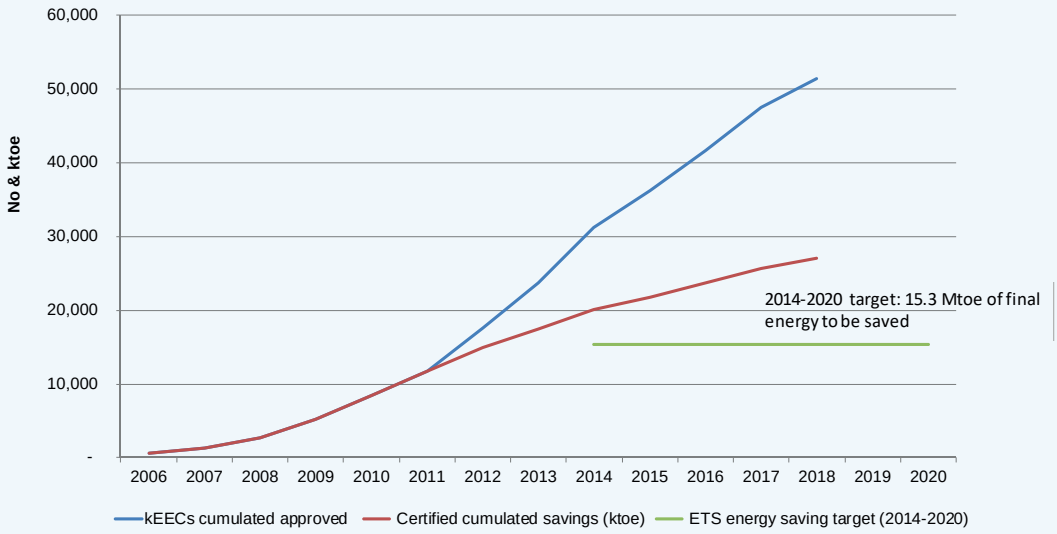
Target

Main normative references/objectives

Convention on long-range transboundary air pollution, (Geneva, 1979); 794 (1985) on the Reduction of Sulphur Emissions or their Transboundary Fluxes; Oslo Protocol (1994); Göteborg Protocol (1999); Legislative Decree No 112/2014 – transposition of Directive No. 2012/33/EU amending Directive 1999/32/EC *"relating to a reduction in the sulphur content of certain liquid fuels"*.
Directive (EU) 2016/2284, reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.
Directive NEC 2001/81/EC. In Italy this Directive has been transposed by Legislative Decree No 171/2004 which set out the SO_2 national emission limit in 475 thousand tons (by 2010).
Directive NEC 2001/81/EC is the transposition at the EU level of the Göteborg Protocol (1999) *"to abate acidification, eutrophication and ground-level ozone"*. This Protocol has been updated in 2012 with a new SO_2 national emission limit (to be reached by 2020). The target has no longer expressed in absolute value but as a percentage (35% compared to 2005 emission level).

Trend analysis

Sulphur dioxide emissions from energy processes decrease (-94% in 2017 compared to 1990 and -97% compared to 1980) due to cleaner fuels. It hitherto ensures compliance with international acidification protocols.
Overall emissions decrease by 71.9% in 2017 compared to 2005.
In 2017 energy processes have been responsible for 87.9% of the overall SO_2 emissions.
Reduction in the sulphur content of fuels used in energy processes and suitable emissions abatement systems, lead to a lower contribution by these processes to SO2 emissions (from 97.7% in 1996 to 87.9% in 2017).



EECs and energy savings time-series

Data source: ISPRA

Achieving Climate Neutraly

Target

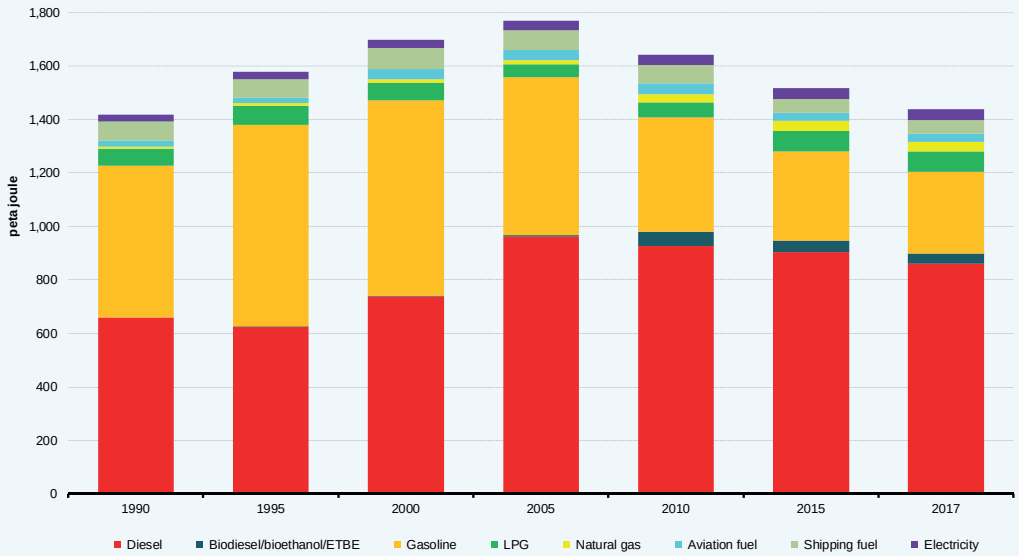
Main normative references/objectives

White certificates scheme (also known as Energy Efficiency Credit system) has been adopted in 2001 by several Ministerial decrees, in order to stimulate the establishment of energy efficiency measures with regard to the energy final uses. The EEC system chanced over time in accordance with legislative progress.
Following the commitments stated in *"2020 climate & energy package "*, the National Energy Strategy (SEN 2013) sets the national objectives: a primary energy saving (with respect to the reference consumption and based on an inertial evolution of the system - Primes Model, 2008) equal to 20 Mtoe/year by 2020, with 5.5 Mtoe/year to be achieved by the EEC system. These objectives have been reformulated by Legislative Decree No 102/2014 (transposition of Directive 2012/27/EU), redefining the minimum cumulative saving in 25.5 Mtoe of final energy, to be achieved between 2014 and 2020; the EEC system should guarantee the 60% of the objective: 15.3 Mtoe of final energy to be saved.

Trend analysis

Overall, 27 Mtoe of additional saves in primary energy and 51.3 million of energy efficiency credits have been certified (2006-2018). In 2018, the cumulative volume of EECs increases by 8.1% (compared to 2017).
The annual value of 2018 credits amount to about 3.8 million (equal to about 1.3 Mtoe of certified savings).
In recent years, credits and savings performances slow down (compared to 2013 and 2014 volumes).
From 2012, the discrepancy between approved EECs and certified savings is caused by the adoption of a durability "tau" coefficient which brings forward, in terms of useful life years, the certificates related to the achievable savings during the whole technical life of the project.

FINAL ENERGY CONSUMPTION (TRANSPORT SECTOR)



Final energy consumption (transport sector)

Data source: MISE, Eurostat. Data processing by ISPRA

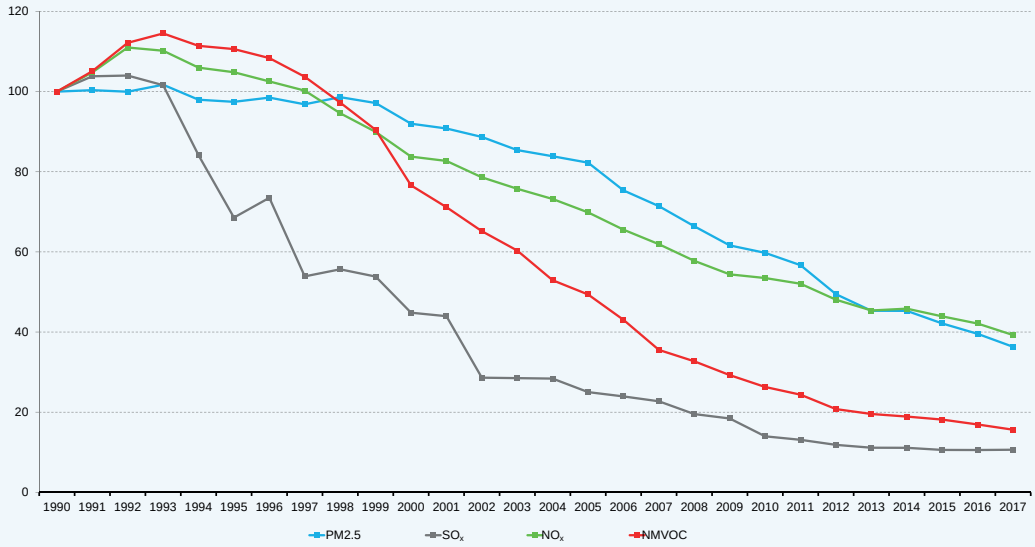
Achieving Climate Neutraly

Main normative references/objectives

The objectives set out at the Community level are as follows: achieving sustainable levels of energy use in transport, reducing greenhouse gas emissions from this sector and decoupling economic growth from transport demand in order to reduce environmental impacts (EU Council, 2006). Given the high cost of fuels and the need to reduce strategic dependence on these raw materials, the potential of each mode of transport should be optimised. Fuels used for road transport in the EU must meet strict quality requirements for the protection of human health and the environment, and to ensure that vehicles can travel safely from one country to another. Directive 2009/30/EC on fuel quality asks for a reduction to *"at least 6% by 31 December 2020, compared to the EU-average level of life cycle greenhouse gas emissions per unit of energy from fossil fuels in 2010"* ; together with Directive 2009/28/EC on "the promotion of the use of energy from renewable sources", regulates biofuel sustainability. Directive 2009/28/EC states that *"Each Member State shall ensure that the share of energy from renewable sources in all forms of transport in 2020 is at least 10% of the final consumption of energy in transport in that Member State"* .
2017 National target regarding the share of renewable sources in overall energy consumption by the transport sector (National Action Plan) is equal to 8%. The EC "White Paper 2011" provides as follow:
"halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030;
low-carbon sustainable fuels in aviation to reach 40% by 2050; also, by 2050 reduce EU CO_2 emissions from maritime bunker fuels by 40% (if feasible 50%)".

Trend analysis

Road transport and fossil fuel get the main share in total, compared to fuel used in national aviation, shipping and rail transport (electricity). Considering the 1990-2017 lapse of time, final energy consumption in the transport sector increases starting from the '90s and decreases since 2005. The reduction is due both to the higher energy efficiency of motor vehicles and to the 2008 economic crisis. The latter resulted in a traffic fleeting stabilisation and freight traffic decreasing. The increase in diesel consumption is noteworthy (more than half of the total consumption since 2005) as well as biodiesel, bioethanol, ETBE (ethyltertbutylether) and natural gas (2-3% during the last years); in contrast, gasoline consumption decreases (around one-fifth of the total, since 2015). LPG share is stable; just a slight increase during the last years (around 5% since 2015).



Emission trends of pollutants from the transport sector (1990-2017). Index number, base value 1990=100

Data source: ISPRA

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

European Green Deal

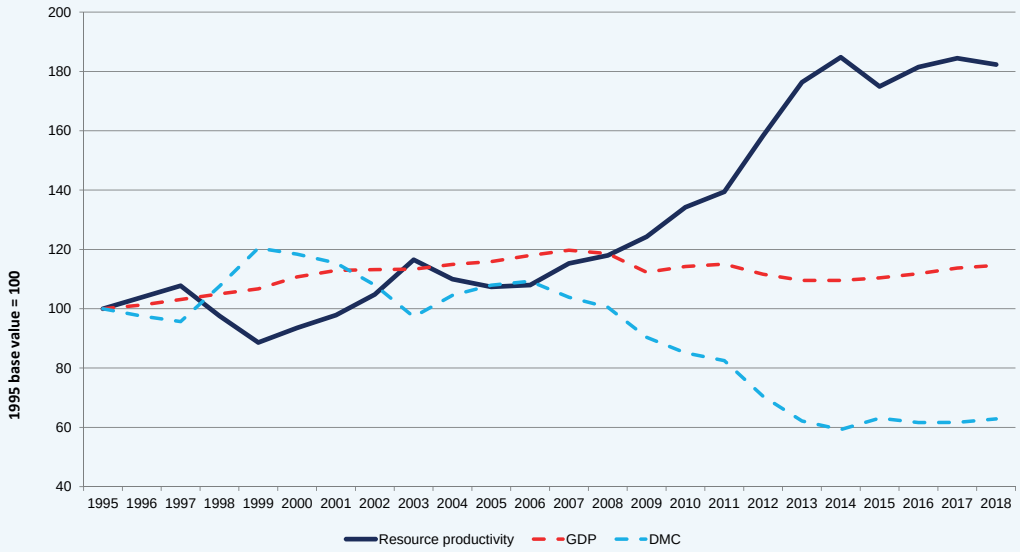
A zero pollution Europe

Main normative references/objectives

Directive 91/441/EEC (EURO 1) requires the installation of emission-reducing devices on all registered petrol-fuelled vehicles (since 1st January 1993).
At EU level, pollutant emissions from road vehicles are regulated separately according to the distinction between light vehicles (cars, light commercial vehicles) and heavy vehicles (lorries, buses); the most recent measures on pollutant emissions come from the Regulation No 715/2007/EC on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and from Regulation No 595/2009/EC on type-approval of motor vehicles and engines with respect to emissions from heavy-duty vehicles (Euro 7).
As regards the sulphur content of marine fuels, Legislative Decree No 205/2007, transposing Directive 2005/33/EC, lays down a 1.5% ceiling. Shipping and aviation emissions are regulated at the international level.

Trend analysis

Since the early '90s, the emissions of particulate matter (PM2.5), sulphur oxides (SO_x), nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOC) drastically drop; this is due to the technological innovation for emissions reduction in road transport, implemented by the above-mentioned European directives.
The drastic drop occurred despite the increase of distance travelled (vehicle/kilometer) as well as of goods and passengers transported during the pre-crisis years. The economic crisis has further contributed to the transport emissions to decrease.



Resource productivity, Domestic material consumption, GPD: Italian trends (1995-2018)

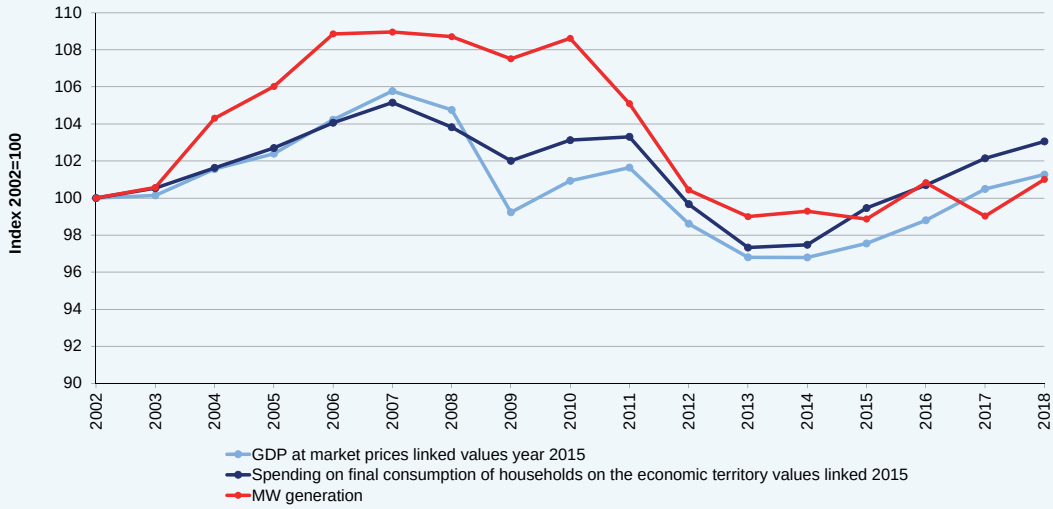
Data source: Eurostat

Main normative references/objectives

No specific objectives concerning material consumption and resource productivity are set by the Italian legislation.
'Resource productivity' and 'Domestic material consumption' are used as lead indicators to monitor resource use and circular economy policies at the European level.
UN Agenda 2030 (Goals 8 and 12) states:
"8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead;
12.2 By 2030, achieve the sustainable management and efficient use of natural resources."

Trend analysis

Resource productivity – GDP (Gross Domestic Product) divided by DMC (Domestic Material Consumption) – has almost doubled from 1.87 Euro per kilogram in 1995 to 3.41 Euro per kilogram in 2018. A significant contribution to achieving this result comes from a reduction of productive activities (2008 economic and financial crisis) as well as from a significant decrease in domestic extraction (which is the most important part of Italian DMC).
Overall, Italian resource productivity is high: 3rd place in 2018 GDP/DMC ranking, behind The Netherlands and UK.



Municipal waste generation: trend and main socio-economic indicators

Data source: ISPRA and ISTAT. Data processing by ISPRA

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

European Green Deal

Transition to a Circular Economy

Target

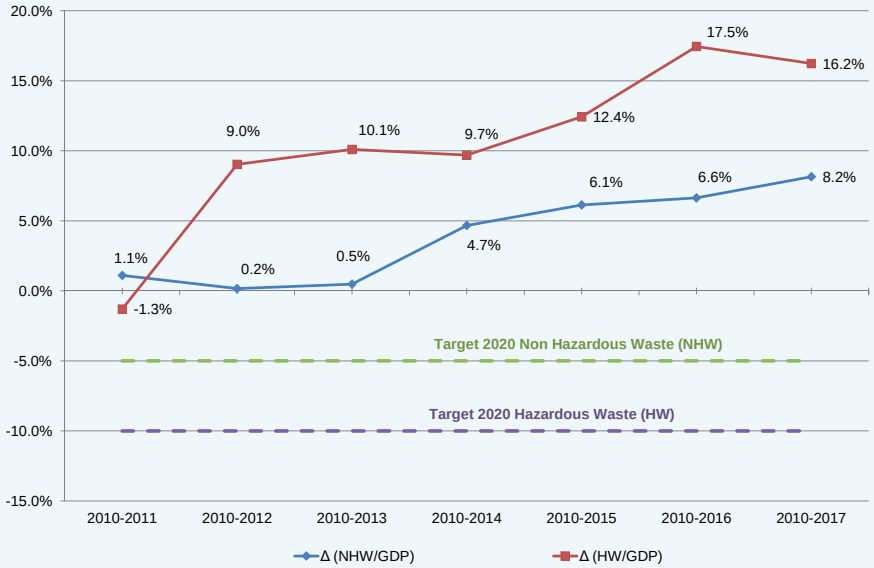
Main normative references/objectives

Decision No. 1600/2002 launched a consultation with a view to setting new aims.
Directive 2008/98/EC establishes the following hierarchy for waste prevention and management:
• prevention; • preparing for re-use; • recycling; • other waste recovery (e.g.: energy recovery); • disposal.
Concerning municipal waste re-use and recycling, Article 11 of the Directive (transposed by Legislative Decree No 152/2006 Article 181 and amended by Legislative Decree 205/2010), requires the Member States to adopt measures to achieve, by 2020, at least 50% in weight for the following typologies: paper, metals, plastic, and glass from private households.
Further objectives have been fixed by Directive 2018/851/EU as for preparing for re-use and recycling, to be achieved by 2025 (55%), 2030 (60%) and 2035 (65%). The National Programme for waste prevention (Directorial Decree 7th October 2013) lays down as a prevention target by 2020 (compared to 2010 figures) a 5% decrease in municipal waste generation per GDP unit.

Trend analysis

In 2018, national generation of municipal waste grows by 590 thousand tonnes (+2%) compared to 2017; almost 30.2 Million tonnes on the whole. After the decrease in 2017, the production therefore again exceeds 30 million tonnes, as in 2016 (30.1 Million tonnes). The long-term trend (1997-2018) shows an improvement (-13.4% decrease).

WASTE GENERATION FROM ECONOMIC ACTIVITIES (HAZARDOUS AND NON-HAZARDOUS WASTE)



Percentage change in non-hazardous waste generation/GDP ratio and hazardous waste generation/GDP ratio.
Data source: ISPRA, ISTAT. Data processing by ISPRA

Transition to a Circular Economy

Target

Main normative references/objectives

Decision No. 1600/2002 launched a consultation with a view to setting new aims.
Directive 2008/98/EC establishes the following hierarchy for waste prevention and management:
• prevention; • preparing for re-use; • recycling; • other waste recovery (e.g.: energy recovery); • disposal.
The National Programme for waste prevention (Directorial Decree 7 October 2013) lays down the following targets (by 2020, compared to 2010 figures):
10% reduction in hazardous waste generation per GDP unit;
5% reduction in non-hazardous waste generation per GDP unit.
Targets may be changed according to new data available.

Trend analysis

Data analysis shows a sharp increase in production between 1997 and 2006; then a decreasing trend up to 2009.
In 2010 and 2011, due to the economic and financial crisis in our Country, a further decrease took place in waste generation from economic activities (-10%). Between 2011 and 2018, national waste generation from economic activities rises again (+15%).
Between 2010 and 2017 the shift of two ratios (non-hazardous waste generation/GDP unit and hazardous waste generation/GDP unit) is positive, compared to 2010 figures. Therefore, Italy is far from objectives set by the National Programme for waste prevention (Directorial Decree 7 October 2013).

SEPARATED WASTE COLLECTION

Trend of separated municipal waste collection on total generation (percentage)

Data source: ISPRA

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

European Green Deal

Transition to a Circular Economy

Target

Main normative references/objectives

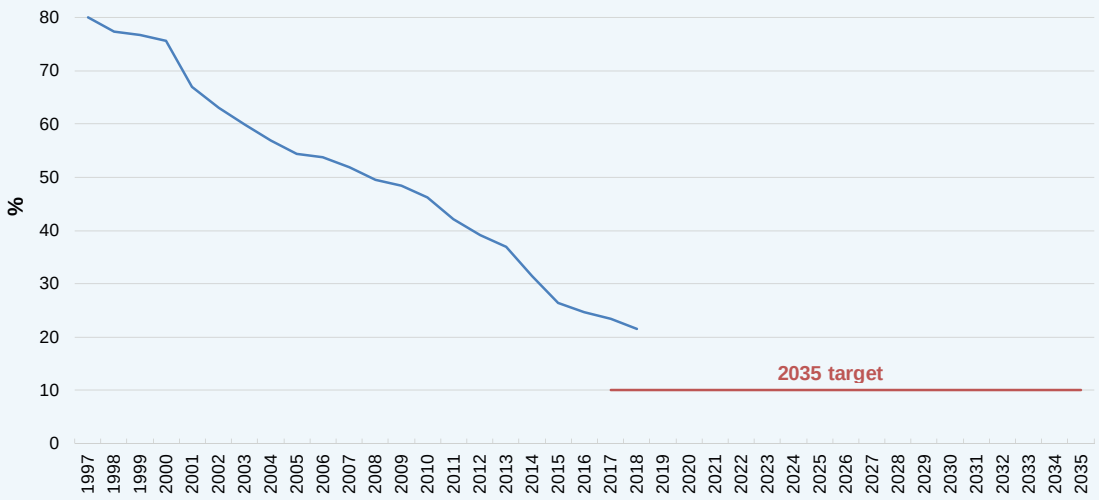
Legislative Decree No 22/97, Article 24, paragraph 1, provided: *"In every suitable area must be ensured separated municipal waste collection, as minimal percentage of the total, as follows: a) 15% within two years after the entry into force of the decree; b) 23% within four years after the entry into force of the decree; c) 35% beginning from the sixth year from the entry into force of the decree."*

Legislative Decree No 152/2006, Article 205, paragraph 1 and Law No 296, 27th December 2006, set as follows: 35% by 31st December 2006; • 40% by 31st December 2007; • 45% by 31st December 2008; • 50% by 31st December 2009; • 60% by 31st December 2011; • 65% by 31st December 2012.

Trend analysis

Separated collection percentage in 2018 amounts to 58.1% of total national generation (+2.6% compared to 2017). Such an increase isn't enough to achieve the objective (65% by 2012). Due to the adoption of the regulatory objectives included in the Legislative Decree No 152/2006 and in Law No 296, 27th December 2006, the rise proceeds at a slower pace than required by the legislation.

LANDFILLED MUNICIPAL WASTE (PERCENTAGE)



Landfilled municipal waste compared to the total of municipal waste generated (trend)

Data source: ISPRA

Transition to a Circular Economy

Target

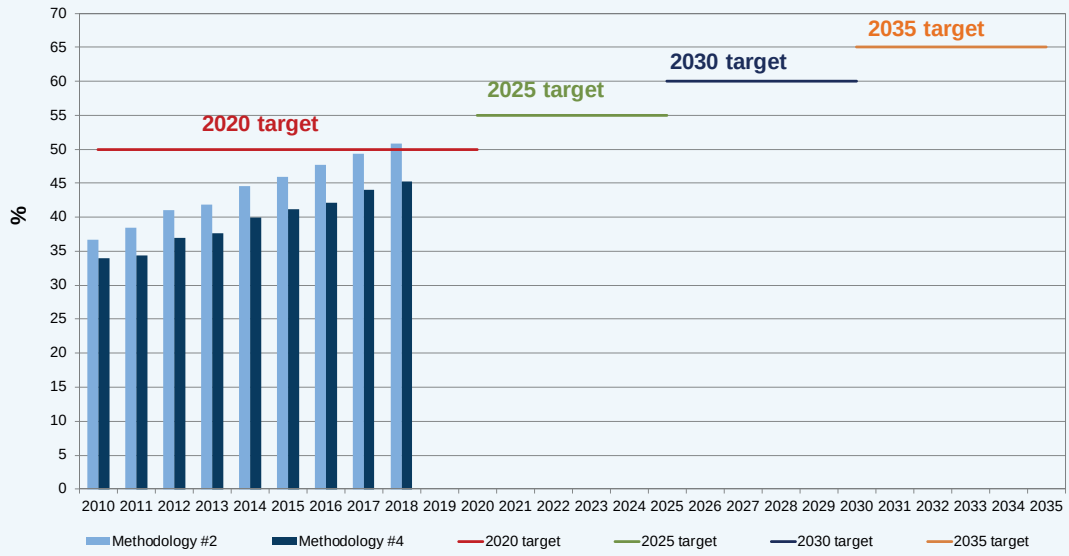
Main normative references/objectives

Directive 2008/98/EC lays down the key principles about waste management, prioritising the different options in order to choose the best ones. Landfilling is the less desirable of all, just to be chosen as a residual option.
Eligibility criteria for waste landfilling are set out in Legislative Decree No 36/2003 and Ministerial Decree 27th September 2010 transposing Decision 2003/33/EC.
Directive 2018/850/EU (into force on 4th July 2018), amends the Directive 1999/31/EC and provides as follows: *"Member States shall take the necessary measures to ensure that by 2035 the amount of municipal waste landfilled is reduced to 10 % or less of the total amount of municipal waste generated (by weight)".*

Trend analysis

The amount of landfilled municipal waste decreases by about 70% (1997-2018); 58% decrease compared to the total generation; 21.5% of total generation, in absolute figures (2018). It is a positive trend towards the achievement of the target (10% by 2035).

PREPARING FOR RE-USE AND RECYCLING (PERCENTAGE)



Percentage of recycling. Directive 2008/98/EC, Methods #2 and #4 simulations.

Data source: ISPRA

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

European Green Deal

Transition to a Circular Economy

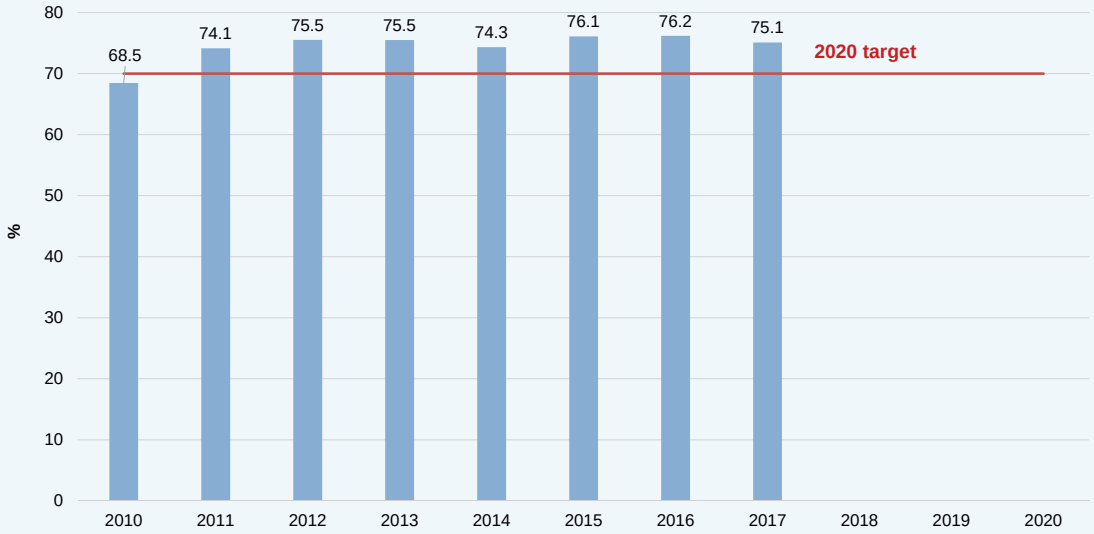
Target

Main normative references/objectives

Directive 2008/98/EC formerly set out the following target: "*by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight*".
Legislative Decree No 205/2010 transposes this Directive and includes the recycling targets set out in Legislative Decree 152/2006, Article No 181. Later, Decision 2011/753/EU *"establishes rules and calculation methods for verifying compliance with the targets"* . Four methods are available.
Further methods have been established by Directive 2018/851/EU to be achieved by 2025 (55%), 2030 (60%) and 2035 (65%). The latest three methods concern the total amount of municipal waste (no waste fractions considered).
"In order to ensure uniform application of the calculation rules", Decision 2019/1004/EU has been issued

Trend analysis

The 2020 target (50%) has been achieved by method #2, which takes into account just a few waste fractions (paper, glass, plastic, metal, wood and organic fraction). Since 2021, just a single method shall be used, taking into account all of the municipal waste fractions. On the ground of this over-arching method the target has not yet been reached.
A positive trend is observed about preparing for re-use and recycling of municipal waste, but it's not enough to achieve the new targets as well as to narrow the gap between separate waste collection and recycling.



Preparing for re-use, recycling and other material recovery about construction and demolition waste (backfilling not included)

Data source: ISPRA

Transition to a Circular Economy

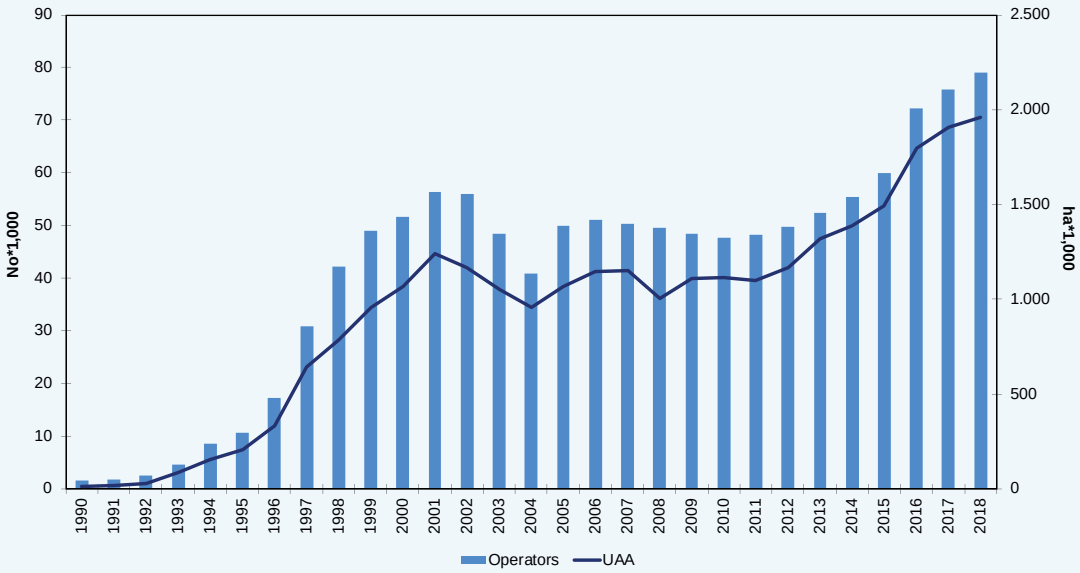
Target

Main normative references/objectives

To come to a recycling European society with a high level of resource efficiency, Directive 2008/98/EC sets out clear objectives for preparing, re-use and recycling of urban waste and construction & demolition waste.
As regards the latter, the target is 70% by weight to be achieved by 2020.
Legislative Decree No 205/2010 includes the recycling targets set out in Legislative Decree 152/2006, Article No 181.
Directive 2018/851/EU provides as follows: *"by 31 December 2024, the Commission shall consider the setting of preparing for re-use and recycling targets for construction and demolition waste and its material-specific fractions".*
Decision 2011/753/EC provides "rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC".

Trend analysis

Construction and demolition waste are the most important stream of waste from economic activities generated both at the European and national levels. Recovery and recycling share for construction and demolition waste amounts to 75.1% in 2017, which is above the target set out by the Directive 2008/98/EC (70% by 2020).



Evolution of registered organic operators and areas

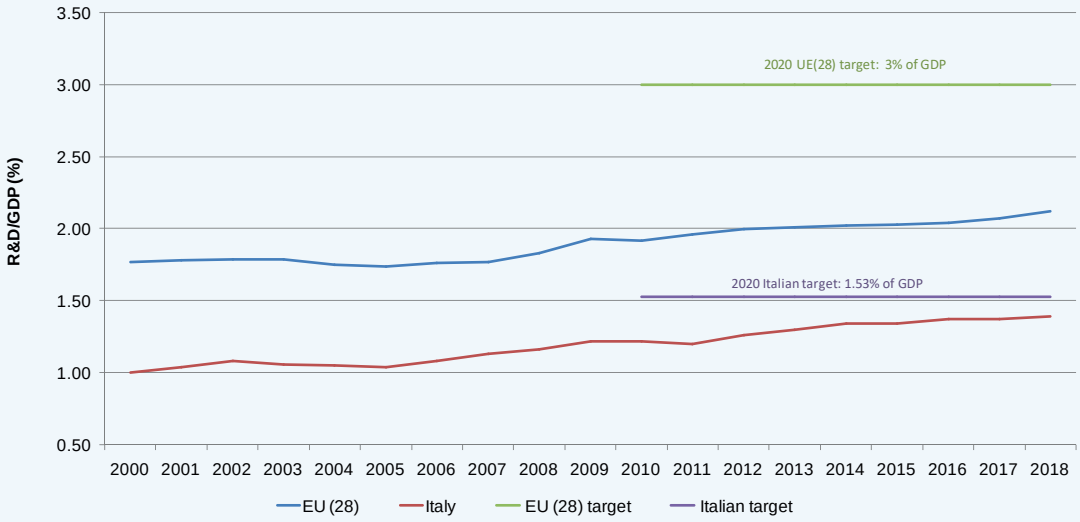
Data source: MiPAAF (SINAB)

Main normative references/objectives

Council Regulation (EC) No 834/2007 *"on organic production and labelling of organic products, provides the basis for the sustainable development" of the sector. "It establishes common objectives and principles […] concerning all stages of production, preparation and distribution of organic products and their control; the use of indications referring to organic production in labelling and advertising; compulsory indications for products imported from third countries".*
Regulation (EU) 2018/848 *"on organic production and labelling of organic products, repealing Council Regulation (EC) No 834/2007",* has been issued in 2018, after years of consultation and negotiation.
Similar to the previous Regulation, it requires more restrictive controls against frauds, allows the only import of compliant products, promotes closely linked to the soil products, sets new standards about seed, provides group certification, improves information exchange among the Member States, promotes *"high animal welfare standards"*.
In 2016, MiPAAF (the Italian Ministry of agriculture) drew up the National Strategic Plan for the development of the organic system. In order to meet the needs of the Italian organic sector, this plan provides for mid-term measures until 2020.

Trend analysis

Since 1990, Italian organic farming has grown significantly. According to Eurostat's latest revision Italy ranked 4th (EU 28) as for the percentage of organic area in 2017.
On the ground of national control bodies and regional administration data (provided to the MiPAAF), the organic and *"in-conversion"* areas amounted to 1,958,045 hectares in 2018, (+2.6% compared to 2017).
Operators number amounts to 79,046 (+4.2% compared to 2017).
Organic farming covers 15.5% of the National UAA (Utilised Agricultural Area) and involves 6.1% of total farms.



R&D expenditure

Data source: ISPRA

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

European Green Deal

Financing the transition

Target

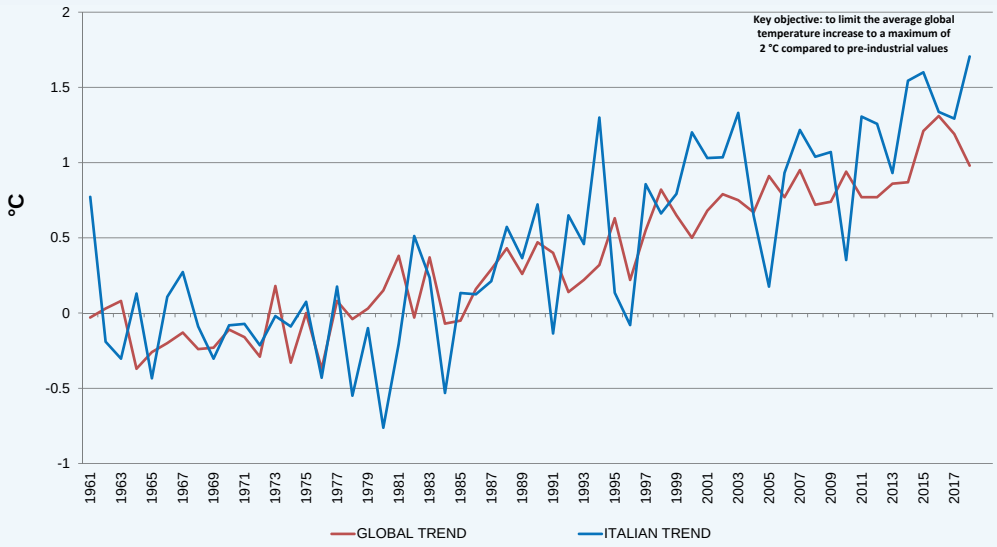
Main normative references/objectives

Regulation n. 995/2012 EC.
COM/2010/2020 EUROPE 2020 "*A strategy for smart, sustainable and inclusive growth*". One of the aims in the EUROPE 2020 strategy for smart, sustainable and inclusive growth is achieving an appropriate ratio between research and development investment (R&D) and GDP. This Strategy has been drawn up by EC in March 2010 to create conditions for *"a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion"* . The Strategy provides as follows:
-Smart growth – *"developing an economy based on knowledge and innovation"*.
-Sustainable growth – *"promoting a more resource efficient, greener and more competitive economy"*.
-Inclusive growth – *"fostering a high-employment economy delivering economic, social and territorial cohesion "*.
"The EU currently has a target of investing 3% of GDP in R&D. The target has succeeded in focusing attention on the need for both the public and private sectors to invest in R&D". Italian national target is 1.53% of GDP in R&D.

Trend analysis

In-house R&D investment by the industrial enterprises amounts to 10,459 million euros in 2017, (+23.7% compared to 2012).
Looking at the whole institutional sector in 2017, the investment amounts to 23.794 million euros in 2017, (+16.1% compared to 2012), equal to 1.37% of GDP.
Growth is expected in 2018 and 2019, but in terms of GDP percentage it will probably be far from 1.53% (Italian target for 2010).

AVERAGE TEMPERATURE



Annual average temperature anomalies over land, compared to normal climate values (1961-1990)

Data source: NCDC/NOAA, ISPRA

13 CLIMATE ACTION

European Green Deal

Achieving Climate Neutraly

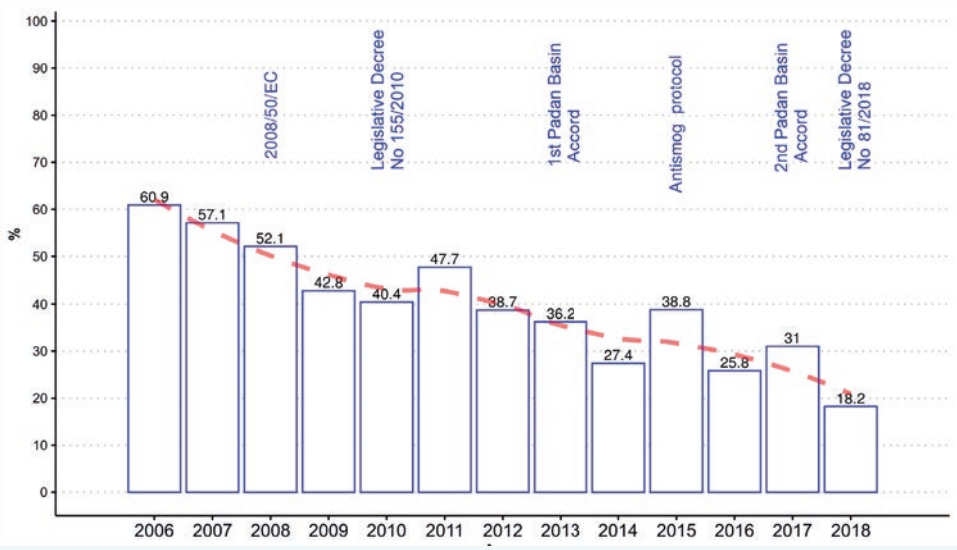
Target

Main normative references/objectives

No specific target set by national legislation.
The European Council stresses the strategic importance of limiting *"the average global temperature increase to a maximum of 2°C compared to pre-industrial values"* (EU Council declaration 8/9 March 2007).

Trend analysis

Over the last thirty years the increase in average temperature in Italy has always been higher than the global average over land. The 2018 Italian mean temperature anomaly (+1.71 °C) with respect to 1961-1990 climatological normal was higher than the corresponding global over land anomaly (+0,98 °C).
It has been estimated that the average temperature in Italy has risen by about 0.38 °C per decade (1981-2018).
Key international policy strategies and programmes on climate change are all meant to deal with the current global warming. Nevertheless, the increasing trend clearly shows how far the target achievement actually is.



Percentage of measuring stations exceeding the daily limit value (50 µg/m³, not to be exceeded more than 35 times a calendar year)

Data source: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

A zero pollution Europe

Target

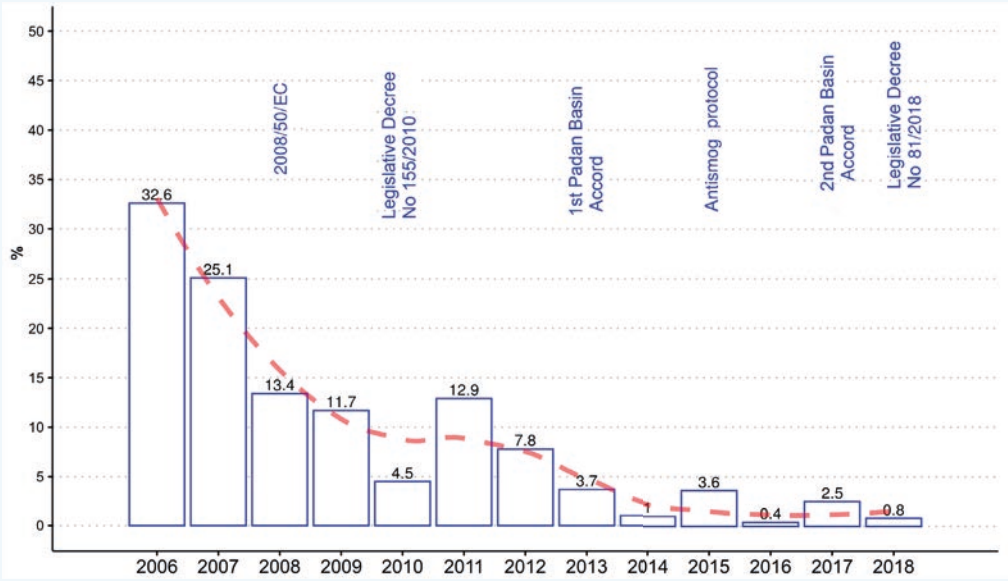
Main normative references/objectives

The Directive 2008/50/EC lays down measures aimed at the following: "assessing the ambient air quality in Member States on the basis of common methods and criteria"; "obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures"; ensuring that such information on ambient air quality is made available to the public"; "promoting increased cooperation between the Member States in reducing air pollution".
Legislative Decree No 155/2010, transposing the mentioned Directive into national legislation, allows regions and autonomous provinces to assess and manage the ambient air quality. According to the Decree, to comply with the limit values is necessary to mitigate, prevent and reduce harmful consequences for human health and the environment on the whole. WHO guidelines' reference values are intended as benchmarks for air pollution impact reduction on human health.The following table shows ambient PM10 threshold/reference values in the national legislation and the WHO guidelines:

Averaging period	Legislative Decree No 155/2010 threshold values	WHO guidelines' reference values
24h	*50 µg/m³, not to be exceeded more than 35 times a calendar year*	*50 µg/m³, not to be exceeded more than 3 days/ year*
Calendar year	40 µg/m³	20 µg/m³

Trend analysis

The number of measuring stations exceeding the regulatory limits decreases over the period.
2018 data confirm the generally decreasing trend of PM10 concentration in Italy: the daily threshold has been exceeded by 95 measuring stations (18%); WHO daily limit value has been exceeded by 390 measuring stations (75%).



Percentage of measuring stations exceeding the annual limit value (40 µg/m³)

Data source: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

A zero pollution Europe

Target

Main normative references/objectives

The Directive 2008/50/EC lays down measures aimed at the following: *"assessing the ambient air quality in Member States on the basis of common methods and criteria"*; *"obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures"*; *"ensuring that such information on ambient air quality is made available to the public"*; *"promoting increased cooperation between the Member States in reducing air pollution"*.

Legislative Decree No 155/2010, transposing the mentioned Directive into national legislation, allows regions and autonomous provinces to assess and manage the ambient air quality. According to the Decree, to comply with the limit values is necessary to mitigate, prevent and reduce harmful consequences for human health and the environment on the whole. WHO guidelines' reference values are intended as benchmarks for air pollution impact reduction on human health.

The following table shows ambient PM10 threshold/reference values in the national legislation and the WHO guidelines:

Averaging period	Legislative Decree No 155/2010 threshold values	WHO guidelines' reference values
24 ore	*50 µg/m³, not to be exceeded more than 35 times a calendar year*	*50 µg/m³, not to be exceeded more than 3 days/ year*
Calendar year	*40 µg/m³*	*20 µg/m³*

Trend analysis

The number of measuring stations exceeding the regulatory limits decreases over the period.

2018 data confirm the generally decreasing trend of PM10 concentration in Italy: the annual threshold has been exceeded by 4 measuring stations (0.8%); WHO annual reference value has been exceeded by 352 measuring stations (67%).

Percentage of measuring stations exceeding the annual limit value (25 µg/m³)

Data source: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

European Green Deal — A zero pollution Europe

Target

Main normative references/objectives

The Directive 2008/50/EC lays down measures aimed at the following: *"assessing the ambient air quality in Member States on the basis of common methods and criteria"*; *"obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures"*; ensuring that such information on ambient air quality is made available to the public"; *"promoting increased cooperation between the Member States in reducing air pollution"*.

Legislative Decree No 155/2010, transposing the mentioned Directive into national legislation, allows regions and autonomous provinces to assess and manage the ambient air quality. According to the Decree, to comply with the limit values is necessary to mitigate, prevent and reduce harmful consequences for human health and the environment on the whole.

WHO guidelines' reference values are intended as benchmarks for air pollution impact reduction on human health.

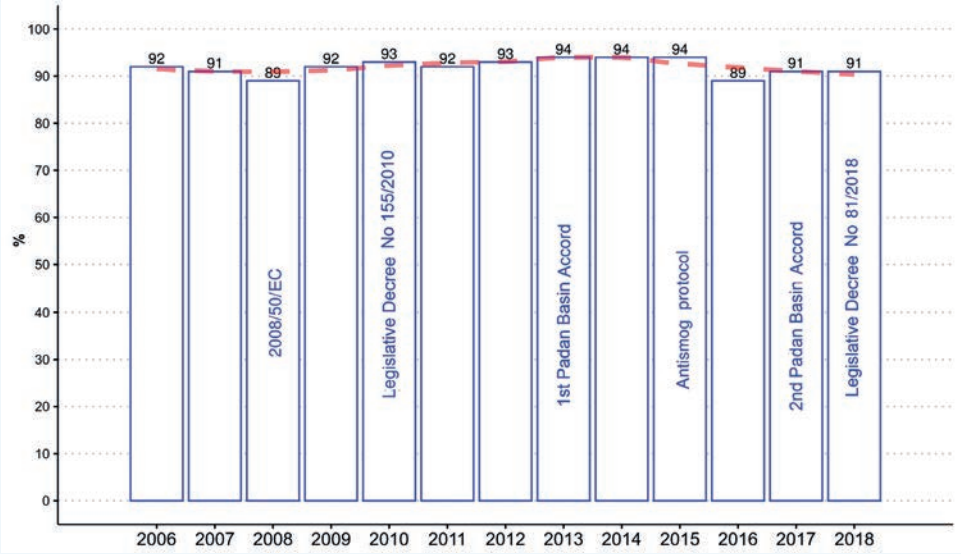
The following table shows ambient PM2.5 threshold/reference values in the national legislation and the WHO guidelines:

Averaging period	Legislative Decree No 155/2010 threshold values	Date by which the limit value is expected to be reached	WHO guidelines' reference value for long-term human exposure.
Fase I			
Calendar year	*25 µg/m³*	1st January 2015	*10 µg/m³*
Fase II*			
Calendar year	*	1st January 2020	
* Limit value to be set by further decree			

Trend analysis

The number of measuring stations exceeding the regulatory limits decreases over the period.

2018 data confirm the generally decreasing trend of PM2.5 concentration in Italy. In 2018, the compliance with the annual limit value has been achieved by the majority of the measurement stations. The limit has been exceeded in 4 measurement stations (1.6%). However, the WHO guidelines' reference value has been exceeded by the majority of the measurement stations (88% of the instances). Exceedances are clustered in the Padan basin area.



Percentage of the measurement stations exceeding the long-term target (no exceedances of 120 µg/m³ maximum daily - moving average)

Fonte: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

A zero pollution Europe

Target

Main normative references/objectives

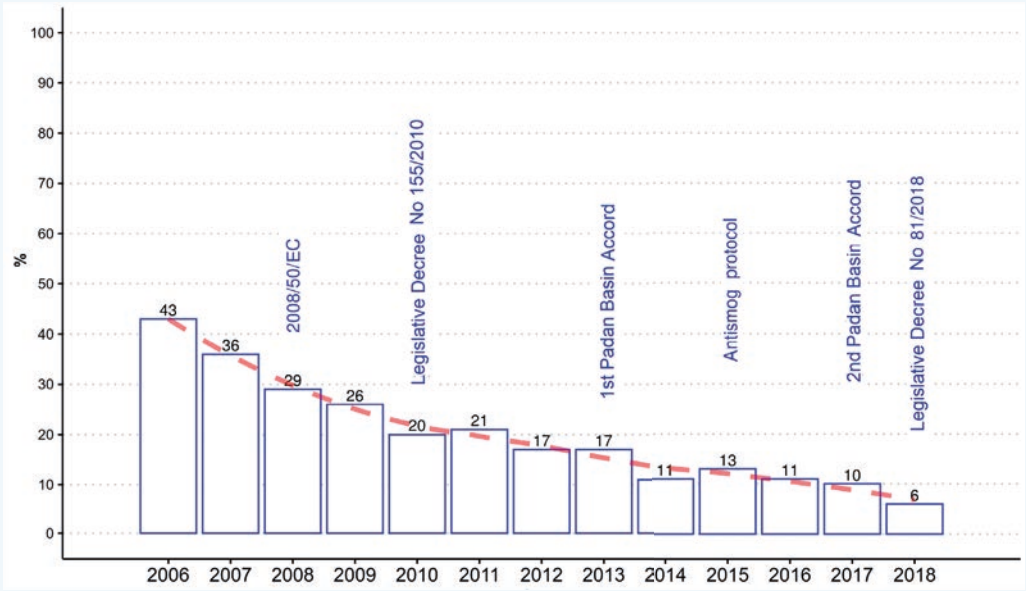
The Directive 2008/50/EC lays down measures aimed at the following: *"assessing the ambient air quality in Member States on the basis of common methods and criteria"; "obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures"; ensuring that such information on ambient air quality is made available to the public"; "promoting increased cooperation between the Member States in reducing air pollution"*. Legislative Decree No 155/2010, transposing the mentioned Directive into national legislation, allows regions and autonomous provinces to assess and manage the ambient air quality. According to the Decree, to comply with the limit values is necessary to mitigate, prevent and reduce harmful consequences for human health and the environment on the whole. The information and alarm thresholds as well as the long-term objective values are shown in the following table:

	Legislative Decree No 155/2010 threshold values	Averaging period
Information threshold	*180 µg/m³*	1 h
Alarm threshold	*240 µg/m³*	1 h
Long-term objective for human health protection	*120 µg/m³*	Maximum daily 8 h mean
Long-term objective for the protection of vegetation (AOT40v)	*6.000 µg/m³*h*	1 h cumulative time from May to July

Trend analysis

2018 data show a stable trend of the ozone concentration in Italy. In 2018 long-term objective for human health protection has been exceeded by 291 measurement stations out of 321 (91% of the station with an adequate temporal coverage); the long-term objective for human health protection has been exceeded for over 25 days in 166 stations (52%). The 30 stations with no registered exceedances are located in urban and sub-urban areas. Information and alarm thresholds have been exceeded in 116 (36%) and 4 stations (1%) out of 321 respectively. Higher values are mainly clustered in Northern Italy.The long-term objective for the protection of vegetation (AOT40v) has been exceeded in 145 measurement stations out of 157 (92%) with values well above the regulatory limit.

AIR QUALITY: NITROGEN DIOXIDE (NO_2)



Percentage of measuring stations exceeding the annual limit value (40 µg/m³)

Data source: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

European Green Deal — A zero pollution Europe

Target

Main normative references/objectives

The Directive 2008/50/EC lays down measures aimed at the following: *"assessing the ambient air quality in Member States on the basis of common methods and criteria"; "obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures"; "ensuring that such information on ambient air quality is made available to the public"; "promoting increased cooperation between the Member States in reducing air pollution"*.

Legislative Decree No 155/2010, transposing the mentioned Directive into national legislation, allows regions and autonomous provinces to assess and manage the ambient air quality. According to the Decree, to comply with the limit values is necessary to mitigate, prevent and reduce harmful consequences for human health and the environment on the whole. WHO guidelines' reference values are intended as benchmarks for air pollution impact reduction on human health.

The following table shows ambient NO_2 threshold/reference values in the national legislation and the WHO guidelines:

Averaging period	Legislative Decree No 155/2010 threshold values	WHO guidelines' reference value
1 h	200 µg/m³ not to be exceeded 18 times per calendar year	200 µg/m³ not to be exceeded per calendar year
Calendar year	40 µg/m³	40 µg/m³

Trend analysis

Measurement stations with values above the regulatory limit decrease over the period considered.

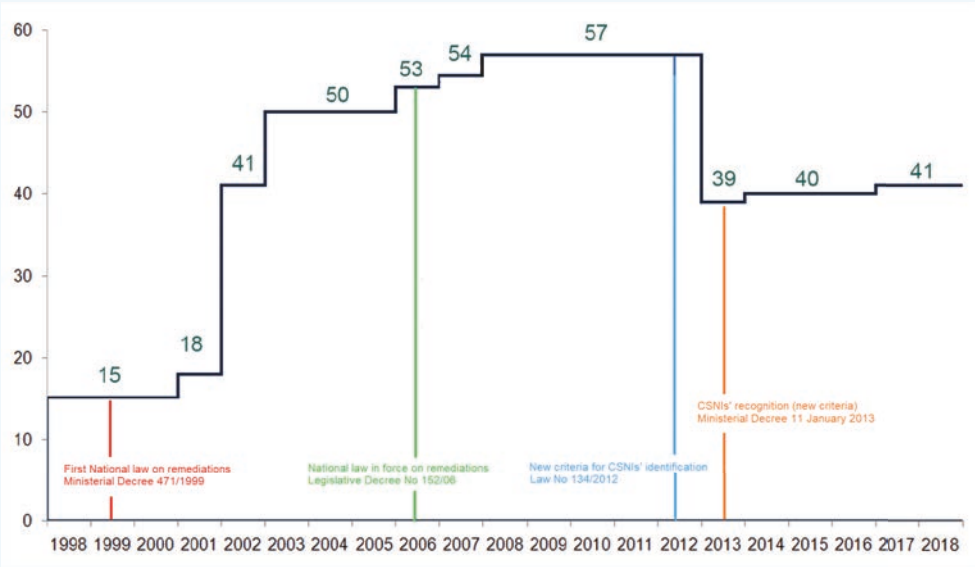
2018 data confirm the generally decreasing trend of NO_2 in Italy.

In 2018 the annual threshold value (40 µg/m³ annual average), matching the WHO long-term reference value for human health, has been exceeded in 37 stations (6%).

The hourly limit value has always been respected: no station exceeded the limit for more than 18 times.

WHO reference value (no exceedance admitted) has been exceeded in 14 stations (2% of the station with an adequate temporal coverage).

Almost the all exceedances have been clustered in traffic-oriented stations located in relevant urban areas.



Number of identified CSNIs

Data source: ISPRA

11 SUSTAINABLE CITIES AND COMMUNITIES

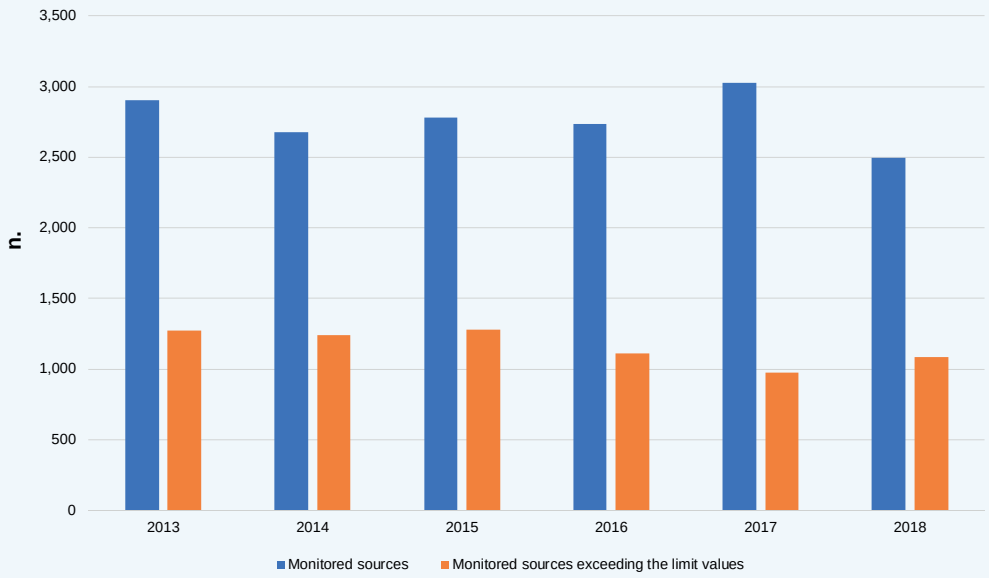
European Green Deal — A zero pollution Europe

Main normative references/objectives

Law No 134, 7 August 2012, art. 36-bis modified the identifying criteria of CSNIs (article 252 of Legislative Decree No 152/06 and subsequent changes). In accordance with the new criteria a review has been made of the existing 57 CSNIs. On the basis of Ministerial Decree 11 January 2013, the number of CSNIs turned into 39.
The administrative authority on CSNIs which didn't meet the new criteria shifted to their respective regions.
The Lazio Administrative Court decision No 7586/2014 brought the Fiume Sacco basin back into the CSNIs list. Therefore, the Ministry of the Environment (MATTM) was back to being responsible for characterisation proceedings, safety and remediation. In 2016 the consultation ended and the CSNIs delimitation have been published.
Law No 205, 27 December 2017 identified as a CSNI the "ETR - Officina Grande Riparazione" in Bologna.
To date, the overall number of CSNIs amount to 41.

Trend analysis

CSNIs have been identified by several regulation. Usually CSNIs delimitation occurs by MATTM decree, in accordance with the involved regions.
With regard to remediation, a CSNI could be identified by the properties of the site, the pollutants' amount and hazardousness, the environmental impact in terms of health, social and ecological risk, as well as of environmental and cultural heritage damage. (Legislative Decree No 152/06, Art. 252, paragraph 1 and subsequent changes).
CSNIs remediation procedure is up to MATTM, with support of ISPRA, ARPA/APPA, National Institute of Health and other qualified public and private authorities, if necessary.
The CSNIs delimitation may change over time due to new information about proven/potential contamination of new areas as well as due to a more precise definition of the areas affected by a potential source of contamination.
The delimitation of certain CSNIs could concern both terrestrial and marine areas.



Total monitored sources and monitored sources exceeding the limit values
Data source: ISPRA, ARPA/APPA

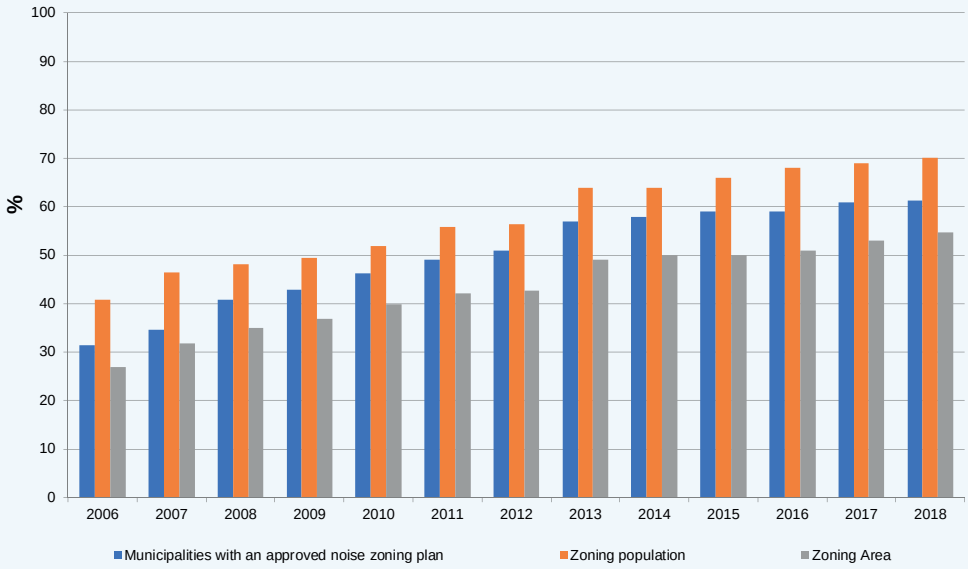
A zero pollution Europe

Main normative references/objectives

Prime Minister's Decree 14 November 1997 Table C includes the absolute limit values for propagation, on the basis of six territorial acoustic classes (I - VI) and day periods (day-time: 6 AM – 10 PM; night-time: 10 PM – 6 AM), in accordance with the Framework Law No. 447/95.
Municipalities with no noise zoning plan shall adopt the limits set out by Prime Minister's Decree 1 March 1991, as a transitional measure.
As for transport facilities, the limit values for propagation are set by specific implementing decrees within their jurisdiction. Out of their jurisdiction, transport facilities contribute to the achievement of absolute limit values for propagation (Table C), as defined by the Municipalities according to their own noise zoning plans.
To date, three implementing decree have been issued: Ministerial Decree 31 October 1997 (airport noise), Decree of the President of the Republic No 459, 18 November 1998 (railway noise) and Decree of the President of the Republic No n. 142, 30 March 2004 (road noise). It has not yet been issued a decree regarding port & harbour facilities.

Trend analysis

In 2018, Regional and Provincial Agencies for the Environment Protection monitored 2,495 noise sources (2,282 following complaints). The 43.5% of the monitored sources exceeded the limit at least once, suggesting a significant noise pollution issue: +11.4 % compared to 2017, in line with what experienced from 2014 to 2016 (40.6% in 2016, 45.9% in 2015, 46.3% in 2014).



Municipalities with an approved noise zoning plan

Data source: ISPRA, ARPA/APPA

A zero pollution Europe

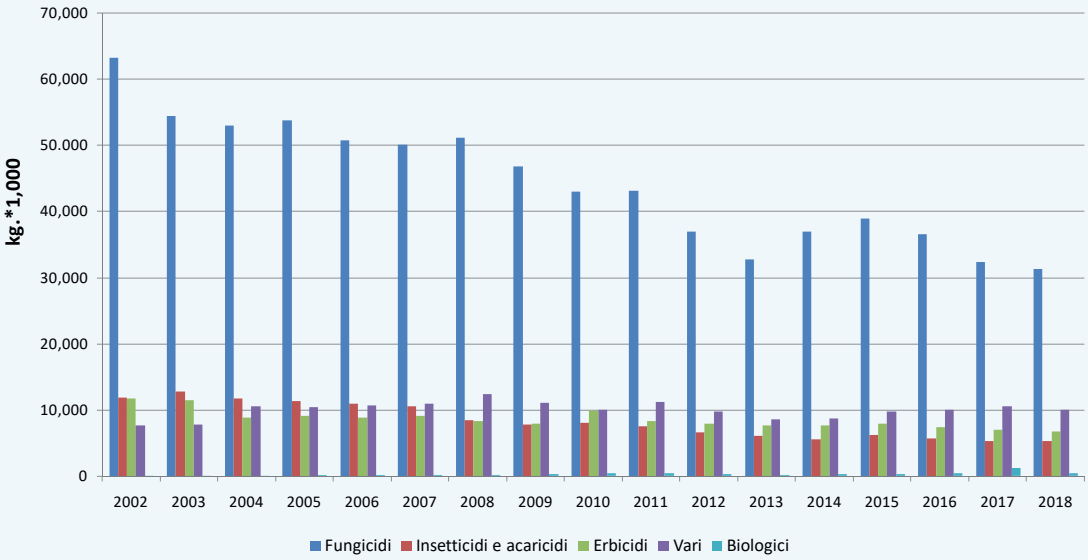
Main normative references/objectives

According to the Framework Law 447/95 art. 6, paragraph 1, point a), each municipality is required to proceed to the implementation of a noise zoning plan on its own territorial jurisdiction. The zoning activity must consider the six consistent territorial classes laid down by the legislation, on the basis of the main and real use. The acoustic limit values must be assigned to each consistent area taking into account day-time/night-time (Prime Minister's Decree 14 November 1997). According to Framework Law 447/95 art. 4, paragraph 1, point a), each region has the task to define the criteria to be used by the municipalities in order to proceed with the noise zoning in their own territory.
Municipalities with no noise zoning plan shall adopt the limits set out by Prime Minister's Decree 1 March 1991, as a transitional measure (Framework Law 447/95 art. 15).

Trend analysis

The municipalities compliance with the Framework Law requirements is quite good.
Compared to 2017, the municipalities approving a noise zoning plan in 2018 are steady (61% of all).
Between 2006 and 2018 an increasing trend has been experienced (+30% in municipalities with noise zoning plan): from 2,552 in 2006 (31.5% of all) to 4,862 in 2018 (61.3% of all).

PLANT PROTECTION PRODUCTS PROVIDED FOR AGRICULTURAL USE



Active substances in plant protection products

Data source: ISTAT

Farm to fork

A zero pollution Europe

Main normative references/objectives

Regulation (EC) No 1107/2009 "of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC".
Directive 2009/128/EC "of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides".
Regulation (EC) No 1185/2009 "of the European Parliament and of the Council of 25 November 2009 concerning statistics on pesticides".
Legislative Decree No 150, 14 August 2012, implementation of Directive 2009/128/EC "establishing a framework for Community action to achieve the sustainable use of pesticides".
Inter-ministerial Decree 22 January 2014. Uptake of the National Action Plan for the sustainable use of plant protection products, in accordance with Legislative Decree No 150, 14 August 2012, Article 6.
Inter-ministerial Decree 10 March 2015. Guidelines on water environment and drinking water preservation, use reduction of plant protection products with related risks in Natura 2000 sites as well as in protected natural areas.
Inter-ministerial Decree 15 July 2015. Data collection and processing with respect to the implementation of the indicators laid down by the National Action Plan for the sustainable use of plant protection products (NAP).

Trend analysis

In 2018, the active substances in plant protection products placed on the market amount to 54,000 tonnes.
Compared to 2014 (before the adoption of the NAP) a decrease of about 8.9% is observed (-5,266 tonnes).
Between 2008 and 2018, a remarkable general decrease in the use of active substances (a.s.) is observed (-32.9%), even with different trend depending on a.s. classes.
All classes of a.s. decease (fungicides -38.7%, insecticides and acaricides -36.7%, herbicides -18.3%, others -18.8%) except for organic a.s. which keep on rising (+130%). These trends depend on technical/agronomic needs and (probably) on market strategies.
The decreasing trend shall be assessed positively on the whole, taking due account of the quantities' reduction level and their decreasing but unsteady trend.
Other indicators such as "plant protection products allowed in organic farming/total plant protection products" or "plant protection products/hectare", are basically stable. The latter, even though decreasing in the last few years, has in 2018 the same figures than in 2013.

7th EAP main sub-objectives "in brief"[1]

Composite indicators

Also this year, composite indices have been developed to briefly describe several complex environmental phenomena, on the basis of some national indicators (ISPRA - Environmental Data Yearbook) considered useful to measure the achievement of the top three objectives of the European 7th EAP (Environmental Action Programme) and related sub-objectives.

Composite indices, by their nature, foster communication purposes than deepening.
In this report, summarising has been preferred to better provide an overall comprehension of the different indicators' trends. Therefore, the wealth of information is reduced with respect to the elementary indicators' real values and interrelations as well.
Developing composite indicators is a risk because they actually provide an overview. A kind of "stylisation"of realty (Maggino 2017), which should not be oversimplified.
This is where the risk lies: providing an oversimplified reality, a meaningless representation of the observed phenomenon (Alaimo and Maggino 2020).

Developing a composite indicator actually consists in a wise aggregation of a certain number of elementary indicators representing different issues of the same multi-dimensional phenomenon.
It's a step-by-step procedure made of conceptual and methodological stages (OECD 2008).
Once the indicators have been aggregated, they provide an information basis which could steer possible political governance actions and monitor their results.

Different aggregative methods have been tested in the indicators' development.
Inter alia: arithmetic average (min-max standardisation, index number standardisation) and the AMPI method (Adjusted Mazziotta-Pareto Index), already used last year in "Dati sull'Ambiente" as well as in ISTAT BES report (BES stands for Equitable and Sustainable Well-Being) and ASVIS (Italian Alliance for Sustainable Development) annual reports to monitor the national situation about sustainable development goals.

Since no substantial difference was found using the one or the other methodology, AMPI method has been chosen in order to ensure trends comparability throughout the years.
AMPI method is also the soundest one, according to several studies found in literature (Mazziotta et al. 2010, Mazziotta and Pareto 2015).
AMPI method is based on the assumption that the elementary indicators can't be replaced with others and that they all have the same relevance (non-compensatory approach).

This method requires: data normalization and equal weighting of the indicators.
The latter have been selected according to the length of the available time-series; the aggregation of normalized data has been made by an arithmetic mean adjusted by a penalizing function of variability (the higher the indicators' variability, the higher the penalty).

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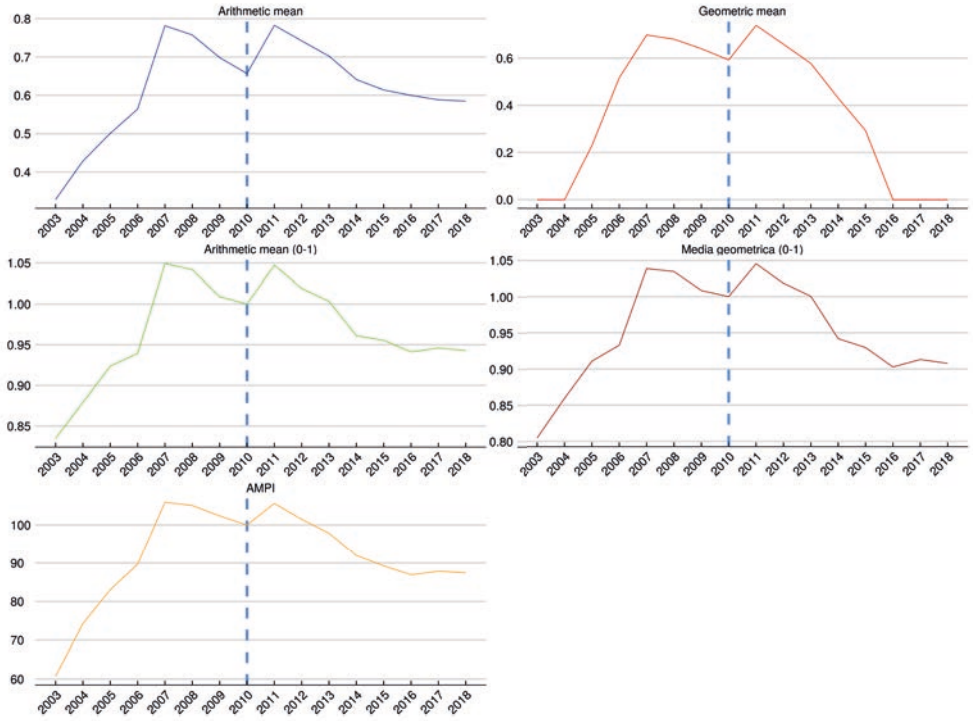
Thanks go to: Prof. Filomena Maggino ("La Sapienza" University in Rome), Department of statistical sciences and Dr. Leonardo Salvatore Alaimo ("La Sapienza" University in Rome), Department of social and economic sciences for revision and suggestions.



Graph #1: Examples of different tested aggregation methods

The time-series length is one of the criteria adopted for the indicators' selection and AMPI method has a potentially high sensitivity to "wide" time-series such as those used. However, this method ensures the desirable features of a composite index keeping it simple to communicate to a non-expert audience.
Considering the 16 sub-objectives of the first three 7th EAP' objectives, the suitability of the elementary indicators' time-series has been checked. Here's the outcome: 8 feasible sub-objectives (one more than last year). In particular: 3 out of the 7 indicators concerning the Objective 1 (1a, 1c, 1d), 4 out of the 5 indicators concerning the Objective 2 (2a, 2b, 2c, 2d) and 1 out of the 4 indicators concerning the Objective 3 (3a).
The following table shows the selected indicators (Environmental Data Yearbook 2019) used to develop the composite index, plus meta-information such as "Time-series (elementary indicator)", "Time-series (composite index)", and "Polarity". The latter makes it clear the influence (positive or negative) between the indicator and the phenomenon.

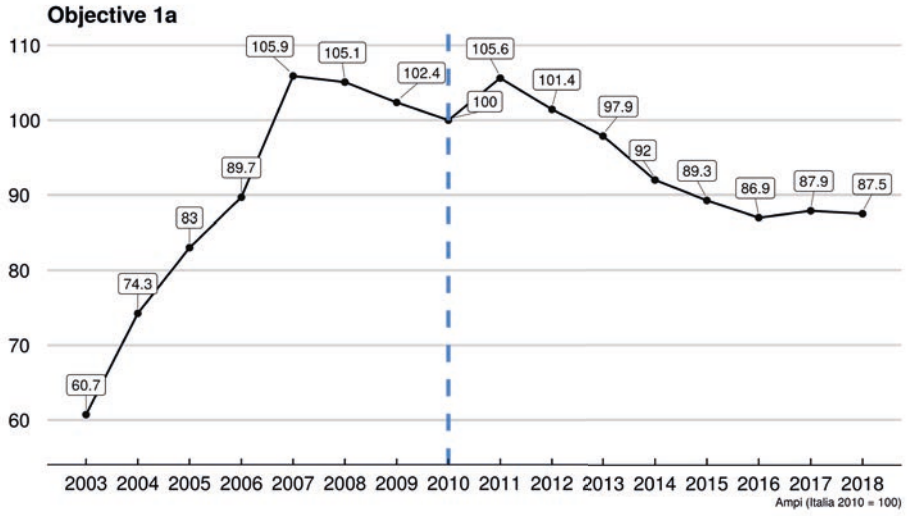
Sub-objective	Environmental Data Yearbook reference indicator	Elementary indicator	Unit of measure	Time-series (elementary indicator)	Polarity	Time-series (composite index)
Ob. 1a	Birds' richness and plenty in Italy	Number of ringed birds	No	1982-2018	+	2003-2018
Ob. 1a	Spreading of allochthonous plant and animal species	Number of allochthonous species	Cumulated number	1901-2018	-	2003-2018
Ob. 1a	Terrestrial protected areas	Number of terrestrial protected areas	Cumulated surface (kha)	1968,1971-2018	+	2003-2018
Ob. 1a	Natura 2000 network	Special Protection Areas (SPAs): annual surface in Italy	Surface (kha)	2003-2018	+	2003-2018
Ob. 1a	Natura 2000 network	Sites of Community Interest (SCIs) and Special Protection Areas (SPAs): total annual surface	Surface (kha)	2003-2018	+	2003-2018
Ob. 1c	Overexploited fish stocks	Overexploited fish stocks	%	2007-2018	-	2007-2018
Ob. 1c	Fishery consistency	Fishing effort	GT* average days/1,000,000	2004-2018	-	2007-2018
Ob. 1c	Fishery consistency	CPUE (Catches Per Unit Effort)	kg	2004-2018	-	2007-2018
Ob 1d	Glaciers frontal variations	Western Alps – average minimum altitude	Meters above sea level	1978-2017	-	1978-2017
Ob 1d	Glaciers frontal variations	Central Alps - average minimum altitude	Meters above sea level	1978-2017	-	1978-2017
Ob 1d	Glaciers frontal variations	Eastern Alps - average minimum altitude	Meters above sea level	1978-2017	-	1978-2017
Ob. 2a	GHGs emissions (CO_2, CH_4, N_2O, HFCS, PFCS, SF_6): sectorial breakdown	Domestic GHGs emissions/GDP	million tonnes of CO_2 eq/year	1990-2017	-	2004-2017
Ob. 2a	Renewable energy share in final consumption	Renewable energy share in final consumption	%	2004-2017	+	2004-2017
Ob. 2a	Total consumption of primary energy sources	GDP's primary energy intensity (2010 chain linked market prices)	ktep/M€	1990-2010, 2017	-	2004-2017
Ob. 2b	Resources' productivities	Resources' productivities	€/kg	2000-2017	+	2010-2017
Ob. 2b	Domestic material consumption	Domestic material consumption	Mt	1991-2017	-	2010-2017

Sub-objective	Environmental Data Yearbook reference indicator	Elementary indicator	Unit of measure	Time-series (elementary indicator)	Polarity	Time-series (composite index)
Ob. 2b	Final energy consumption and total energy consumption rate	Final energy consumption and gross domestic energy consumption rate	%	1990-2017	+	2010-2017
Ob. 2b	Sectorial and total final energy intensities	Final energy intensities	tep /M€	1995-2010, 2017	-	2010-2010
Ob. 2b	CO_2 specific emissions	CO2 specific emissions	grams of CO_2/ km	1990, 1995 2000, 2005, 2010-2017	-	2010-2017
Ob. 2b	Transport demand and intensity (freight transport and transport fleeting)	Transport demand and intensity (freight transport and transport fleeting)	thousands of vehicles-km/ capita	2000, 2005 2010-2017	-	2010-2017
Ob. 2b	Energy consumption (transport sector)	Energy consumption (transport sector)	PJ	1990,1995 2000,2005 2010-2017	-	2010-2017
Ob. 2b	UNI-EN- ISO 14001 certifications	UNI-EN- ISO 14001 certifications	No.	2004-2017	+	2010-2017
Ob. 2b	EMAS registrations	EMAS registrations	No	1997-2017	+	2010-2017
Ob. 2c	Air pollutants' emissions (transport sector)	NO_x emissions (transport sector)	t	2005, 2010-2017	-	2010-2017
Ob. 2c	Air pollutants' emissions (transport sector)	NMVOC emission (transport sector)	t	2005, 2010-2017	-	2010-2017
Ob. 2c	Air pollutants' emissions (transport sector)	PM 2.5 emission (transport sector)	t	2005 2010-2017	-	2010-2017
Ob. 2c	Air pollutants' emissions (transport sector)	SOx emissions (transport sector)	t	2005, 2010-2017	-	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	Gasoline-powered automobile	%	2004-2017	+	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	Diesel-powered automobile	%	2004-2017	+	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	Light-duty vehicles	%	2004-2017	+	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	Heavy-duty vehicles	%	2004-2017	+	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	City busses, suburban busses	%	2004-2017	+	2010-2017
Ob. 2c	Vehicle fleet compliance with emission standards (share)	Motorcycle and three-wheelers	%	2004-2017	+	2010-2017;
Ob. 2c	Spreading of low environmental impact fuels	Spreading of low environmental impact fuels	%	2005, 2010-2017	+	2010-2017

Sub-objective	Environmental Data Yearbook reference indicator	Elementary indicator	Unit of measure	Time-series (elementary indicator)	Polarity	Time-series (composite index)
Ob. 2c	GHGs emissions in ETS and ESD sectors	GHGs emissions in ETS and ESD sectors	Mt CO_2 eq	2005-2017	-	2010-2017
Ob. 2c	EU ECOLABEL licences and certified products/services	EU ECOLABEL licences and certified products/services	No	2004-2017	+	2010-2017
Ob. 2c	White certificates	White certificates	ktoe	2006-2017	+	2010-2017
Ob. 2c	Organic farming	Organic farming areas	Cumulated surface (ha)	1990-2017	+	2010-2017
Ob. 2d	Waste generation from economic activities	Waste generation from economic activities	t*1.000	1995-2017	-	2010-2017
Ob. 2d	Municipal waste generation	Municipal waste generation	t*1.000	1995-2017	-	2010-2017
Ob. 2d	Municipal waste generation/GDP	Municipal waste generation/GDP	t/million euros	2002-2017	-	2010-2017
Ob. 2d	Municipal waste - Preparing for re-use and recycling (percentage)	Municipal waste - Preparing for re-use and recycling (percentage)	%	2010-2018	+	2010-2017
Ob. 2d	Recycling/re-use of construction and demolition waste	Recycling/re-use of construction and demolition waste	%	2010-2017	+	2010-2017
Ob. 2d	Landfilled municipal waste	Landfilled municipal waste	t*1.000	1997-2018	-	2010-2017
Ob. 2d	Waste processing: composting and anaerobic digestion	Waste processing: composting	t	1999-2018	+	2010-2017
Ob. 2d	Waste processing: composting and anaerobic digestion	Waste processing: anaerobic digestion	t	2010-2018	+	2010-2017
Ob. 2d	Waste processing: mechanical-biological treatment	Waste processing: mechanical-biological treatment	t	2000-2018	+	2010-2017
Ob. 2d	Municipal waste incineration	Total incinerated waste	t*1.000	1997-2018	-	2010-2017
Ob. 2d	Incinerated waste from economic activities	Total incinerated waste	t*1.000	1997-2017	-	2010-2017
Ob. 2d	Recovered waste from economic activities	Recovered waste from economic activities	t*1.000	1997-2017	+	2010-2017
Ob. 3d	Air quality: particulate matter (PM10)	Percentage of measuring stations exceeding the daily limit value	%	2006-2018	-	2010-2017

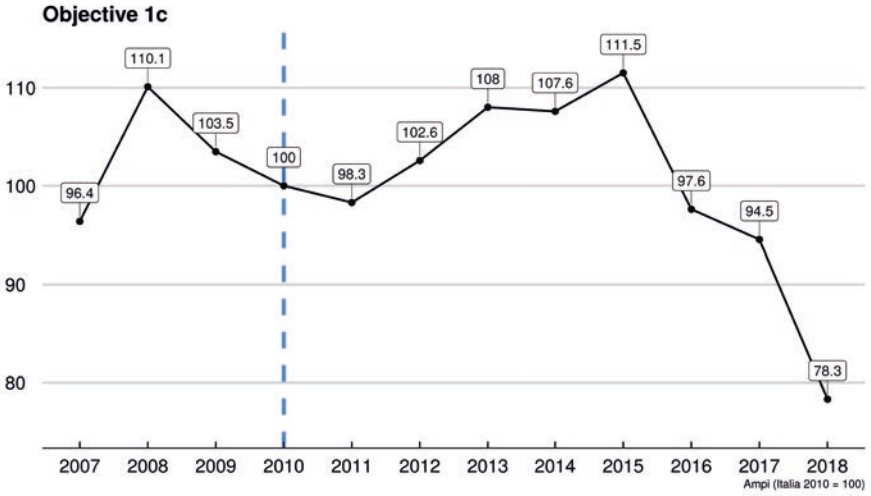
Sub-objective	Environmental Data Yearbook reference indicator	Elementary indicator	Unit of measure	Time-series (elementary indicator)	Polarity	Time-series (composite index)
Ob. 3d	Air quality: particulate matter (PM2.5)	Percentage of measuring stations exceeding the annual limit value	%	2010-2018	-	2010-2017
Ob. 3d	Air quality: ozone (O_3)	Percentage of the measurement stations exceeding the long-term target	%	2006-2018	-	2010-2017
Ob. 3d	Air quality: nitrogen dioxide (NO_2)	Percentage of measuring stations exceeding the annual limit value	%	2006-2018	-	2010-2017
Ob. 3d	CO emissions: trend and sectorial breakdown	CO emission	kt/year	1990-2017	-	2010-2017
Ob. 3d	PM10 emissions: trend and sectorial breakdown	PM10 emission	kt/year	1990-2017	-	2010-2017
Ob. 3d	SO_x, NO_x, NH_3 emissions: trend and sectorial breakdown	SO_x, NO_x, NH_3 emissions	kt H+/year	1990-2017	-	2010-2017
Ob. 3d	Emissions of tropospheric ozone precursors (NO_x and NMVOC: trend and sectorial breakdown	NMVOC emission	kt/year	1990-2017	-	2010-2017
Ob. 3d	Benzene (C_6H_6) emission: trend and sectorial breakdown	Benzene (C_6H_6) emission	t/year	1990-2017	-	2010-2017

The 60% of the basic indicators associated to the sub-objectives contributes to develop 8 composite indices. Just 4 out of 8 indicators aimed at monitoring the Objective 1a have been aggregated (2003-2018): *"Terrestrial protected areas"* (represented as "terrestrial protected areas' surface"); *"Natura 2000 network"* (represented as "Special Protection Areas (SPAs) surface", "Sites of Community Interest (SCIs) surface" and "Special areas of conservation (SACs)", "Birds' richness and plenty in Italy" (represented as "Number of ringed birds"); "Spreading of allochthonous plant and animal species" (represented as "Number of allochthonous species").
Considering 2010 as the base year (value = 100), the AMPI method shows (graph #2) the trend until 2018 (value = 87.5). That's a decreasing trend since 2010 onwards, except in 2011 and between 2016 and 2017.



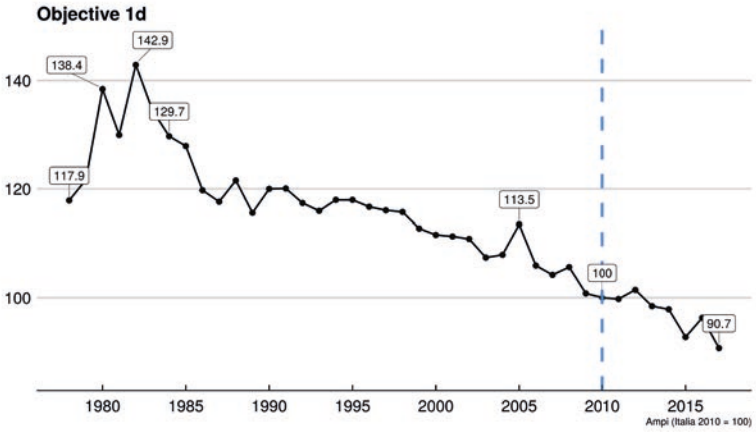
Graph #2: AMPI method about Objective1a "The loss of biodiversity and the degradation of ecosystem services, including pollination, are halted, ecosystems and their services are maintained and at least 15 % of degraded ecosystems have been restored"

9 indicators have been used for the Objective 1c *"the impact of pressures on marine waters is reduced to achieve or maintain good environmental status, as required by the Marine Strategy Framework Directive, and coastal zones are managed sustainably"*. On the ground of a common and fairly long time-series (2007 al 2018), three basic indicators have been selected to define the composite index #3. They all concern fishery and result from two Environmental Data Yearbook indicators: *"Overexploited fish stocks"* and *"Fishery consistency"*. With regard to "Fishery consistency", two indicators have been selected: "Fishing effort" and "CPUE (Catches Per Unit Effort)". With regard to "Overexploited fish stocks", the percentage of the overexploited fish stocks has been taking into account. The composite index shows (graph #3) an increasing trend since 2010 (base year, value = 100) until 2015, and then a decreasing trend until 2018 (value = 78.3). According to the AMPI method, the best performance occurred in 2008 (value = 111.5) due to an overall decrease of the already mentioned three basic indicators.



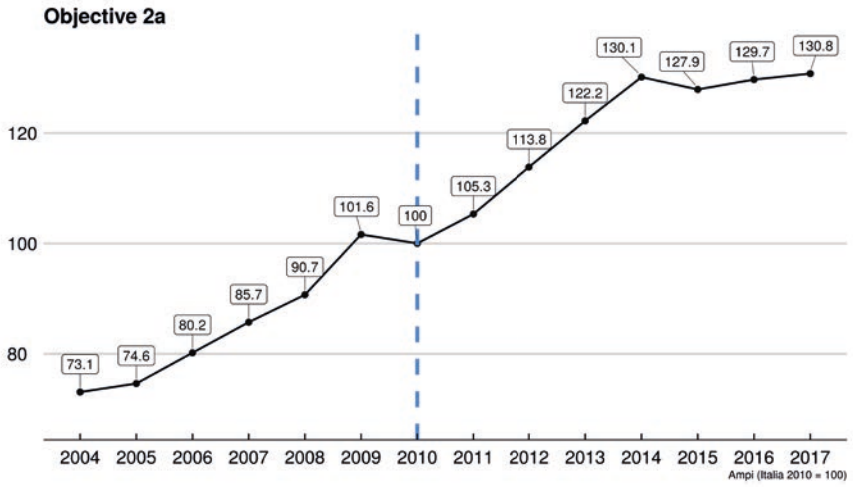
Graph #3: AMPI method about Objective 1c "the impact of pressures on marine waters is reduced to achieve or maintain good environmental status, as required by the Marine Strategy Framework Directive, and coastal zones are managed sustainably"

With regard to the Objective 1d *"Air pollution and its impacts on ecosystems and biodiversity are further reduced with the long-term aim of not exceeding critical loads and levels"*, 4 environmental indicators were available in the ISPRA Data Yearbook, but just one of them has been selected: "Glaciers frontal variation". The other three indicators couldn't offer enough long time-series to be taken into account. "Glaciers frontal variation" have been described by 3 indicators, as the average minimum altitude (meters above sea level) in Western, Central and Eastern Alps. The composite index analysis covers the period 1978–2017. The lowest value of the time-series occurred in 2017 (value = 90.7). The decreasing trend depends on the increasing values in all the three indicators over the years, since they have a negative polarity towards this phenomenon (graph #4).



Graph #4: AMPI method about the Objective 1d "Air pollution and its impacts on ecosystems and biodiversity are further reduced with the long-term aim of not exceeding critical loads and levels"

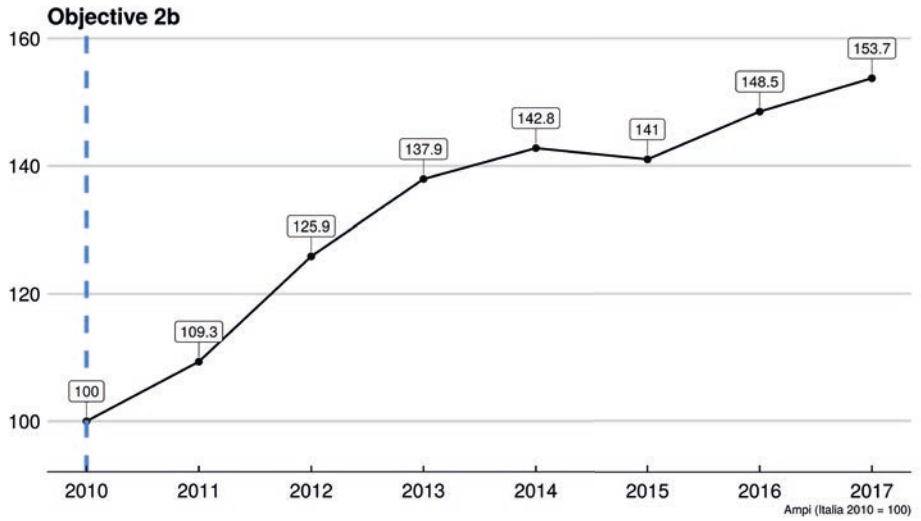
With regard to the Objective 2a: Italy *"has met its 2020 climate and energy targets and is working towards reducing by 2050 GHG emissions by 80–95 % compared to 1990 levels, as part of a global effort to limit the average temperature increase below 2 °C compared to pre-industrial levels, with the agreement of a climate and energy framework for 2030 as a key step in this process"*, the lack of common fairly long time-series has led to select just 3 environmental indicators out of the 7 available ("GHGs emissions per capita and GDP", "Renewable energy share in final consumption", "Total consumption of primary energy sources"). The resulting composite index covers the period 2004-2017.
The 3 selected indicators have been represented by: $MtCO_2$ eq of domestic GHGs emissions/GDP, the percentage of renewable energy share in final consumption, and GDP's primary energy intensity (ktoe/M€ - 2010 chain linked market prices).
AMPI's value of composite index (graph #5) increases from 100 in 2010 (base year) to 130.8 in 2017. This is due to the drop in the values of all the three mentioned indicators.



Graph #5: AMPI method about the Objective 2a "Italy has met its 2020 climate and energy targets and is working towards reducing by 2050 GHG emissions by 80–95 % compared to 1990 levels, as part of a global effort to limit the average temperature increase below 2 °C compared to pre-industrial levels, with the agreement of a climate and energy framework for 2030 as a key step in this process"

With regard to the Objective 2b: *"the overall environmental impact of all major sectors of the Italian economy is significantly reduced, resource efficiency has increased, and benchmarking and measurement methodologies are in place. Market and policy incentives that foster business investments in resource efficiency are in place, while green growth is stimulated through measures to foster innovation"*, 10 out of 15 indicators have been selected, considering the availability of suitable time-series covering the period from 2010 to 2017.
The selected environmental indicators are as follow: "Resources' productivity" (Domestic material consumption/GDP); "Domestic material consumption" (Mt); "Final energy consumption and total energy consumption rate" (%); "Sectorial and total final energy intensities" (toe/Million euros 2010), "CO2 specific emissions" (grams of CO2/km); "Transport demand and intensity: freight transport and transport fleeting" (thousands of vehicles-km/capita), "UNI-EN-ISO 14001 certifications", "EMAS registrations", "Energy consumption in transport sector" (PJ). The composite index (graph #6) shows an on-going improvement since 2010 (base year, value =

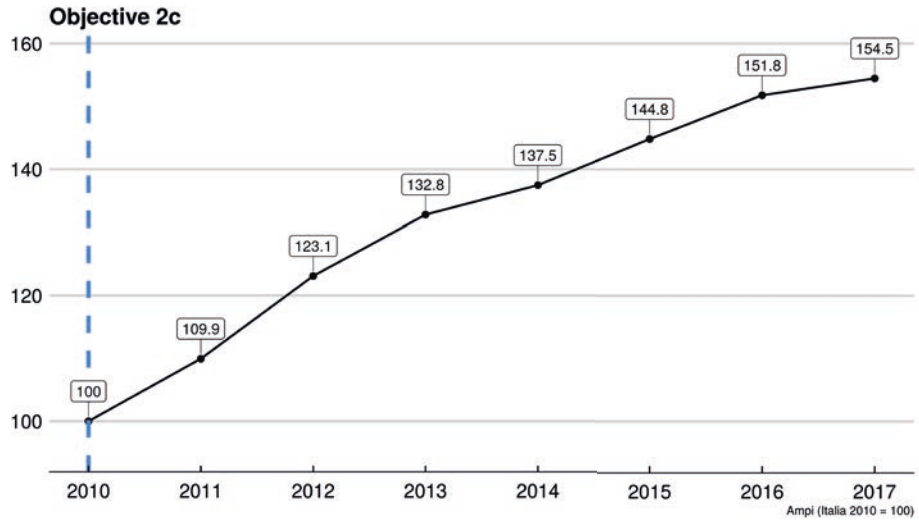
100) until 2017 (value = 153.7). Such a trend is probably due to the increase of the values in "Resources' productivity", "Final energy consumption and total energy consumption rate", "UNI-EN-ISO 14001 certifications" and "EMAS registrations", as well as to the decrease of the values in "Domestic material consumption", "CO_2 specific emissions", "Sectorial and total final energy intensities", "Transport demand and intensity: freight transport and transport fleeting", "Energy consumption in transport sector".



Graph #6: AMPI method about Objective 2b: "the overall environmental impact of all major sectors of the Italian economy is significantly reduced, resource efficiency has increased, and benchmarking and measurement methodologies are in place. Market and policy incentives that foster business investments in resource efficiency are in place, while green growth is stimulated through measures to foster innovation"

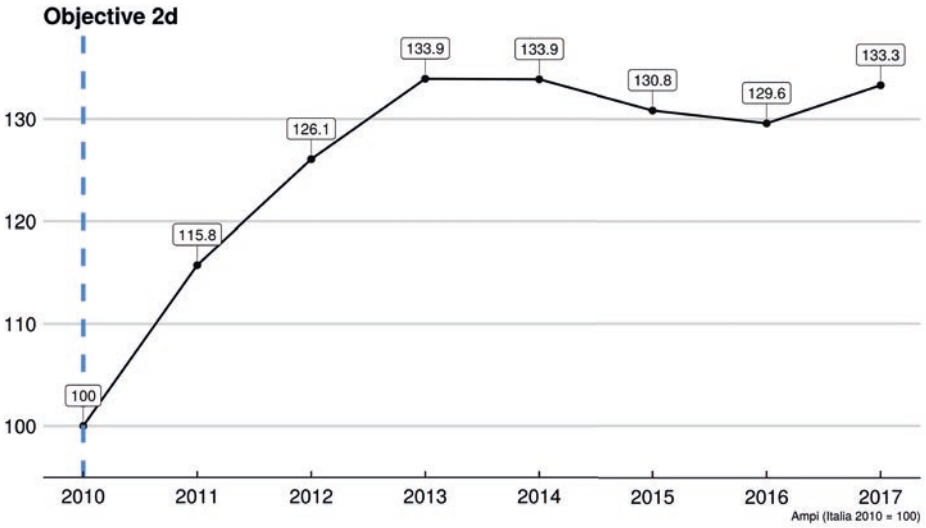
With regard to the Objective 2c: *"structural changes in production, technology and innovation, as well as consumption patterns and lifestyles have reduced the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors"*, 7 available indicators have been selected: NO_x, NMVOC, PM2.5, SO_x emissions from transport sector ($MtCO_2$ eq) are all included in *"Air pollutants' emissions (transport sector)"* indicator, *"Vehicle fleet compliance with emission standards (share)"* has been represented by "Gasoline-powered automobile (%)", "Diesel-powered automobile (%)", "Light-duty vehicles (%)", "Heavy-duty vehicles (%)", "City busses and suburban busses (%)", "Motorcycle and three-wheelers (%)". The following indicators have also been selected: *"Spreading of low environmental impact fuels (%)"*, *"GHGs emissions in ETS and ESD sectors ($MtCO_2$ eq)"*, *"EU ECOLABEL licences and certified products/services (No)"*, *"White certificates (ktoe)"*, *"Organic farming (ha)"*.
Concerning this sub-objective, two different tests have been made last year.
During the first test, the unit weight assigned to each of the selected indicators was the same.
During the second test, the unit weight has been shared among the basic indicators according to the belonging area. Thereby, a weight of 0.25 has been attributed to: "NO_x emissions from transport sector", "NMVOC emission from transport sector", "PM2.5 emissions from transport sector", "SO_x emissions from transport sector" which together described the "Air pollutants' emissions (transport sector)" indicator. A weight of 0.167 has been attributed to "Gasoline-powered automobile", "Die-

sel-powered automobile", "Light-duty vehicles", "Heavy duty vehicles", "City busses and suburban busses", "Motorcycle and three-wheelers" which together described the "Vehicle fleet compliance with emission standards (share)".
Since the outcomes of the two different tests were very similar, the "classic" AMPI method has been chosen this year. This means: same unit weight for each and all of the selected indicators.
Graph #7 shows an increasing trend for the Objective 2c.



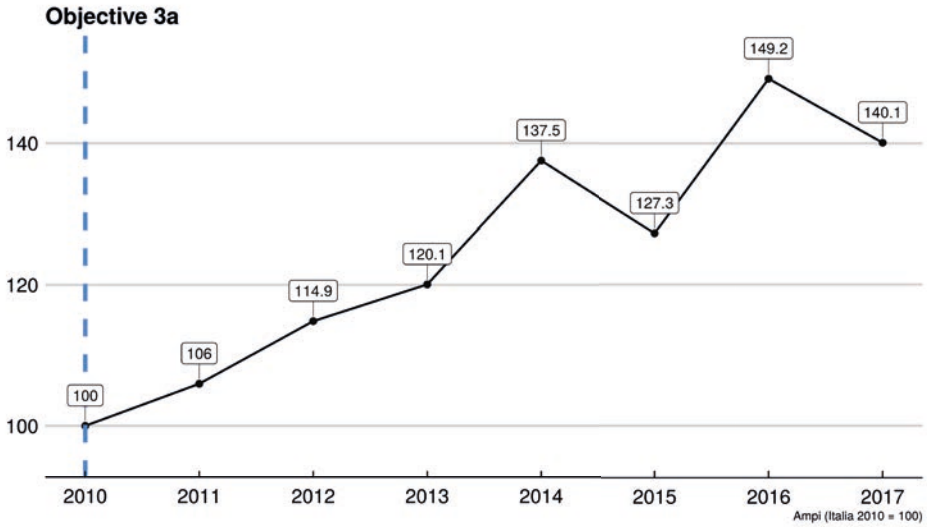
Graph #7: AMPI method about Objective 2c: "structural changes in production, technology and innovation, as well as consumption patterns and lifestyles have reduced the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors"

With regard to the Objective 2d: *"waste is safely managed as a resource and to prevent harm to health and the environment, absolute waste generation and waste generated per capita are in decline, landfilling is limited to residual (i.e. non-recyclable and non-recoverable) waste, having regard to the postponements provided for in Article 5(2) of the Landfill Directive and energy recovery is limited to non-recyclable materials, having regard to Article 4(2) of the Waste Framework Directive"*, 9 out of 10 indicators have been selected.
All of the selected basic indicators concern the "Waste" issue: "Waste generation from economic activities" (t *1,000); "Municipal waste generation" (t *1,000); "Preparing for re-use and recycling" (%), "Recycling/recovery of construction and demolition waste" (%); "Landfilled municipal waste" (t *1,000); "Waste processing: composting" (t); "Waste processing: anaerobic digestion" (t*1,000); "Waste processing: mechanical-biological treatment" (t*1,000); "Total incinerated waste" (t*1,000); "Recovered waste from economic activities" (t*1,000).
The composite index covers the period 2010-2017. Since 2010 (base year) we can observe an improvement until 2014 (value = 133.9) and then a decreasing trend until 2016 (value = 129.6). A new increasing trend can be observed in 2017 (value = 133.3). The composite index trend seems mostly affected by "Waste processing: anaerobic digestion" over years.



Graph #8: AMPI method about Objective 2d: "waste is safely managed as a resource and to prevent harm to health and the environment, absolute waste generation and waste generated per capita are in decline, landfilling is limited to residual (i.e. non-recyclable and non-recoverable) waste, having regard to the postponements provided for in Article 5(2) of the Landfill Directive and energy recovery is limited to non-recyclable materials, having regard to Article 4(2) of the Waste Framework Directive".

With regard to the Objective 3a: *"outdoor air quality in Italy has significantly improved, moving closer to WHO recommended levels, while indoor air quality has improved, informed by the relevant WHO guidelines"*, 9 out of 18 environmental indicators have been used for the implementation of the composite index (period 2010-2017).
4 basic indicators concern air quality, namely the "Percentage of measuring stations exceeding the limit value" of PM10, PM2.5, O_3 and NO_2 concentrations. The other 5 basic indicators concern the air pollution issue in terms of emissions of CO, PM10, acidifying substances (SO_x, NO_x, NH_3), NMVOC and benzene. The application of the AMPI method shows (Graph #9) increasing values of the composite index from 100 (2010 base year) to 140.1 (2017). The trend constantly grows except in 2015 and 2017.



Graph #9: AMPI method about Objective 3a: "outdoor air quality in Italy has significantly improved, moving closer to WHO recommended levels, while indoor air quality has improved, informed by the relevant WHO guidelines"

Summing up, 5 out of the 8 composite indices show an improvement (increasing values compared to the 2010 base year's value) and 3 composite indices show a worsening (decreasing values compared to the 2010 base year's value). The three decreasing composite indices all belong to the Objective 1 *"to protect, conserve and enhance the natural capital"*: sub-objective 1a *"the loss of biodiversity and the degradation of ecosystem services, including pollination, are halted, ecosystems and their services are maintained and at least 15 % of degraded ecosystems have been restored"*, sub-objective 1c *"the impact of pressures on marine waters is reduced to achieve or maintain good environmental status, as required by the Marine Strategy Framework Directive, and coastal zones are managed sustainably"* and sub-objective 1d *"air pollution and its impacts on ecosystems and biodiversity are further reduced with the long-term aim of not exceeding critical loads and levels"*.

Summary of the composite indices' trends (base year = 2010)

Sub-Objectives	Composite index trend
1a: "The loss of biodiversity and the degradation of ecosystem services, including pollination, are halted, ecosystems and their services are maintained and at least 15% of degraded ecosystems have been restored"	
1c: "The impact of pressures on marine waters is reduced to achieve or maintain good environmental status, as required by the Marine Strategy Framework Directive, and coastal zones are managed sustainably"	
1d: "Air pollution and its impacts on ecosystems and biodiversity are further reduced with the long-term aim of not exceeding critical loads and levels"	
2a: Italy "has met its 2020 climate and energy targets and is working towards reducing by 2050 GHG emissions by 80–95 % compared to 1990 levels, as part of a global effort to limit the average temperature increase below 2 °C compared to pre-industrial levels, with the agreement of a climate and energy framework for 2030 as a key step in this process"	
2b: "The overall environmental impact of all major sectors of the Union economy is significantly reduced, resource efficiency has increased, and benchmarking and measurement methodologies are in place. Market and policy incentives that foster business investments in resource efficiency are in place, while green growth is stimulated through measures to foster innovation"	
2c: "Structural changes in production, technology and innovation, as well as consumption patterns and lifestyles have reduced the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors"	
2d: "Waste is safely managed as a resource and to prevent harm to health and the environment, absolute waste generation and waste generated per capita are in decline, landfilling is limited to residual (i.e. non-recyclable and non-recoverable) waste, having regard to the postponements provided for in Article 5(2) of the Landfill Directive and energy recovery is limited to non-recyclable materials, having regard to Article 4(2) of the Waste Framework Directive"	
3a: "Outdoor air quality in Italy has significantly improved, moving closer to WHO recommended levels, while indoor air quality has improved, informed by the relevant WHO guidelines"	

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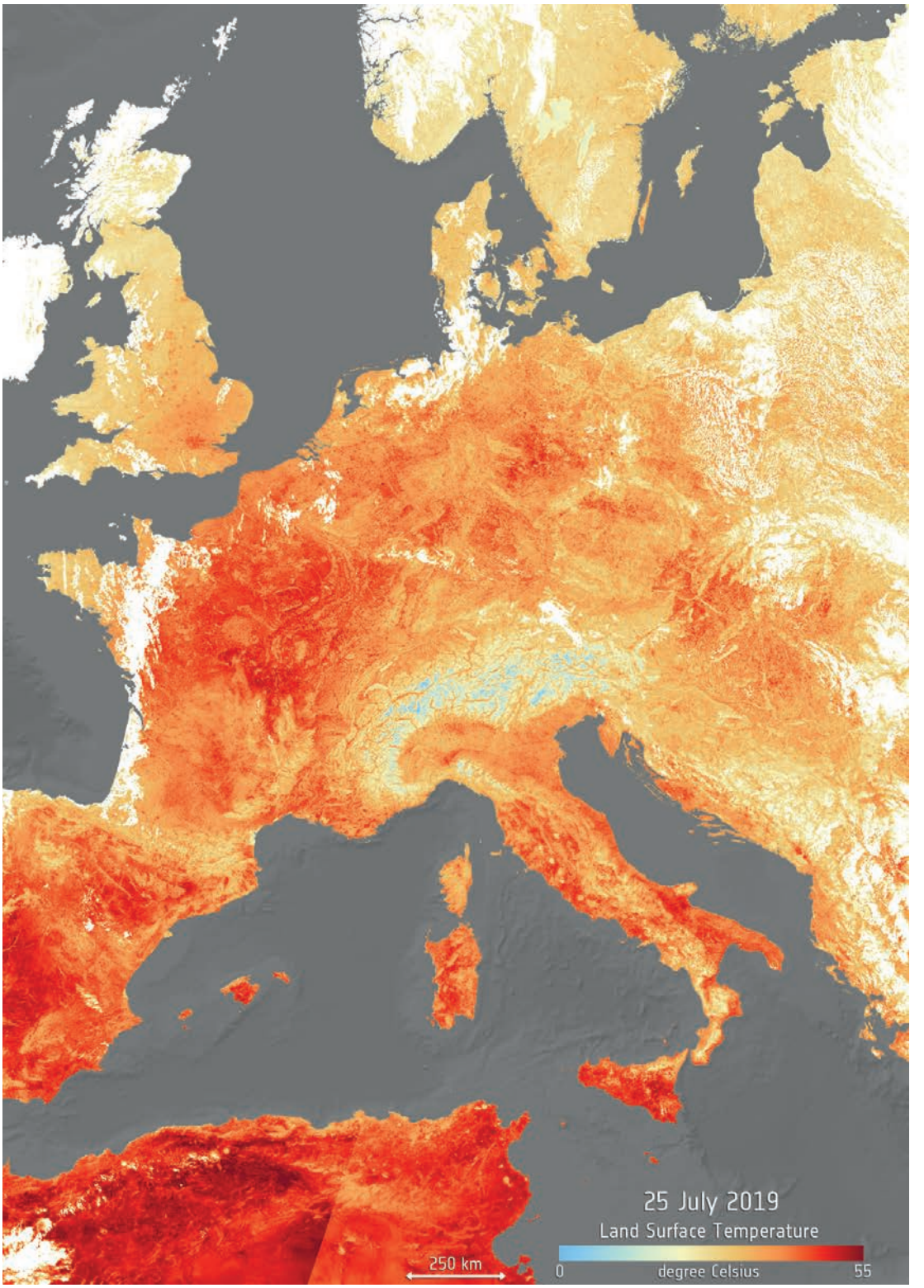

Italy, Sentinel-3A image, 25 July 2019 (ESA)

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