European Environment Agency

Monitoring progress towards the 8th Environment Action Programme

Compilation of the 8th EAP headline indicators

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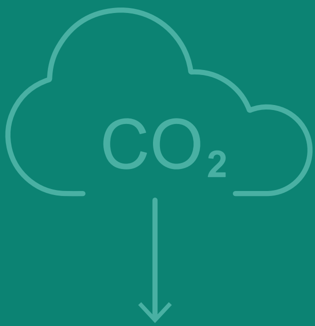


8TH EAP HEADLINE INDICATOR, 2023

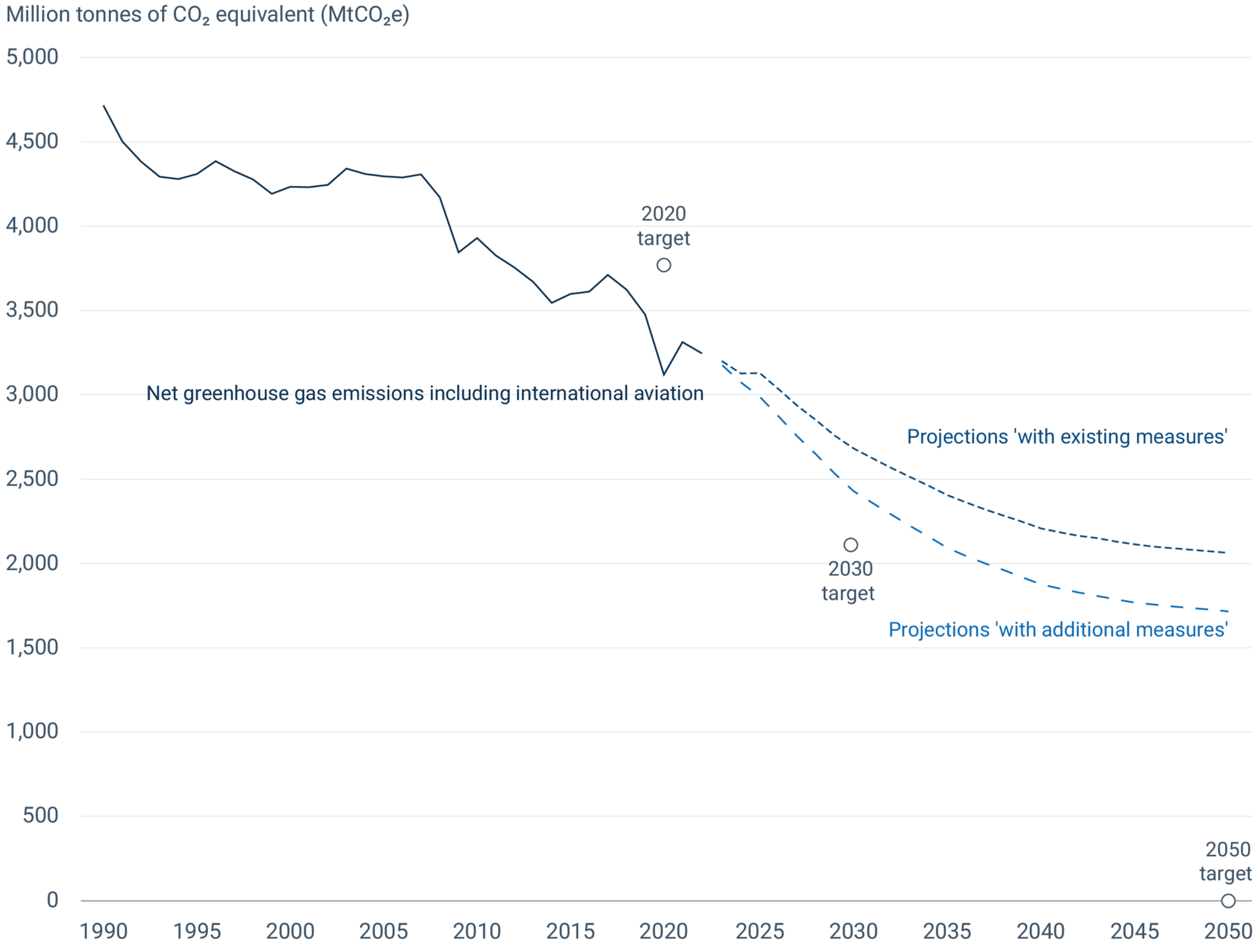
European Environment Agency

Total net greenhouse gas emission trends and projections in Europe

Published 24 Oct 2023

Net greenhouse gas (GHG) emissions including international aviation in the EU-27 decreased by 30% between 1990 and 2021. Despite the energy crisis causing higher emissions from energy production, preliminary estimates for 2022 indicate a further year-on-year reduction of 1.9%. The EU Member States' current projections suggest that a 48% reduction in net emissions will be reached by 2030 compared to 1990 levels. Although this indicates an increased ambition from the 41% projected last year, this will still leave a seven percentage point gap to the 2030 target. This will need to be addressed rapidly to achieve the required reductions.

Figure 1. Progress towards achieving climate targets in the EU-27



Source: EEA.

The reduction of GHG emissions is vital to slow the rate of global warming and mitigate its impact on our environment and on human health. The EU is a frontrunner in climate ambition, with the European Climate Law setting the binding target to achieve climate neutrality by 2050 at the latest, and to reduce net GHG emissions by at least 55% in 2030 compared to 1990. The EU has taken significant steps to fulfill these ambitions.

Compared to 1990, net EU GHG emissions in 2021 had fallen by 30%, while prosperity significantly increased over the same period. This achievement includes emissions from international aviation and takes the carbon sink from the land use, land use change and forestry sector (LULUCF) into account.

The reduction in net GHG emissions has primarily taken place within the past two decades alongside a gradual strengthening of policies to reduce GHG emissions. The overall decrease can be largely attributed to shifts in energy production methods, notably a significant decline in coal usage and growth in the adoption of renewable energy sources. Additionally, there has been a modest reduction in total energy consumption, and substantial decreases in GHG emissions linked to specific industrial production processes, as documented earlier by the EEA.

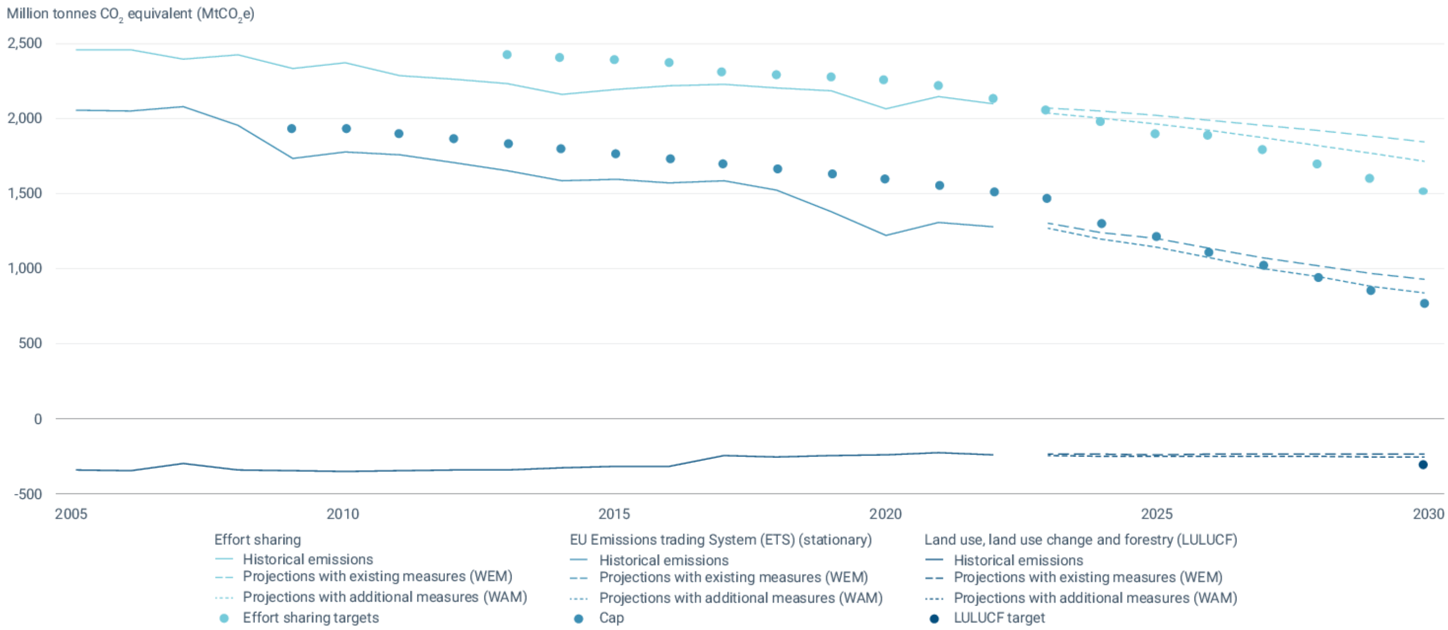
Preliminary estimates indicate that, in 2022, net GHG emissions fell by a further 1.9% below 2021 levels, which can be largely explained by the energy crisis. Spiking gas prices led to energy savings and reduced GHG emissions in the buildings sector, while output decreases in energy-intensive industries caused a significant emission reduction. At the same time, emissions rose in the power sector due to a partial switch to more CO_2 - intensive coal generation.

Compared with the pace of emission reductions observed during the past 10 years, the average annual rate of absolute GHG emission reductions must more than triple to reach the 2030 climate target. Current and planned policy measures across the EU are expected to help contribute to the required acceleration. According to Member States' projections as submitted in March 2023, the policies and measures they currently have in place combined would achieve a reduction of 43% in net emission levels by 2030 compared to 1990. If planned additional measures are taken into account, the projected reduction would reach 48%. Last year, Member States only projected this reduction to total 41%, indicating a shared increase in ambition across Europe in the past year. However, this will still leave a gap of seven percentage points to the 2030 target, which will need to be addressed rapidly to achieve the required reductions.

The update of National Energy and Climate Plans, for which final versions are due to be submitted in June 2024, may include pathways to focus on this shortfall. Generally, all sectors will need to be addressed by strengthened policies and measures. Specifically, in the buildings sector, there exists significant cost-effective potential to reduce GHG emissions by 2030. The transport and agricultural sectors also require substantial additional efforts, given their limited progress in recent years.

Looking beyond 2030, the gap between the targets and the projected impact of current and planned measures is even wider. Taking into account currently adopted and planned measures, net emissions are projected to reach a level of 60% below 1990 levels in 2040 and 64% in 2050. This indicates the need for transformative policies across all sectors to reach climate neutrality.

Figure 2. Effort Sharing, ETS, LULUCF trends and projections in the EU-27



Source: EEA.

Three pivotal EU policies target GHG emissions and removals, and each is accompanied by clear binding targets for 2030.

The EU Emission Trading System (EU ETS) covers the GHG emissions from stationary installations in the power sector and large industrial plants; since 2012, it has also included CO_2 emissions from aviation. ETS emissions from stationary installations have decreased by 38% between 2005 and 2022, largely driven by the decarbonisation of the power sector. In 2022, stationary EU ETS emissions showed a further 2% decrease compared to 2021, with higher energy prices leading to reduced output in industry and a temporal increased use of coal in the power sector. At the same time, aviation ETS emissions increased by more than 80% as the sector rebounded from the effects of the COVID-19 pandemic. By 2030, projections taking into account current and planned measures indicate a 59% reduction compared to 2005 for stationary installations, falling slightly short of the 62% reduction target for the EU ETS.

National GHG reduction targets are governed by the Effort Sharing legislation, covering sectors such as transport, buildings and agriculture. The reduction in these emissions has been less pronounced compared to those governed by the EU ETS, showing a 14% decrease between 2005 and 2021, with estimates for 2022 indicating a further 3% decrease. Projections suggest a considerable gap towards 2030, with the emissions reaching a reduction of 32% compared with the target of 40%.

The land use, land use change and forestry (LULUCF) sector represented a net carbon sink of about 230Mt CO_2e in 2021, corresponding to the absorption of 7% of total GHG emissions. Over the last decade, the carbon sink has been shrinking continuously, although the initial estimates for 2022 show a reversal of this trend. GHG projections as submitted by Member States in March 2023 foresee a further increase of the carbon sink, but not at a growth rate that would permit achievement of the target level of -310 Mt CO_2eq by 2030.

Supporting information

Definition

This indicator presents past and projected GHG emission trends in Europe and assesses the progress of the EU towards its GHG targets. The EU's total GHG emissions include GHG emissions from land use, land use change and forestry (LULUCF) and international aviation to be consistent with the scope of the EU's 2030 Nationally Determined Contribution (NDC) and as included in the EU greenhouse gas inventory 1990-2021[1].

In addition to the overall GHG emissions, this indicator presents disaggregated trends to illustrate the development of emissions covered by the EU Emission Trading Scheme (ETS) and the Effort Sharing Legislation as well as from land use, land use change and forestry (LULUCF).

This indicator aims to present an assessment of the EU's progress towards its 2030 and 2050 ambitions under consideration of the trends of emissions covered under EU Emission Trading Scheme (ETS), the Effort Sharing Legislation as well as from land use, land use change and forestry (LULUCF).

The indicator is based on the official GHG inventories submitted by the EEA countries and the EU to the UNFCCC, as well as on the projected GHG emissions submitted by the Member States under the Regulation on the Governance of the Energy Union and Climate Action (Regulation (EU) 2018/1999)[2]. Finally, this indicator uses data and estimates from the 'Approximated GHG inventory' for the year (X-1).

The indicator covers all 27 Member States of the European Union.

Methodology

Methodology for indicator calculation

This indicator is based on the official GHG inventories submitted by the EEA countries to the EEA, as well as on the projected GHG emissions submitted by the Member States under the Regulation (EU) 2018/1999 [2]on the governance of the energy union and climate action. The EU GHG inventory submitted by the EU to the UNFCCC is based on the same data and is also used. The EU ETS emissions, as reported to the European Commission by operators of industrial installations and aircrafts, are also used. When available, approximate estimates of the GHG emissions for the year (X-1) are also presented.

Greenhouse gases

In line with the UNFCCC reporting guidelines on annual inventories, the national inventories cover emissions and removals of the following GHGs:

- carbon dioxide (CO_2), including indirect $CO_{2;}$

- methane (CH_4);

- nitrous oxide (N_2O);

- hydrofluorocarbons (HFCs);

- perfluorocarbons (PFCs);

- suphur hexafluoride (SF_6); and

- nitrogen trifluoride (NF_3)

from six sectors (Energy, Industrial processes and product use, Agriculture, LULUCF, Waste and Other).

The gases do not include the GHG emissions that are also ozone-depleting substances, which are controlled by the Montreal Protocol.

In order to be aggregated, non-CO_2 gases are weighted by their respective global warming potential (GWP) and presented in CO_2-equivalent units. Global warming potential (GWP) is a measure of how much a given mass of a GHG is estimated to contribute to global warming on a 100-year horizon.

Consistent with the latest Decision on the UNFCCC Reporting Guidelines adopted at COP27 in Sharm-El-Sheik, the GWP values used in this indicator are the ones from IPCC AR5:

Gas	Global warming potential values from IPCC AR5
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_2O)	265
Sulphur hexafluoride (SF_6)	23,500
Nitrogen trifluoride (NF_3)	16,100

HFCs and PFCs comprise a large number of different gases that have different GWPs. The full list of GWPs can be found in Chapter 8 of the 5th Assessment Report.

Greenhouse gas inventories

For the preparation of their national inventories, countries use the methodologies of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Projected greenhouse gas emissions

For projected GHG emissions, information submitted by the EEA countries under the Governance Regulation is used, with the latest submission in March 2023. The projected GHG emissions referred to in the indicator are those reported under the 'with existing measures' scenario (WEM) and the 'with additional measures' scenario (WAM).

Emission trading system emissions

Emissions from the EU ETS are also presented in the indicator. The EU ETS runs over three trading periods: Phase I (2005-2007), Phase II (2008-2012) and Phase III (2013-2020).

In 2013, the scope of the EU ETS was expanded to include additional references to (a) the capture, transport and geological storage of GHG emissions; (b) CO_2 emissions from petrochemical, ammonia and aluminium production; (c) N_2O emissions from the production of nitric, adipidic and glyoxylic acids; and (d) PFC emissions from aluminium production. Since 1 January 2012, aviation has also been part of the EU ETS.

Since 2013, these emissions have been calculated by the plant operators that fall under the ETS obligations in line with Regulation No 601/2012 [3], whereas in Phase II of the EU ETS (2008-2012), the monitoring and reporting of the operators was based on Commission Decision 2004/156/EU. Croatia entered the EU ETS on 1 January 2013.

Approximated greenhouse gas inventory

Finally, this indicator uses data and estimates from the 'Approximated GHG inventory' for the year (X-1). These 'proxy' inventories are reported by Member States to the EEA and to the Commission under the Governance Regulation by 31 July of each year, X, and are calculated at an aggregated level on the basis of the national and international information available for the year (X-1).

Methodology for gap filling

Greenhouse gas inventories (years 1990-(X-2)):

The historic emission data presented in the indicator are based on the information reported by Member States under the Governance Regulation. However, should a Member State not submit the inventory data required to compile the EU inventory, the Commission shall prepare estimates to complete the GHG inventories submitted by Member States in consultation and close cooperation with the Member States concerned. In this case, the Member State shall use the gap-filled inventory in its official submission to the UNFCCC. The basis for these gap-filling processes is described in the Commission Delegated Regulation of 12.03.2014 (http://ec.europa.eu/clima/policies/g-gas/monitoring/docs/c_2014_1539_en.pdf)

Projected greenhouse gas emissions (year X–2050):

In order to ensure the timeliness, completeness, consistency, comparability, accuracy and transparency of the reporting of projections by the EU and its Member States, the quality of the reported projections is assessed by the ETC CM on behalf of the EEA. As the Member States' reporting of projections is carried out every two years by countries, in certain cases, projections are adjusted to ensure full consistency with historic GHG emission data from the latest GHG inventories. Where a country has not made a submission, data are gap-filled by the ETC CM.

Approximated greenhouse gas inventory (year X-1):

Under the Governance Regulation, the Commission shall also estimate a Member State's approximated GHG inventory if the Member State does not provide it. These estimates are provided by the EEA and are country-specific. More information on the methodology used for gap-filling is provided in the 'Approximated GHG inventory report' of each year.

Methodology references

- Annual European Union greenhouse gas inventory and inventory report. All the data used to prepare the indicator are consistent with the latest EU GHG national inventory report (NIR). The main institutions involved in the compilation of the EU GHG inventory are the Member States, the European Commission's Directorates-General Climate Action (DG CLIMA), Eurostat, the Joint Research Centre and the European Environment Agency (EEA) and its European Topic Centre on Air Pollution and Climate Change Mitigation (ETC CM). This report is compiled on the basis of the inventories of the EU Member States for the EU-27. The EU GHG inventory is the direct sum of the national inventories.
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories The 2006 IPCC Guidelines for National Greenhouse Gas Inventories are the latest step in the IPCC development of inventory guidelines for national estimates of GHGs. These 2006 Guidelines build on the previous Revised 1996 IPCC Guidelines and the subsequent Good Practice reports. They include new sources and gases as well as updates to the previously published methods whenever scientific and technical knowledge have improved since the previous guidelines were issued. Since 2015, UNFCCC Parties are using the 2006 IPCC Guidelines' methodologies and reporting formats when preparing their inventories, in line with the UNFCCC reporting guidelines (Decision 24/CP.19).
- UNFCCC reporting guidelines on annual inventories This document contains the complete updated UNFCCC reporting guidelines on annual inventories for all inventory sectors.
- Commission Regulation (EU) No 601/2012 Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council. The regulation sets out the rules for the monitoring and reporting of ETS emissions by plant operators, covering the scope of Phase III of the ETS.
- IPCC Fifth Assessment Report (AR5) At regular intervals, the (IPCC) prepares comprehensive Assessment Reports of scientific, technical and socio-economic information relevant for the understanding of human induced climate change, the potential impacts of climate change and options for mitigation and adaptation. Currently used GWP are based on the AR5.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring aspects of the 8th EAP priority objective Article 2a. that shall be met by 2030: 'swift and predictable reduction of greenhouse gas emissions and, at the same time, enhancement of removals by natural sinks in the Union to attain the 2030 greenhouse gas emission reduction target as laid down in Regulation (EU) 2021/1119[4], in line with the Union's climate and environment objectives, whilst ensuring a just transition that leaves no one behind;'[5]. For the purposes of the 8th EAP monitoring framework, this indicator assesses specifically whether the EU will 'reduce net GHG emissions by at least 55% by 2030 from 1990 levels' [5]. This year's projections may not fully reflect the current efforts by Member States to meet some of the measures under the Fit for 55 package that were adopted in the course of 2023 [6]. The modelling results presented by the European Commission in its impact assessments for the Fit for 55 package of legislative proposals indicate an expected full achievement of the 2030 target if strengthened policies are implemented across the sectors.

The UNFCCC sets an ultimate objective of stabilising GHG concentrations 'at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.' The 2015 Paris agreement clarifies that the overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels." The European Union, as a party to the UNFCCC and the Paris Agreement, reports annually on the GHG emissions within the area covered by its Member States. The Annual European Union greenhouse gas inventory and inventory report, officially submitted to the UNFCCC Secretariat, is prepared on behalf of the European Commission (DG CLIMA) by the EEA and its European Topic Centre for Climate Change Mitigation (ETC CM), supported by the Joint Research Centre and Eurostat.

The EU is committed to reduce its GHG emissions and has taken several steps over the past decades:

In 2007, EU leaders set the target of a 20% reduction of EU GHG emissions by 2020 compared with the emissions in 1990. To attain this goal, a comprehensive legislative package known as the **EU 2020 Climate and Energy Package** was introduced. This package encompassed not only climate objectives but also a commitment to substantially expand renewable energy sources and enhance energy efficiency. To fulfill the climate objectives, a twofold legal framework was put in place:

- The implementation of a cap-and-trade system with the EU Emissions Trading Scheme (EU ETS) for regulating emissions from energy-intensive industries and the power sector. In this framework, the emission cap for 2020 was set at a 21% reduction compared to 2005 levels.
- An effort to reduce emissions not covered by the EU ETS by about 10% compared with 2005 levels, shared between the EU Member States through differentiated annual national GHG targets under the ESD.

The **European Climate Law**, published in 2021, sets the trajectory towards 2050 and beyond, with the target to reduce GHG emissions in the EU by at least 55% by 2030, and to achieve climate neutrality at the latest by 2050, with the aim of to achieve negative emissions thereafter. Contrary to the 2020 target, both targets also account for emissions and removals of the land use, land use change and forestry sector and are therefore net targets. In line with the European Climate Law, the European Commission will make a legislative proposal, as appropriate, for a Union-wide 2040 climate target within 6 months of the global stocktake under the Paris Agreement in November 2023.

Towards **2030, the 'Fit for 55' legislative" package**, a key element of the European Green Deal, sets the EU on a path to reach its climate targets in a fair, cost-effective, and competitive way. It builds on the previous 2020 energy and climate framework, but also includes many new policy instruments and targets that incentivize climate action across all sectors of society. In the area of climate mitigation, the key targets of the package are:

- The revised EU ETS Directive increases the ambition of the existing ETS to 62% emissions reductions by 2030, compared to 2005 levels, and will also apply to international maritime transport.
- For the sectors not covered by this ETS system, namely road and domestic maritime transport, buildings, agriculture, waste and small industries, a global reduction target of 40% compared with 2005 levels is set through the amended Effort Sharing Regulation (ESR). This target is shared between the EU Member States through differentiated annual national GHG targets, ranging from -10% to – 50%.
- The LULUCF regulation sets an overall EU-level objective of 310 Mt CO_2 equivalent of net removals, with national targets for each Member State

In addition to these key policies, a new emissions trading system (ETS2) will be introduced from 2027 onwards. ETS2 will cover emissions from fuel combustion in road transport, buildings, and other sectors, contributing to a 42% reduction in emissions compared to 2005 levels within these sectors. These emissions will also be subject to the Effort Sharing Regulation.

Related policy documents

- Regulation (EU) 2021/1119('European Climate Law')

Regulation of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality

- Consolidated text of the Regulation (EU) 2018/1999 (Governance Regulation)

Regulation of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action

- Consolidated text of Regulation 2018/842, as amended by Regulation (EU) 2023/857 (Effort Sharing Regulation)

Regulation on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement

- Consolidated text of Directive 2003/87/EC as last amended by Directive 2023/959 (ETS Directive)

Directive of the European Parliament and of the Council establishing a system for greenhouse gas emission allowance trading within the Union,

- Consolidated text of Regulation (EU) 2018/841, as last amended by Regulation 2023/839 (LULUCF Regulation)

Regulation of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework

- Consolidated text of Commission Implementing Decision (EU) 2020/2126, as last amended by Commission Implementing Decision (EU) 2023/1319

Decision on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council

- Kyoto Protocol to the UN Framework Convention on Climate Change

Kyoto Protocol to the United Nations Framework Convention on Climate Change; adopted at COP3 in Kyoto, Japan, on 11 December 1997

- Paris Agreement

The Paris Agreement. Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 11 December 2015.

- European Green Deal
- UNFCCC

UNFCCC reporting guidelines on annual inventories

Accuracy and uncertainties

Methodology uncertainty

Greenhouse gas inventories

(a) Difference in methodologies between countries

Since Member States use different national methodologies, national activity data or country-specific emission factors in accordance with IPCC and UNFCCC guidelines, these different methodologies are reflected in the EU GHG inventory data. The EU believes that it is consistent with the UNFCCC reporting guidelines and the 2006 IPCCC guidelines to use different methodologies for one source category across the EU territory, especially if this helps to reduce the uncertainty and improve the consistency of the emission data, provided that each methodology is consistent with the 2006 IPCC guidelines. At the same time, the EU is making an effort to promote and support the use of higher tier methodologies across Member States. At the EU level, and for most of the key categories of the EU inventory, more than 75% of the EU emissions are calculated using higher tier methodologies, resulting in lower uncertainty rates.

(b) Global warming potential

According to the IPCC, the GWP values used in the IPCC AR4 have an uncertainty of ±35% for the 5-95% (90%) confidence range.

Projected greenhouse gas emissions

The methodology proposed consists of simple additions of data reported by Member States. However, uncertainty arises from the following:

- projections can be subject to updates that might not be reflected in the assessment if these updates were recently developed;
- the projections taken into account are fully consistent with Member State submissions under the Governance Regulation. However, other sets of projections with different data might have been published by countries (e.g. national allocation plans, national communications to the UNFCCC).

Several countries carry out sensitivity analyses on their projections.

Approximated greenhouse gas inventory

The uncertainty ranges estimated in the approximated GHG inventories are derived by comparing the official national data submitted to the UNFCCC in year X with the proxy estimates of the same year. The uncertainty for the approximated emissions at the EU level is estimated as the weighted mean of the differences described: weighted again by the relative contribution that each Member State makes to total EU-27 emissions. More details about these methodologies are provided each year in the 'Approximated GHG inventory report'.

Data sets uncertainty

The 2006 IPCC Guidelines provide approaches on how Parties should estimate uncertainties, suggesting different values for the uncertainty of activity data and emission factors for most of the emission source categories. On the basis of this guidance, EU Member States and other EEA countries perform their own assessment of the uncertainty of reported data and provide an uncertainty analysis in the National Inventory Report to account for uncertainty per source category, as well as the total uncertainty of their national inventory.

Section (1.6) of the annual EU GHG inventory report considers the uncertainty evaluation, describing the methodology used to estimate it. The results suggest that the uncertainty level in the EU is about 5% for total GHG emissions (including LULUCF).

Total EU-27 GHG emission trends are likely to be more accurate than individual absolute annual emission estimates, because the annual values are not independent of each other. The IPCC suggests that the uncertainty in total GHG emission trends is approximately 4-5%. For the EU, the trend uncertainty is estimated to be close to 1%. Total GHG emission estimates are quite reliable and the limited number of interpolations used to build the indicator do not introduce much uncertainty at the EU level.

Uncertainties in the projections of GHG emissions can be significant but have not been assessed.

Data sources and providers

- National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism, October 2023, European Environment Agency (EEA)
- Greenhouse gas emissions under the Effort Sharing Legislation, 2005-2022, European Environment Agency (EEA)
- Member States' greenhouse gas (GHG) emission projections, 2023, European Environment Agency (EEA)
- European Union Emissions Trading System (EU ETS) data from EUTL, July 2023, European Environment Agency (EEA)
- Approximated estimates for greenhouse gas emissions, 2022, European Environment Agency (EEA)
- Member States' greenhouse gas (GHG) emission projections, 2023, European Environment Agency (EEA)
- National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism, October 2023, European Environment Agency (EEA)
- Approximated estimates for greenhouse gas emissions, 2022, European Environment Agency (EEA)

Metadata

DPSIR

Pressure

Topics

Climate change mitigation

Tags

CLIM050 # Climate # Progress to target # Energy # Greenhouse gases # climate change mitigation # Trends # Projections # Energy efficiency # Renewable energy # 8th EAP

Temporal coverage

1990-2050

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Performance indicator (Type B - Does it matter?)

UN SDGs

Climate action

Unit of measure

This indicator expresses GHG emissions in 'million tonnes of CO_2 equivalent' (Mt CO_2e).

Frequency of dissemination

Every 2 years

Contact

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References and footnotes

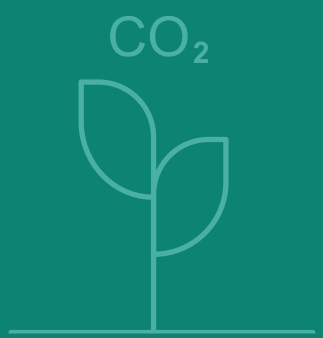
1. The European Climate Law and greenhouse gas emission reduction objectives included therein apply to all anthropogenic greenhouse gas emissions that are regulated by EU law. Consequently, in the forthcoming years, this indicator's scope can be further improved, encompassing intra-EU and extra-EU maritime emissions as they will be included into the scope of the EU ETS from 2024 onwards. Additionally, the scope of aviation emissions can be fine-tuned to include those emission regulated by EU law.
↵

2. EU, 2018, Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council, OJ L 328, 21.12.2018, p. 1-77.
a b
3. EU, 2018, Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012
↵
4. EU, 2021, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality (OJ L 243, 9.7.2021, p. 1–17).
↵
5. EC, 2022, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme’s 2030 and 2050 priority objectives
a b
6. EEA, 2023, *Trends and Projections in Europe 2023*, Publication, 07/2023.
↵

European Environment Agency

8th Environment Action Programme

Greenhouse gas emissions from land use, land use change and forestry in Europe



8TH EAP HEADLINE INDICATOR, 2023

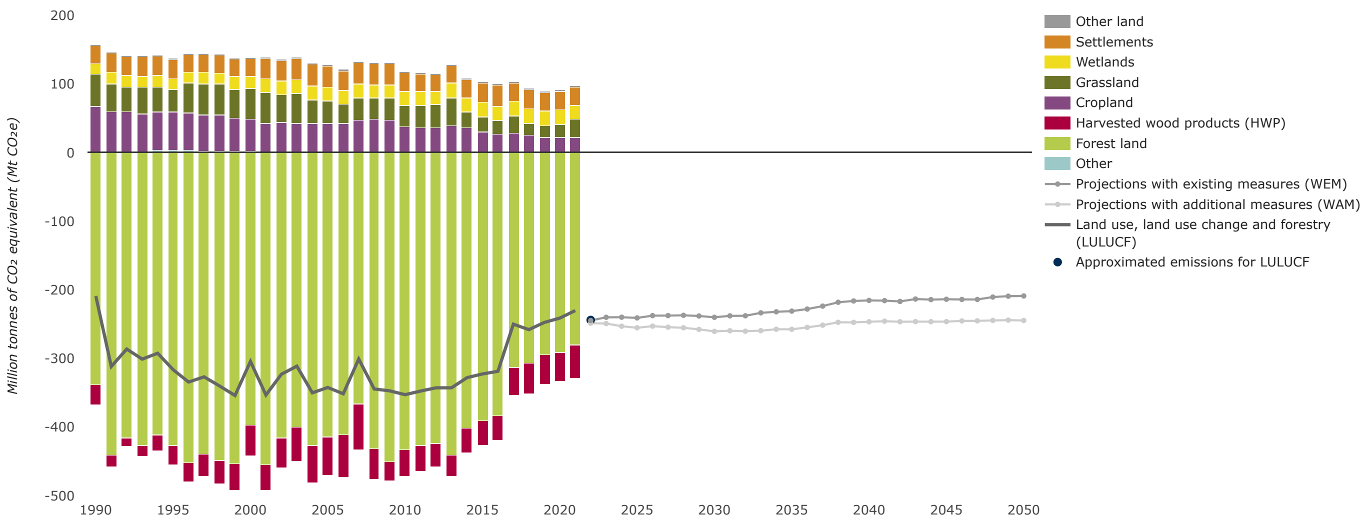
European
Environment
Agency

Greenhouse gas emissions from land use, land use change and forestry in Europe

Published 24 Oct 2023

The land use, land use change and forestry (LULUCF) sector plays a key role in achieving the EU's goal of zero net emissions by 2050. LULUCF activities removed net 230 metric tonnes of CO_2 equivalent (Mt CO_2e) from the atmosphere in 2021, equal to 7% of the EU's annual greenhouse gas emissions. Removals are estimated to increase to 244Mt CO_2e in 2022. The LULUCF Regulation sets an EU-level net removal target of 310Mt CO_2e by 2030. Based on Member State projections submitted in 2023, the current implemented and planned measures will not suffice to meet the target, falling short by 50 Mt CO_2e.

Figure 1. EU emissions and removals of the LULUCF sector by main land use category



Source: EEA.

The EU aims to be climate neutral by 2050, as set out in the European Green Deal[1]. Achieving this depends on not only a reduction in emissions, but also an increase in CO_2 removals from the atmosphere. The land use, land use change and forestry (LULUCF) sector has the potential to contribute by removing CO_2 from the atmosphere.

The LULUCF Regulation[2] sets an EU-level net removal target of 310Mt CO_2e by 2030, with national targets for each Member State. In 2021, the EU's LULUCF sector accounted for the net removal of 230Mt CO_2e, equal to 7% of the EU's total greenhouse gas emissions and it is estimated to account for 244 Mt CO_2e in 2022. Overall, CO_2e removals have decreased in the past 10 years, mainly as a result of increased harvest of wood as well as lower sequestration of carbon by ageing forests in some Member States. Natural disturbances (e.g. wind throws, forest fires, droughts) cause inter-annual variations, and their increasing frequency has likewise been negatively affecting long-term trends. To a lesser extent, a decreased rate of net forest area gain has also contributed to the reduction in removals. Cropland, grassland, wetland and settlements are sources of LULUCF emissions at EU level, with soils containing large proportions of organic matter (mainly peat) accounting for a large proportion of these emissions, although such "organic soils" are only found in wetter and colder parts of Europe.

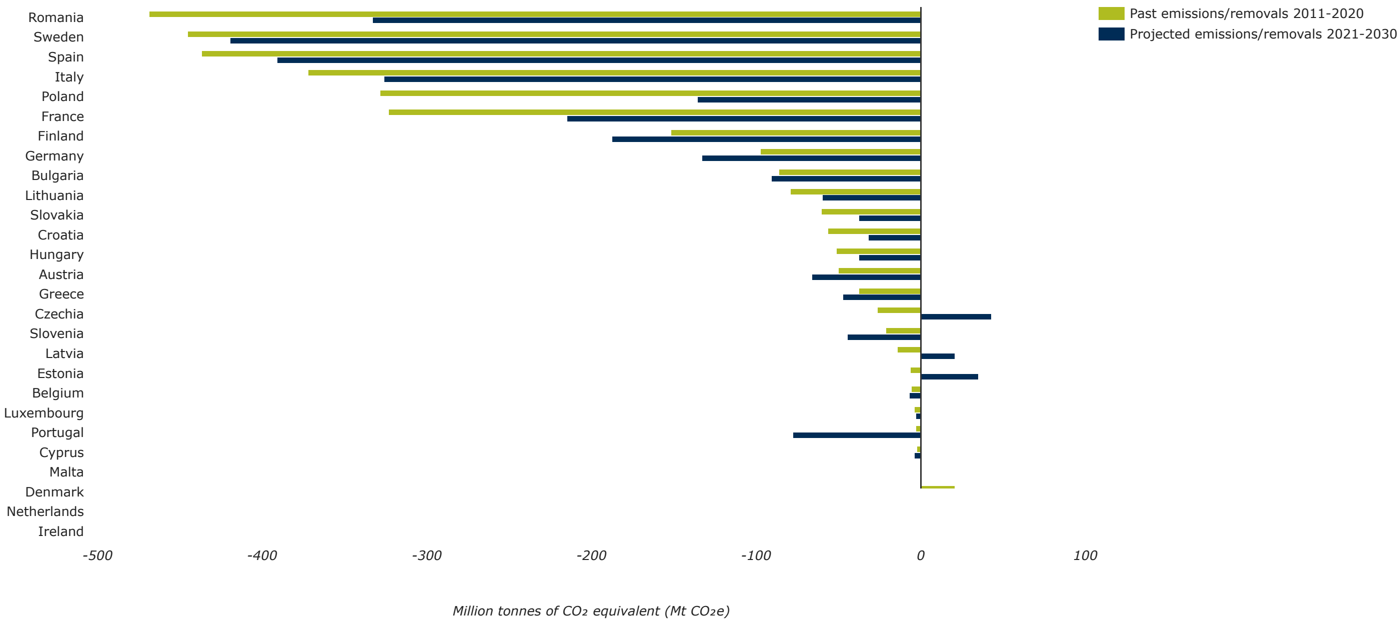
Member State projections submitted in 2023 suggest that net removals will decrease at EU level, from an average of 314Mt CO_2e per year in 1990-2020 to 226Mt CO_2e in 2021-2050. Additional measures reported by Member States are expected to increase average net removals in 2021-2050 (11% compared to existing measures scenario). The projections show that for 2030 net removals of 240Mt CO_2e are expected with existing measures and 260Mt CO_2e with planned additional measures. This means at present, the EU is not, on track to meet the 2030 net removal target of 310Mt CO_2e.

This target entered into force in May 2023 and some countries may have not began establishing the requisite measures and reflect these in their projections.

However, discounting preliminary 2022 data, the last 10-year trend has consistently pointed in the wrong direction. There is, therefore, a need to both reverse the trend as well as to accelerate in the right direction. This requires significantly more ambitious removal measures to be implemented in the coming years.

Some measures with additional mitigation potential are increased afforestation, decreased deforestation, improved forest management, fallowing of histosols, improved crop rotation and improved grassland management. However, for many of the measures there is a challenge with the time lag between when a mitigation measure is implemented and the results.

Figure 2. Comparison of cumulative historical and projected Land Use, Land Use Change and Forestry (LULUCF) emissions and removals per Member State



Source: EEA.

Data used in the graph

Country	Past emissions/removals 2011-2020	Projected emissions/removals 2021-2030
Romania	-468.8	-333.3
Sweden	-445.2	-419.7
Spain	-437.1	-390.9
Italy	-372.4	-326.1
Poland	-328.6	-136
France	-323.2	-215
Finland	-152.1	-187.5
Germany	-97.4	-132.8
Bulgaria	-86.5	-90.7
Lithuania	-78.9	-59.5
Slovakia	-60.2	-37.7
Croatia	-56.2	-31.8
Hungary	-51	-37.4
Austria	-50	-66.4

Country	Past emissions/removals 2011-2020	Projected emissions/removals 2021-2030
Greece	-37.9	-47.6
Czechia	-26.9	42.9
Slovenia	-21.4	-44.8
Latvia	-14	20.9
Estonia	-6.5	35.1
Belgium	-6.1	-7.4
Luxembourg	-3.9	-3.4
Portugal	-3.3	-78.1
Cyprus	-2.9	-3.8
Malta	0	0.1
Denmark	21	40.4
Netherlands	49.7	39.3
Ireland	62.5	87.2

Among the EU Member States, Romania, Sweden, Spain, Italy, Poland, and France were responsible for the largest cumulative net removals from the LULUCF sector in the past 10 years, contributing to approximately 87% of the EU's LULUCF sink. Although these countries are expected to remain large contributors, all project a reduction in removals in the coming decade. On the other hand, Finland, Germany, Bulgaria, Austria, Greece, Slovenia, Belgium, Portugal and Cyprus project increasing cumulative removals in the next decade. Czechia, Latvia, Estonia and Malta however, project a reversal in the trend for net removals from the LULUCF sector, with the sector expected to shift from net removals to net emissions in these countries. The LULUCF sectors in Denmark, the Netherlands and Ireland were a net source of emissions in the past decade and are projected to remain so in the coming decade.

Supporting information

Definition

Land use categories

• Forest land: land areas covered by forests and woody vegetation as defined by the national forest definition. Forest land areas can be temporarily without trees if harvest or storms occurred and if trees will re-grow on this land area.

• Cropland: cropped land including orchards, vineyards or agro-forestry systems if the woody vegetation falls below the thresholds of the national forest definition.

• Grassland: rangelands, pastures or grassland. Woody vegetation on grassland is included if the woody vegetation falls below the thresholds of the national forest definition.

• Wetlands: areas covered or saturated by water for all or part of the year such as peatlands or water reservoirs.

• Settlements: areas with human settlements or infrastructure.

• Other lands: bare soil, rock, ice and land that does not fall in the other categories above.

CO_2equivalent. There are three greenhouse gases relevant for the LULUCF sector: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). CO_2 equivalent is a common unit that allows these different gases to be added up based on their warming potential. Following the IPCC 5th Assessment report and as agreed for the Paris agreement, 1 ton CH_4 = 28 ton CO_2equivalent, 1 ton N_2O = 265 ton CO_2equivalent and 1 ton CO_2 = 1 ton CO_2equivalent.

Organic soils and mineral soils. Organic soils are soils with a high carbon content while the rest is mineral soils. In the EU only 8% of the soils are organic soils according to the GHG inventories. Due to the higher carbon content, organic soils have generally higher emissions than mineral soils.

Methodology

Methodology for indicator calculation

Historical and projected emissions estimates from all 27 EU Member States and aggregated for the EU-27 were obtained from the publicly available databases published by the EEA based on official submissions by the Member States.

For individual Member State emissions and removals, the cumulative 10-year LULUCF total for 2011-2020 and the projected 10-year LULUCF total for 2021-2030 for the 'with existing measures' scenario are shown.

The latest available version of the historical inventory and projected emissions were used to compile the indicator, but it should be noted that this may introduce slight inconsistencies between the historical and projected emissions, if projections for some Member States are not based on the latest inventory data submitted and recalculations have been made.

Methodology for gap filling

No methodology for gap filling has been specified.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring aspects of the 8th EAP priority objective Article 2a. that shall be met by 2030: 'swift and predictable reduction of greenhouse gas emissions and, at the same time, enhancement of removals by natural sinks in the Union to attain the 2030 greenhouse gas emission reduction target as laid down in Regulation (EU) 2021/1119[3], in line with the Union's climate and environment objectives, whilst ensuring a just transition that leaves no one behind;' (EU, 2022). For the purposes of the 8th EAP monitoring framework, this indicator assesses specifically whether the EU will 'increase net GHG removals by carbon sinks from the LULUCF sector to -310 million tonnes CO_2 equivalent by 2030' (EC, 2022).

Accuracy and uncertainties

No uncertainties have been specified.

Data sources and providers

- National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism, October 2023, European Environment Agency (EEA)
- Member States' greenhouse gas (GHG) emission projections, 2023, European Environment Agency (EEA)

Metadata

DPSIR

State

Topics

Climate change mitigation   # Land use   # Forests and forestry

Tags

CLIM057 # 8th EAP # Land use # LULUCF # Land use change # Trends and projections

Temporal coverage

1990-2040

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Policy-effectiveness indicator (Type D)

UN SDGs

Climate action

Unit of measure

Million tonnes of CO_2 equivalent (Mt CO_2e)

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. EC, 2021, 'A European Green Deal: Striving to be the first climate-neutral continent', *European Commission* (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en) accessed November 11, 2021. ↵

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3. EU, 2021, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (‘European Climate Law’), OJ L 243, 9.7.2021, p. 1-17., Regulation (EU) 2021/1119

European Environment Agency

8th Environment Action Programme

Economic losses from weather- and climate-related extremes in Europe

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

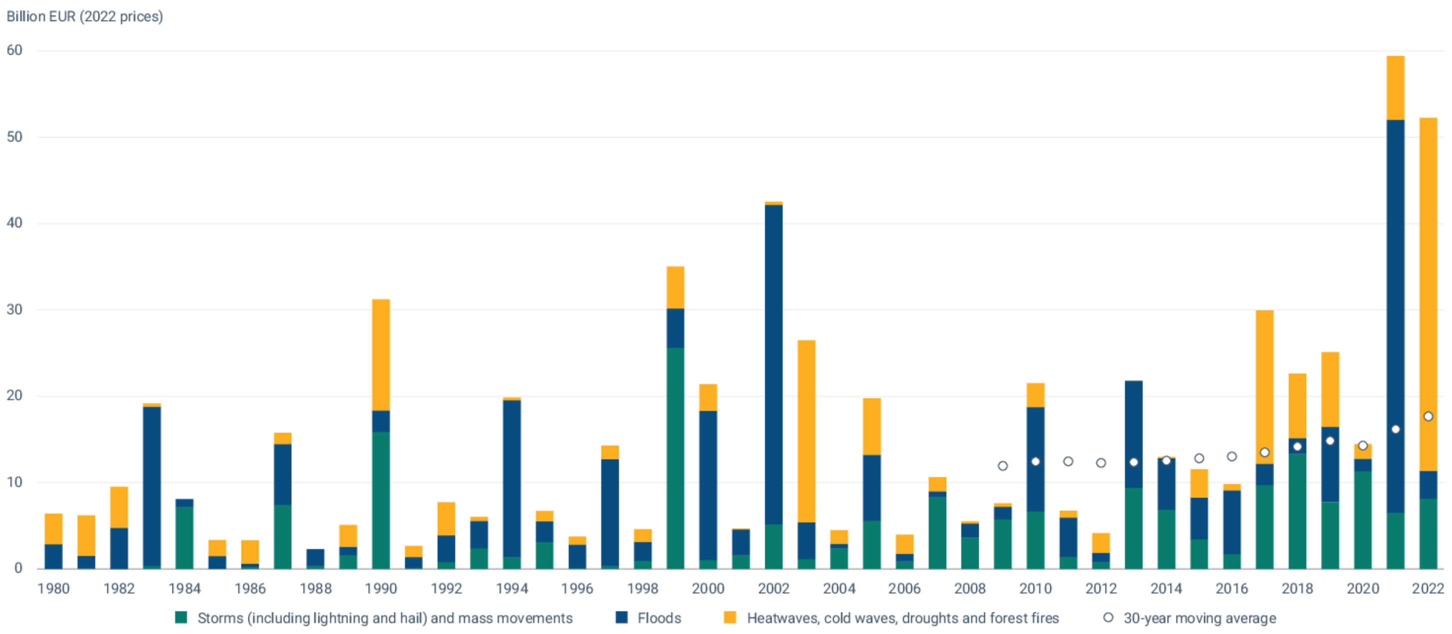
Economic losses from weather- and climate-related extremes in Europe

Published 06 Oct 2023

Analysis and data > Indicators > Economic losses from weather- and cli...

> Between 1980 and 2022, weather- and climate-related extremes caused economic losses of assets estimated at EUR 650 billion in the EU Member States, of which EUR 59.4 billion in 2021 and EUR 52.3 billion in 2022. Analysing trends in economic losses is difficult, partly because of high variability from year to year. Some statistical analysis has revealed, however, that economic losses increase over time. As severe weather- and climate-related extreme events are expected to intensify further, it seems unlikely that the associated economic losses will reduce by 2030.

Figure 1. Annual economic losses caused by weather - and climate - related extreme events in the EU



Source: Risklayer/EEA.

Climate-related hazards, such as temperature extremes, heavy precipitation and droughts, pose risks to human health and the environment and can lead to substantial economic losses [1]. The 2021 EU Adaptation Strategy aims to build resilience and ensure that the EU is well prepared to manage these risks and adapts to the impacts of climate change. The EU aims, among other goals, to ultimately reduce the overall monetary losses from weather- and climate-related events [2].

Between 1980 and 2022, climate-related extremes amounted to an estimated EUR 650 billion (2022 prices) in the EU. Hydrological hazards (floods) account for almost 43% and meteorological hazards (storms,including lightning and hail, together with mass movements) for around 29% of the total. For the climatological hazards, heat waves cause around 20% of the total losses while the remaining +/-8% are caused by droughts, forest fires and cold waves together. The most expensive hazards during the period 1980-2022 include the 2021 flooding in Germany and Belgium (EUR 44 billion), the 2022 compound drought and heat events over the whole continent (EUR 40 billion), the 2002 flood in central Europe (EUR 34 billion), the 1999 storm Lothar in Western Europe (EUR 17 billion), the 2003 drought and heatwave across the EU (EUR 17 billion), and the 2000 flood in France and Italy (EUR 14 billion), all at 2022 prices.

A relatively small number of events is responsible for a large proportion of the economic losses: 5% of the climate-related events with the biggest losses are responsible for 59% of losses and 1% of the events causes 28% of losses (EEA's own calculations based on the original dataset). This results in high variability from year to year. Reasons for this are multiple, including the development of assets in vulnerable areas and a potential reporting bias over time, but also because most weather- and climate-related extremes across the world and in Europe, have become more severe and frequent as a result of human-caused climate change [3].

Nevertheless, the average annual (constant prices, 2022 euros) losses were around EUR 10.4 billion in 1981-1990, 12.2 billion in 1991-2000, 14.7 billion in 2001-2010 and 15.9 billion in 2011-2020. With EUR 59.4 billion and EUR 52.3 billion, 2021 and 2022 have the highest annual values for the whole time series (followed by 2002, 1999 and 1990). Furthermore, a statistical analysis of a 30-year moving average reveals that economic losses increased over the years. A linear trendline through these 30-year averages represent a 41% increase over the 2009 to 2022 period, or 2.5% per year.

The Intergovernmental Panel on Climate Change predicts that climate-related extreme events will become more frequent and severe around the world[4]. This could affect multiple sectors and cause systemic failures across Europe, leading to greater economic losses[5][6]. Therefore, although this is uncertain, it seems unlikely that the associated economic losses will reduce by 2030.

The future cost of climate-related hazards depends not only on the frequency and severity of events but also on several other factors, such as the value of the assets exposed[7][5] and the envisaged climate adaptation measures. Some studies show the benefits of adaptation measures, including nature-based solutions, to mitigate the impacts of weather- and climate-related extremes in Europe[8][9]. Therefore, a comprehensive, integrated approach is required to adapt to and manage the risks. Enhancing society's resilience to climate change through a focus to increasing adaptive capacity is key to the EU's adaptation strategy which was adopted on 24 February 2021. If fully implemented the EU adaptation strategy can contribute to limiting the economic costs of the weather- and climate-related events and to closing the climate protection gap[10] [11][12][13][14]. An example of such an activity coordinated by the European Commission is the Climate Resilience Dialogue [15].

Figure 2. Economic losses and fatalities caused by weather -and climate - related extreme events (1980-2022) - per country

Country	Total losses (Million EURO)	Losses per sq.km (EURO)	Losses per capita (EURO)	Insured losses (Million EURO)	Insured losses (%)	Fatalities
Austria	13216	157566	1626	2333	18	755
Belgium	16208	528524	1543	6310	39	4690
Bulgaria	4741	42715	594	86	2	256
Croatia	3667	64802	830	92	3	906
Cyprus	423	45701	597	7	2	67
Czechia	16274	206334	1567	1896	12	715
Denmark	8881	206896	1646	5459	61	532
Estonia	306	6750	217	44	14	5
Finland	2286	6755	440	70	3	7
France	120613	188907	1947	41727	35	45260
Germany	167299	467879	2065	50391	30	101334
Greece	11934	90622	1129	401	3	4643
Hungary	8919	95894	875	479	5	874
Ireland	3537	50568	869	519	15	68
Italy	111110	367817	1918	5081	5	21758
Latvia	1182	18295	513	64	5	87
Lithuania	1695	25968	511	9	1	102
Luxembourg	1252	482413	2700	622	50	170
Malta	47	148848	118			5
Netherlands	9996	267420	629	3865	39	4315
Poland	18166	58237	480	1214	7	2551
Portugal	15042	163099	1470	535	4	10339

Country	Total losses (Million EURO)	Losses per sq.km (EURO)	Losses per capita (EURO)	Insured losses (Million EURO)	Insured losses (%)	Fatalities
Romania	17525	73513	816	178	1	1438
Slovakia	1773	36159	333	73	4	119
Slovenia	6934	342051	3452	276	4	315
Spain	83782	165582	1977	3990	5	18954
Sweden	3658	8175	402	969	26	43
Iceland	25	248	88			3
Liechtenstein	21	129169	631	10	48	0
Norway	4965	12912	1073	3551	72	41
Switzerland	18743	453957	2542	6690	36	2281
Türkiye	6012	7705	92	402	7	1788
Total EU-27	650467			126690		220308

Source: Risklayer/EEA.

The economic impact of climate-related extremes varies considerably across countries. In absolute terms, the highest economic losses in the period 1980-2022 in the EU were gauged in Germany followed by France then Italy. The highest losses per capita were reckoned in Slovenia, Luxembourg and Germany, and the highest losses per area (in km^2) were in Belgium, Luxembourg and Germany.

According to the estimates, less than 20% of the total losses were insured, although this varied considerably among countries, from less than 2% in Lithuania, Romania, Cyprus and Bulgaria to over 35% in Denmark, Luxembourg, Belgium and the Netherlands. There were also significant differences between the types of events: for meteorological events, over one-third of the losses were insured, while this was less than 15% for hydrological events and little more than 10% for heatwaves and all other climatological events, including droughts and forest fires.

The EU adaptation strategy aims to promote action at national level. All countries have a national adaptation policy [16][13] adopted using different instruments such as strategies and national, regional and sectoral plans, also laws with adaptation relevance reflecting differences in governance in between countries[14]. The Climate-ADAPT platform — developed by the European Commission and the EEA — supports action by sharing knowledge on climate change and its impacts, adaptation strategies and plans, and case studies.

No coherent mechanism is currently in place for countries to report losses to the European Commission or the EEA. This is a key element under development as part of the implementation of the 'smarter adaptation' objective of the EU adaptation strategy.

Supporting information

Definition

This indicator considers estimated values for the number of fatalities, the overall and insured economic losses from weather- and climate-related events in the EEA member countries, i.e., in the 27 EU Member States and in Iceland, Liechtenstein, Norway, Switzerland and Türkiye. Focus of the indicator is on total economic losses for the EU-27, while further detail is provided on Climate-ADAPT with a dashboard presenting information on total economic losses, insured economic losses and fatalities for the EU-27 and for all member countries of the European Environment Agency per country, per year and per hazard type. Hazards considered are those classified as meteorological hazards, hydrological hazards and climatological hazards, based on the classification by the International Council for Science (ICSU) [17].

Methodology

Data have been adjusted to account for inflation. They are presented in 2022 prices (Euro). The implicit GDP deflator is used as an economic metric that measures the price level changes of all new, final goods and services produced in an economy over a specific period, relative to the base year, including those that are not included in the consumer price index (CPI), such as investment goods and exports. As the CPI only reflects the price changes of a specific basket of goods and services that consumers purchase, the implicit GDP deflator is a more comprehensive measure of price changes than the CPI.

Definition of a loss event: the event can occur in several countries; events are counted by country and by year and type of natural hazard. The 30-year moving averages are based on the value of the year and the 29 preceding years. The estimated annual increase over the period from 2009 to 2022 is based on a linear trendline determined with the least squares method.

The European Commission is working with Member States, the ISDR and other international organisations to improve data on disaster losses. The JRC has prepared guidance for recording and sharing disaster damage and loss data, status and best practices for disaster loss data recording in EU Member States and recommendations for a European approach for recording disaster losses. Once comparable national databases on disaster losses are available for all EU Member States and EEA member countries and these data are reported, this EEA indicator can build on such data.

Data sources & providers

This assessment is based on the estimates provided by the RiskLayer CATDAT dataset (dataset url is not available) and the Eurostat collection of economic indicators, whereas data from earlier years not covered by Eurostat have been completed using data from the Annual Macro-Economic Database of the European Commission (AMECO), the International Monetary Fund's (IMF) World Economic Outlook (WEO), the Total Economy Database (TED) and the World Bank database.

Data are received from the RiskLayer CATDAT under institutional agreement.

Methodology for gap filling

Data gap filling is not necessary.

Policy/environmental relevance

In February 2021, the European Commission presented the new EU Strategy on adaptation to climate change. One of the objectives is 'smarter adaptation', within which a key action is 'more and better climate-related risk and losses data'. This is further developed in the Staff Working Document, Closing the climate protection gap - scoping policy and data gaps [11] and in the activities of the Climate Resilience Dialogue, publishing an interim report in July 2023 [18].

Article 6 of the European Union Civil Protection Mechanism (2013) obliges the EU Member States to develop risk assessments at national or appropriate sub-national levels and to make a summary of the relevant elements thereof. It is summarised in an Overview of natural and man-made disaster risks the European Union may face (2020 edition).

The Sendai Framework for Disaster Risk Reduction (2015-2030), including 'Understanding disaster risk', requires that the signatory countries systematically evaluate, record, share and publicly account for disaster losses and understand the economic impacts at national and sub-national levels.

This indicator is an EU indicator for the sustainable development goals (SDGs, for SDG13 Climate) and a headline indicator for monitoring progress towards the 8th Environment Action Programme [19][2]. It contributes to monitoring aspects of the 8th EAP priority objective Article 2.2. b that shall be met by 2030: 'continuous progress in enhancing and mainstreaming adaptive capacity, including on the basis of ecosystem approaches, strengthening resilience and adaptation and reducing the vulnerability of the environment, society and all sectors of the economy to climate change, while improving prevention of, and preparedness for, weather- and climate-related disasters' [19]. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor whether the EU is reducing the overall monetary losses from weather- and climate-related events [2].

Targets

No targets have been identified for this indicator.

Accuracy and uncertainties

No uncertainties have been specified.

Data sources and providers

- CATDAT (Dataset URL is not available), RiskLayer

Metadata

DPSIR

Impact

Topics

Climate change adaptation

Tags

CLIM039 # 8th EAP # Climate losses insurance # Economic losses # Disasters # Natural hazards

Temporal coverage

1980-2022

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Latvia	Liechtenstein
Lithuania	Luxembourg
Malta	Netherlands
Norway	Poland
Portugal	Romania
Slovakia	Slovenia
Spain	Sweden

Switzerland Türkiye

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Climate action, ,No poverty

Unit of measure

Losses in Euros, million and billion Euros, 2022 prices, fatalities as absolute numbers.

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. Geotechnical hazards, like earthquakes and volcanoes are also natural hazards. As they are not seen as directly impacted by climate change, they are not included in this indicator. ↲
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↵

9. Vousdoukas, M. I., Mentaschi, L., Hinkel, J., Ward, P. J., Mongelli, I., Ciscar, J.-C. and Feyen, L., 2020, 'Economic motivation for raising coastal flood defenses in Europe', *Nature Communications* 11(1), pp. 2119 (https://www.nature.com/articles/s41467-020-15665-3) accessed April 4, 2023.
↵

10. The term ‘climate protection gap’ is used in reference to the share of non-insured economic losses in total losses after a wether- and climate-related extreme event. In recent years, it has also been used to refer to the notional gap between likely climate-related impacts and existing resilience measures (EC, 2021a, p. 3)
↵

11. EC, 2021, Commission Staff Working Document — Closing the climate protection gap - Scoping policy and data gaps, SWD(2021) 123 final.
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European Environment Agency

8th Environment Action Programme

Drought impact on ecosystems in Europe

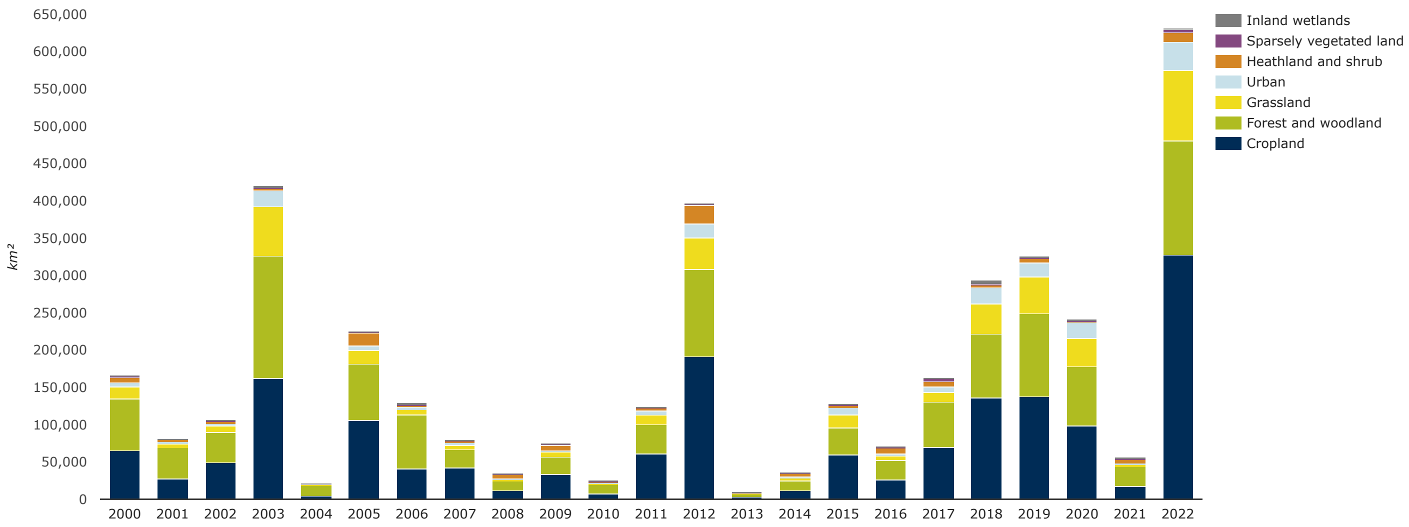
8TH EAP HEADLINE INDICATOR, 2023

Drought impact on ecosystems in Europe

Published 10 Oct 2023

Monitoring meteorological drought impacts supports policy measures that target, among others, greenhouse gas removals and the adaptation of ecosystems to climate change. In 2022, Europe experienced its hottest summer and second warmest year on record, and consequently the largest overall drought impacted area: over 630,000km^2 as opposed to the 167,000km^2 annual average impacted area between 2000 and 2022. Between 2000 and 2022 there is an increasing trend in drought-impacted areas in the EU. Drought impacts may increase further if global mitigation and EU and national adaptation strategies are not effectively implemented.

Figure 1. Annual area of drought impact on vegetation productivity for 2000-2022, EU-27 (km²)



Source: EEA/Copernicus Land Monitoring Service and Copernicus Emergency Service.

Data used in the graph

YEAR	Cropland	Forest and woodland	Grassland	Urban	Heathland and shrub	Sparsely vegetated land	Inland wetlands
2000	65550	68524	15774	6274	7357	1791	328
2001	27976	40949	5616	2529	2710	1187	43
2002	49778	39345	8685	3191	3298	1167	1127
2003	161878	163271	66501	22348	1979	1268	2756
2004	4550	13823	1624	967	76	73	145
2005	105281	75762	18974	5685	17489	1372	49
2006	40365	72314	7260	3653	2436	453	3082
2007	41452	25725	5739	2875	2341	1097	146
2008	12214	11886	2134	1317	5607	1193	138
2009	32754	23455	7331	1580	7820	1122	937
2010	6755	13017	1821	586	1512	366	1296
2011	60794	39183	13459	5820	2881	695	643
2012	191067	117475	42476	17509	25209	2403	458
2013	2216	4522	1330	349	985	151	456
2014	12007	12728	3674	1360	5024	305	714
2015	59771	35924	17602	9557	3038	405	1546
2016	26466	25947	5311	2745	8454	887	1001
2017	69506	60711	12927	7219	7835	3263	1293
2018	135931	85708	39801	22597	3062	1029	5041
2019	136966	112556	49220	18487	5088	982	2320
2020	98045	79441	37836	21597	1535	564	2041
2021	17122	27040	2514	1690	4957	970	2077
2022	327795	152273	94281	37412	14012	3798	1648

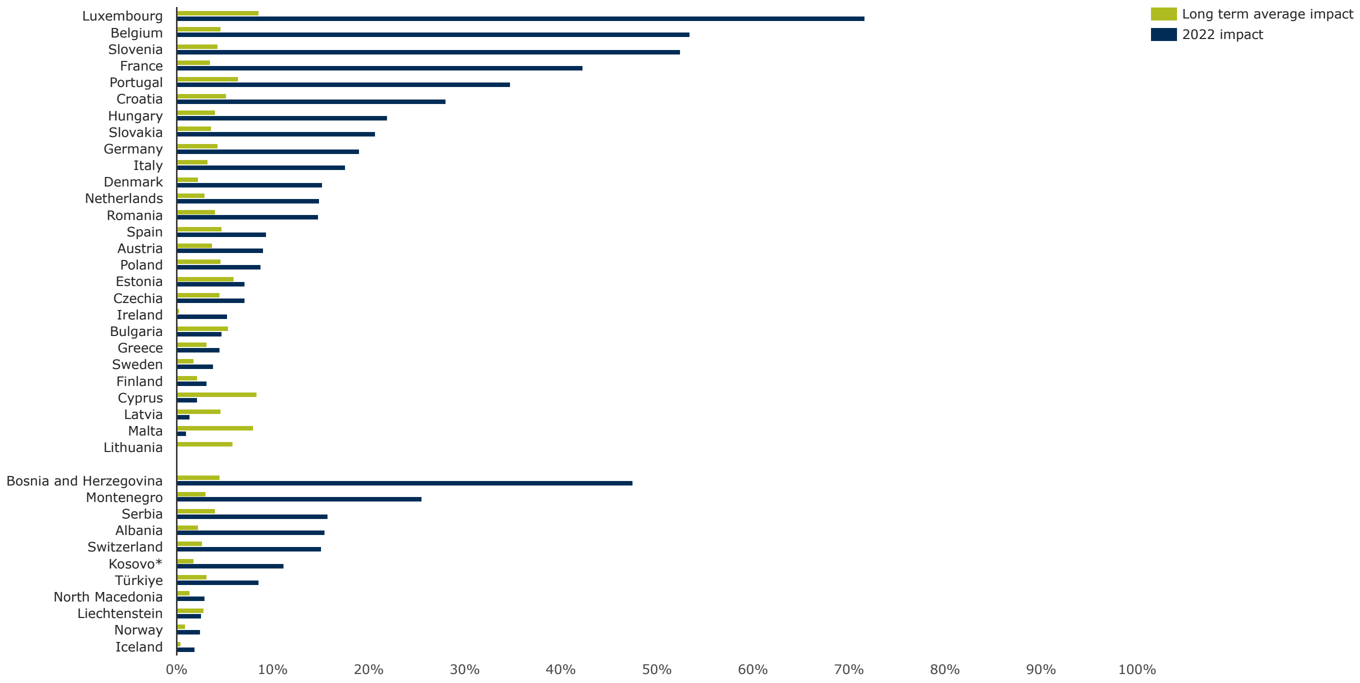
Drought impact hampers nature's ability to deliver a wide range of environmental, social and economic benefits. They impact the EU's ability to achieve its climate change mitigation objective [1][2] through decreasing carbon sequestration, and influence adaptation and the implementation of the EU biodiversity and soil strategies. Viable food production, sustainable management of natural resources and balanced territorial development, and long-term objectives of the EU Common Agriculture Policy are also affected by drought via decreasing soil moisture. It is therefore important that the EU takes action to decrease the severity of impacts and strengthen ecosystem resilience against climate change related droughts.

Europe experienced its hottest summer and second warmest year on record in 2022 with 631,000km^2 under drought impact (Figure 1, dashboard). This is an almost five-fold increase compared to the annual impact during 2000-2022, when ca. 167,000km^2 (4.2%) of EU land was affected every year by droughts due to low precipitation, high evaporation and heatwaves fuelled by climate change. The annual extent of intense drought impacts in the EU, of which six years were in the last decade, shows an increasing trend (Figure 1, dashboard) as a contributing factor to worsening ecosystem conditions [3].

During 2000-2022, the annual impacted area of EU cropland was around 73,000km^2 (ca. 5% of cropland, dashboard), contributing to crop failures. The average annual impacted area in forests was 56,000km^2 (ca. 4% of forests). Forests and woodlands sequester large amounts of carbon, but drought conditions slow this process. Grasslands and wetlands are among the most biodiverse areas in the EU, storing a large amount of carbon in the below ground biomass pool. When soil moisture is in deficit, this carbon is gradually released. The average annual drought impact on grassland was around 20,000km^2 (ca. 5% of grasslands) comparable to the area of Slovenia. In absolute values the annual impacted wetland area was less than 2% of EU wetland. Here an increasing trend can be observed which contributes to CO_2 emissions due to lower-than-normal ground water levels.

By 2030 the frequency and intensity of heatwaves is projected to increase[4] whereas in the continental and Mediterranean regions summer precipitation is projected to decrease [5]. Based on this and the current trends, drought impacted areas may not decrease by 2030. It is important that land management practices (e.g. cultivating drought tolerant and cover crops and leaving crop residuals on the ground) are adequately adjusted in a timely manner to mitigate future impacts of droughts and that EU and national adaptation strategies are effectively implemented.

Figure 2. Drought impact area during 2022 in comparison to the 2000-2020 average drought impact, in % of the country territory (EEA-38 region)



Source: EEA/Copernicus Land Monitoring Service and Copernicus Emergency Service.

Data used in the graph

Country	Long term average impact	2022 impact
Luxembourg	8.6	71.7
Belgium	4.6	53.4
Slovenia	4.3	52.4
France	3.5	42.3
Portugal	6.4	34.8
Croatia	5.2	28
Hungary	4	21.9
Slovakia	3.6	20.7
Germany	4.3	19
Italy	3.3	17.6
Denmark	2.3	15.2
Netherlands	2.9	14.8
Romania	4	14.7
Spain	4.7	9.3
Austria	3.7	9
Poland	4.6	8.8
Estonia	6	7.1
Czechia	4.5	7.1
Ireland	0.2	5.3
Bulgaria	5.4	4.7
Greece	3.2	4.5
Sweden	1.8	3.8
Finland	2.1	3.2
Cyprus	8.3	2.1
Latvia	4.6	1.4
Malta	8	1

Country	Long term average impact	2022 impact
Lithuania	5.9	0
Bosnia and Herzegovina	4.5	47.5
Montenegro	3	25.5
Serbia	4	15.7
Albania	2.2	15.4
Switzerland	2.7	15.1
Kosovo*	1.8	11.1
Türkiye	3.1	8.5
North Macedonia	1.4	2.9
Liechtenstein	2.8	2.6
Norway	0.9	2.5
Iceland	0.5	1.9

In most EU Member States, the 2022 drought impacted area was much larger than the 2000-2020 average impacted area (Figure 2). The largest impacts in 2022 occurred in Belgium, Luxembourg and Slovenia. Drought affected as much as 70% of Luxembourg's area in 2022, much above the annual average impacted area during 2000-2020 which was around 20% (Figure 2). Drought impacted above 50% of the territories in Belgium and Slovenia, much above the long-term average (below 10% of the territory). In 2022, drought was also dominant in France and Portugal impacting over 35% of the countries' area, while in Croatia almost 30% was impacted. In all these countries the 2022 drought largely exceeded the long-term average impacted area.

From the non-EU region, Bosnia and Herzegovina (47% of the country) and Montenegro (25% of the area) experienced highest impact in 2022.

The trend of drought-impacted areas as well as in the number of impacted countries continue to increase in the Member States and in the non-EU member and cooperating countries of the European Environment Agency (see dashboard).

Supporting information

Definition

This indicator only addresses meteorological droughts, hence the annual deficit in soil moisture due precipitation shortages as opposed to hydrological droughts which occur when low water supply becomes evident, especially in streams, reservoirs, and groundwater levels, usually after many months of meteorological drought. The indicator monitors anomalies and long-term trends in vegetation productivity based on remote sensing observed time series data of vegetation indices in areas that are under pressure from drought.

Drought pressure is computed as soil moisture deficit within the growing season, using the Soil Moisture Index (SMI)10 time series of the Copernicus EMS European Drought Observatory of the European Commission Joint Research Centre (EDO, 2019).

Drought impact during the growing season is indicated as a severe negative annual productivity anomaly in drought-pressured areas, i.e. areas with negative annual soil moisture anomalies. Detailed indicator specifications are described under ‘Methodology’.

Methodology

Soil moisture deficit is calculated at the pixel level by deriving z-score anomalies from the Soil Moisture Index, such as:

SMA = SMI-SMI**MN (2001-2020)**/SMI**SD (2001-2020)**, (Equation 1)

Where SMA is Soil Moisture Anomaly, MN is the 2001-2020 average SMA and SD is the 2001-2020 standard deviation of the SMI. The calculated SMA values are then averaged within the growing season to derive the SMA(gs) time series.

The aggregation is performed by averaging the monthly SMA values extracted from the EDO within the vegetation growing season. The vegetation growing season was defined by using the start and the end date of the growing period (SOS or Start of Season and EOS or End Of Season, respectively) extracted from the Medium Resolution Vegetation Phenology and Productivity product of the Copernicus Land Monitoring Service. The SOS and EOS datasets can be explored and downloaded from EEA's data repository under sdi.eea.europa.eu. Direct links to the datasets:

SOS:

https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/a7b2369b-dd62-4d02-99e2-e5d74a8ec83a

EOS:

https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/a3cfb2c4-156a-413c-a73b-15ebbb016557

Annual drought pressure is derived at the pixel level and is simply defined as:

SMA(gs) < -1, (Equation 2) .

Negative soil moisture anomalies indicate that the annual average availability of soil moisture for plants is lower than the long-term normal condition and drops to such a level that it might impact vegetation productivity.

To indicate **drought pressure area**, strong negative soil moisture anomalies are selected by setting a maximum value at -1 standard deviation (std). The drought pressure area is the sum of those grid cells within each analytical unit (see later), where the growing season aggregated SMA values are < -1. This threshold was selected to allow the monitoring of vegetation responses to only considerable soil moisture deficits. Choosing the threshold of -1 std follows the recommendations of the European Drought Observatory (EDO11) of the European Commission's Joint Research Centre. This approach is also followed in the EEA indicator addressing soil moisture deficit (EEA, 2021). By applying this threshold, drought impacts can better be distinguished from response in vegetation anomalies due to other environmental pressures such as e.g. wildfires, storms or insects infestations. As vegetation productivity decline may be also caused by anthropogenic impacts, pixels with land use change were excluded from the statistical population based on the Copernicus Corine Land Cover 2000-2018 accounting layers datasets (12).

The **drought pressure intensity** is defined as the annual, growing season aggregated SMA values where SMA < -1, where aggregation is performed by temporal and spatial averaging within analytical units (see later).

Annual drought impact is quantified as:

SMA(gs)<0 and LINTa<-0.5, (Equation 2) ,

where LINTa (lLarge Integral anomaly) refers to the 2000-2022 annual anomalies in growing season productivity derived from remote-sensing data and approximated using vegetation indices (see more explanation below).

The LINT anomalies were calculated as standard deviations from the long-term mean:

LINTa(year xi-n)=(LINT(xi)-LINT(LTA))/LINT(std)), (Equation 3)

Where xi-n indexes the time series (from i=2000 till n=2021), LINT(LTA) is the long term (using the background of 2000-2020) average of the LINT values and LINT(std) is the long term (using the background) standard deviation of the LINT values for the same period.

The threshold of a -0.5 standard deviation for the vegetation anomalies was selected to indicate small deviations from the long-term mean and to allow for moderate productivity levels under drought impact to be accounted for. In a Europe-wide study, this is a pragmatic solution that provides a wide overview of drought impact situations in Europe. However, local studies might consider setting a lower or higher threshold to reflect local conditions.

The drought impact area is the sum of those grid cells within each analytical unit (see below) where the growing season aggregated SMA values are < -1 and the LINT anomalies are < -0.5. The drought impact intensity is defined as the annual aggregated LINT anomalies where SMA < -1 and LINTa < -0.5. Aggregation is performed by temporal and spatial averaging within analytical units.

For the analytical units of this indicator the following datasets were combined:

1 Administrative boundaries, aligned with the Corine Land Cover: https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/08c0e074-4a98-4545-bd85-f58fe3f74d82

2 Environmental Zones:

3 https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/6ef007ab-1fcd-4c4f-bc96-14e8afbcb688

4 Corine Land Cover accounting layers 2000 and 2018:

https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/fa9bd2f5-8006-42e7-8090-7b9f9b09bf29 and

https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/5a5f43ca-1447-4ed0-b0a6-4bd2e17e4f4d.

1 MAES ecosystem types derived from the Corine Land Cover as Look Up Tables (can be distributed upon request).

2 Land cover flows:

https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/835d25e0-b9dc-4fb9-a8b6-f9e5336fa357 .

The combination of the above datasets resulted in analytical units with 2,700,000 records in the database, which is easy to handle with desktop computers.

Vegetation productivity: LINT, or Large Integral

In summary, vegetation productivity is derived from remote-sensing observed time series data of vegetation indices. The vegetation index used for the LINT index is the Plant Phenology Index (PPI) (Jin and Eklundh, 2014). The PPI is based on the MODIS Nadir BRDF-adjusted reflectance product (MODIS MCD43 NBAR). The product provides reflectance data for the MODIS 'land' bands (1-7), adjusted using a bidirectional reflectance distribution function. This function models values as if they were collected from a Nadir view to remove so-called cross-track illumination effects. The PPI is a new vegetation index optimised for the efficient monitoring of vegetation phenology. It is derived from radiative transfer solution using reflectance in the visible-red (RED) and near-infrared (NIR) spectral domains. The PPI is defined as having a linear relationship with the canopy green Leaf Area Index (LAI) and its temporal pattern is very similar to the temporal pattern of gross primary productivity (GPP) estimated by flux towers at ground reference stations. The PPI is less affected by the presence of snow than other commonly used vegetation indices such as the Normalized Difference Vegetation Index (NDVI) or the Enhanced Vegetation Index (EVI).

The product is distributed with a 500m pixel size (MODIS Sinusoidal Grid) with an 8-day compositing period. The large integral, or LINT, used in this indicator is the mathematical integral calculation of the smoothed and gap-filled PPI time series data between the start and end of the growing season points, being the SOS and EOS datasets described above.

All input data sets are derived with wall-to-wall coverage of the land surface of the EEA-38 region.

No gap filling was needed.

Policy/environmental relevance

The indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme. It contributes mainly to monitoring aspects of the 8th EAP priority objective Article 2.2.b that shall be met by 2030: ‘continuous progress in enhancing and mainstreaming adaptive capacity, including on the basis of ecosystem approaches, strengthening resilience and adaptation and reducing the vulnerability of the environment, society and all sectors of the economy to climate change, while improving prevention of, and preparedness for, weather- and climate-related disasters’ [6]. More specifically, and in accordance with the European Commission Communication on the 8th EAP monitoring framework, the indicator assesses whether the EU will ‘decrease the area impacted by drought and loss of vegetation productivity’ by 2030 [7].

Justification for indicator selection

Droughts are extreme climate events that are induced by temporary water deficits and may be related to a lack of precipitation, soil moisture, streamflow or any combination of the three taking place at the same time. Droughts can occur in most parts of the world, even in wet and humid regions, and can have profound impacts on agriculture, industry, tourism and ecosystems and the services they provide. In arid and semi-arid ecosystems (including the Mediterranean regions), limited water availability is a recurrent phenomenon and governs plant growth and phenology. On the other hand, in temperate and boreal regions, sporadic prolonged dry periods can lead to water-limited conditions and have far-reaching impacts on ecosystems’ carbon balance and structure. The immediate impacts of droughts within the growing season (i.e. a few weeks in duration) are, for example, lead to decline in crop production, pasture growth and fodder supplies from crop residues. Prolonged water shortages (e.g. of several months) may, among other things, potentially increase wildfire occurrences.

The monitoring and assessment of drought impacts are complex because they vary in their severity and often depend on the different phases of the given drought event. Differences in the physiological response of vegetation to water deficits cause differences in the sensitivity and resilience of terrestrial ecosystems to drought, and ultimately influence the types of impacts that droughts have, i.e. slow growth or reduced greenness, that lead to loss of biomass or may even result in plant mortality. Consequently, significant changes in vegetation productivity provide an indication/early warning of imminent impacts on ecosystems’ equilibrium states.

Context description

In May 2020, the EU adopted a Biodiversity strategy for 2030 (COM(2020) 380 final), related to protecting and restoring nature. The strategy states that the ‘biodiversity crisis and the climate crisis are intrinsically linked. For the EU, the cost of not reaching the 2020 biodiversity strategy headline target of halting the loss of biodiversity and ecosystem services has been estimated at EUR50 billion per year. In addition to these economic costs, loss of biodiversity means that ecosystems and the societies that rely upon them are more fragile and less resilient in the face of challenges such as climate change, pollution and habitat destruction. Droughts have an impact on several land and soil functions, as well as ecosystem services, in both urban and rural areas. By putting pressure on natural ecosystems, droughts hampered the achievement of the EU biodiversity strategy’s 2020 objectives.

Climate change accelerates the loss of biodiversity through droughts, flooding and wildfires, while the loss and unsustainable use of nature in turn also contribute to climate change’. The new EU Strategy on Adaptation to Climate Change (COM(2021) 82 final) shows the importance of healthy soils in minimising impacts of floods and droughts. The new Soil Strategy for 2030 (COM(2021) 699 final) points out the crucial and urgent need to address the human caused impacts on soils due to climate change and it calls for the same level of protection for soils that is given to air and water. Therefore, the Commission strongly recommends integrating in the new EU Soil Strategy actions against erosion and desertification linked to extreme floods, droughts and fires. Climate change impacts are also reflected in the proposal for a nature restoration law, adopted in June 2022 by the European Commission, that aims to put all natural and seminatural ecosystems on the path to recovery by 2030. Droughts negatively affect agricultural ecosystems, the resilience of forest ecosystems and in urban ecosystems droughts indirectly affect the ability of green urban spaces to protect people against heatwaves. In particular, the impacts of extended droughts on ecosystems need to be assessed because they can lead to significant loss of vegetation productivity and irreversible damage to the condition of ecosystems and land degradation, in extreme cases desertification.

Drought pressures on natural ecosystems also play an important role in the EU's ability to implement its strategy on green infrastructure (GI). In contrast to the most common 'grey' (human-made, constructed) infrastructure approaches that serve one single objective, GI promotes multifunctionality, which means that the same area of land is able to perform several functions and offer multiple benefits if its ecosystems are in a healthy state. More specifically, GI aims to enhance nature's ability to deliver multiple valuable ecosystem goods and services, potentially providing a wide range of environmental, social, climate change adaptation and mitigation, and biodiversity benefits. Droughts diminish the normal condition of ecosystems and their capacity to provide services that could be integrated into GI.

The EU legislation for LULUCF as part of the 2030 climate target sets clear targets for the LULUCF sector for each Member States. The capacity of forests and other land uses to store and remove carbon from the atmosphere will depend on management as well as a number of natural circumstances, such as variations in growing conditions (soil quality, temperature, precipitation and droughts) and frequency of natural disturbances (storms and fires). The regulation provides some flexibility for EU Member States to compensate excess emissions due natural disturbances impacting forests during the period 2021-2025 and for the period 2026 to 2030 natural disturbances as well as the long-term impact of climate change resulting in excess emissions or diminishing sink that are beyond their control or the effects of an exceptionally high proportion of organic soils in the managed land area. As a condition for access to flexibilities related to natural disturbances, Member States must provide evidence to the Commission on the impact of these natural disturbances including historic level of natural disturbances for the period 2001-2020, the type of disturbance, information on the land areas affected, their geographical location and the associated emissions and where feasible information on measures the Member States undertook to prevent or limit the impact of those natural disturbances. For the long-term impact of climate change, Member States must submit evidence to the Commission including a quantitative assessment of the effects on net emissions or net removals in tonnes Co2 equivalent for the affected areas and shall be based on geographically explicit data and the best scientific evidence available. Those indices and data shall be based on observed changes covering at least the period 2001 to 2025 and on scientifically reviewed projections and observations for the period 2026 to 2030 and include climate characteristics relevant for the LULUCF sector such as aridity, mean temperatures, mean precipitations, frost days, the duration of meteorological or soil moisture droughts. Accounting for natural disturbances has been foreseen for forests only for the 2021-2025 reporting period, whereas the new LULUCF regulation foresees application to all land uses. The drought impact indicator can be used to confirm submitted MSs data when natural disturbances are reported especially from 2026 on when natural disturbances can be accounted for on all impacted lands.

The role of the common agricultural policy (CAP) is to provide a policy framework that supports and encourages producers to address economic, environmental (i.e. relating to resource efficiency, soil and water quality, and threats to habitats and biodiversity), climate and territorial challenges, while remaining coherent with other EU policies. This translates into three long-term CAP objectives: (1) viable food production, (2) sustainable management of natural resources and climate action, and (3) balanced territorial development. Given the pressure that droughts put on natural resources, agriculture's environmental performance has to improve through more sustainable production methods. Farmers also have to adapt to challenges stemming from changes to the climate by pursuing climate change mitigation and adaption actions.

Targets

No specific targets.

Accuracy and uncertainties

Methodology uncertainty

The approach cannot account for land use or land cover changes that have occurred within a pixel in the period of analysis. For example, clear cuts within forest ecosystems or the use of irrigation systems as part of management processes in agricultural areas might increase or decrease vegetation productivity independently of drought occurrences. This can introduce noise to the data sets that might further bias the assumed pixel-based relationships between drought pressure and vegetation productivity.

Another source of uncertainty is related to the simplification of the drought impact model for its implementation in the operational setting. On one hand, the same thresholds for deviations in soil moisture and vegetation production imply similar impacts/impact severity in different sectors (agriculture, forestry, etc), which gives an acceptable approximation on the continental scale but might need to be adjusted to local conditions. Still, in some cases, the start, end, severity and spatial extent of a drought, as well as the propagation of its impacts through the whole land systems, might change as a result of additional climate and/or surrounding biophysical conditions, such as temperature, snowpack, albedo and soil's water-holding capacity.

Data set uncertainty

The datasets represent the average impact on the productivity of all terrestrial ecosystems within an area covered by a pixel of 500m×500m. Therefore, the indicator can be used at coarse resolution only, indicating drought impacts on main terrestrial ecosystems. As opposed to field measurements, remote-sensing products measure vegetation's light absorption from a satellite at a height of several hundred kilometres, which might introduce bias due to atmospheric disturbances.

Rationale uncertainty

No uncertainty has been identified.

Data sources and providers

- Medium Resolution Vegetation Phenology and Productivity: Large integral (raster 500m), Oct. 2022, European Environment Agency (EEA)

Metadata

DPSIR

Impact

Topics

Agriculture and food # Biodiversity # Climate change adaptation

Tags

Biodiversity # Productivity # Land cover # 8th EAP # LSI011 # Drought impact # Ecosystems

Temporal coverage

2000-2022

Geographic coverage

Albania	Austria
Belgium	Bosnia and Herzegovina
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Latvia	Liechtenstein
Lithuania	Luxembourg
Malta	Montenegro
Netherlands	North Macedonia
Norway	Poland
Portugal	Romania
Serbia	Slovakia
Slovenia	Spain
Sweden	Switzerland

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Climate action

Unit of measure

FIG1: Area of drought impact (km^2)

FIG2: Percentage

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

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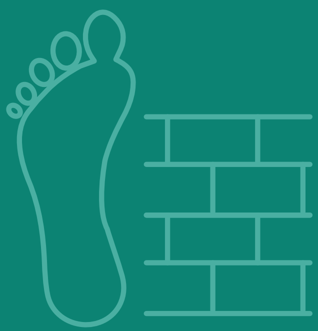
2. https://ec.europa.eu/clima/eu-action/european-green-deal/2030-climate-target-plan_en ↲
3. Background level is set to the 2000-2020 average drought impact. ↲
4. Climate-ADAPT, 2022a, 'Daily maximum temperature — monthly statistics, 2011-2099', *European Environment Agency* (https://climate-adapt.eea.europa.eu/en/metadata/indicators/daily-maximum-temperature-monthly-mean-2011-2099#details) accessed October 31, 2022. ↲
5. Climate-ADAPT, 2022b, 'Precipitation sum, 2011-2099', (https://climate-adapt.eea.europa.eu/en/metadata/indicators/precipitation-sum-2011-2099#details) accessed October 31, 2022. ↲
6. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union environment action programme to 2030, OJ L 114, 12.4.2022, p. 22-36. ↲
7. EC, 2022, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives - COM/2022/357 final ↲

European Environment Agency

8th Environment Action Programme

Raw material consumption: Europe’s material footprint



8TH EAP HEADLINE INDICATOR, 2023

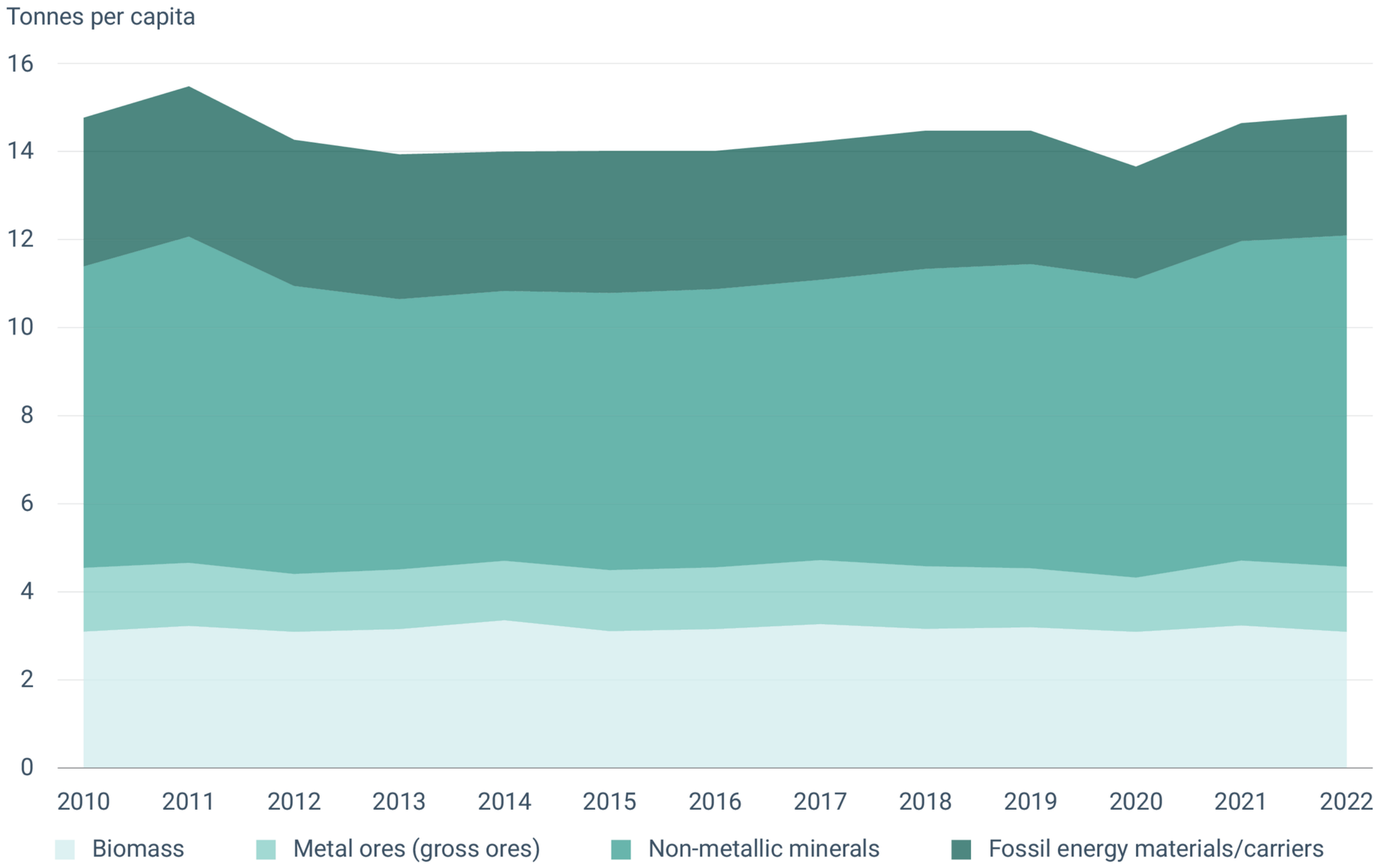
Europe's material footprint

Published 05 Dec 2023

Analysis and data > Indicators > Europe's material footprint

The EU's Eighth Environment Action Programme aims to significantly decrease the EU's material footprint, that is, the amount of raw material extracted to manufacture the goods and services consumed. The per capita material footprint remained stable over the 2010-2022 period. In 2022 the raw material extraction was 14.8 tonnes per capita which is considered not sustainable and higher than the global average. It appears unlikely that the EU will significantly reduce the per capita material footprint in the coming decade as there has been no progress so far, while projections show an increase in the future demand for materials in the EU. Major effort is needed to reduce material extraction and consumption, and switch to goods and services that require less material.

Figure 1. EU material footprint, expressed in tonnes per capita of raw material equivalent per capita



Source: Eurostat.

The EU's material footprint refers to the amount of material extracted from nature, both inside and outside the EU, to manufacture or provide the goods and services consumed by EU citizens. The Eighth Environment Action Programme calls for a significant decrease in the EU's material footprint to safeguard precious natural resources and because the extraction and processing of these resources has significant environmental impacts, such as climate change and biodiversity loss[1].

From 2010 to 2022, the EU per capita material footprint remained stable. In 2020, the material footprint fell markedly by 5.7% to 13.7 tonnes — heavily influenced by the economic slowdown due to the COVID-19 pandemic — but it increased again by 7.2% in 2021. Of the various material groups, consumption of non-metallic minerals is the highest, accounting for 51% of the footprint in 2022; changes in consumption in this group were largely responsible for the overall trend. Biomass was the next largest group (21%), followed by fossil fuels (18%) and metals (10%). The share of fossil fuels has been decreasing (23% in 2010), while the share of non-metallic minerals increased from 46% in 2010. Although non-metallic minerals account for a large part of the total material footprint, they have less of an impact on the environment and climate than metals and fossil fuels, relative to their shares of the material footprint as they are mainly composed of relatively inert material such as gravel, limestone etc. [2].

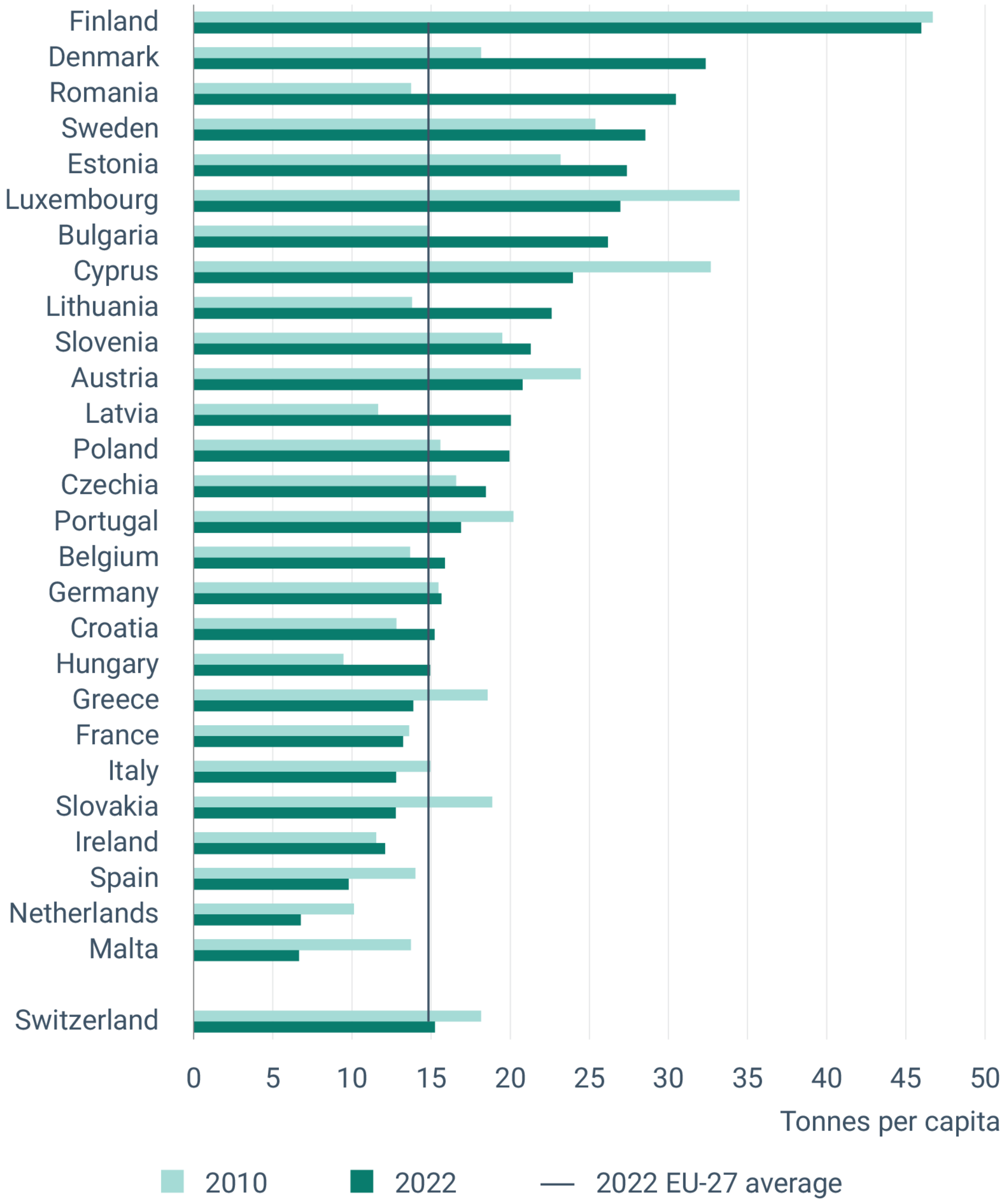
The material footprint provides a comprehensive measure of all materials extracted to satisfy consumption demand in the EU, including materials extracted outside the EU and then imported. The demand for metals and fossil fuels is met mainly by imports, while the demand for biomass and non-metallic minerals is met mainly by domestic extraction (see the EU's Raw Material Information System for more information). The proportion of the material footprint accounted for by imports increased from 48% in 2010 to 51% in 2020. This indicates a growing reliance by the EU on other countries to satisfy its need for materials.

The EU's total material footprint is above the global average and far greater than those of low- and middle-income non-EU countries[3]. This level of resource consumption exceeds the planet's 'safe operating space' for resource extraction[4], meaning that, if the world were to consume resources at the level of the EU, the capacity of the planet to provide these resources would be exceeded.

The material footprint could be reduced by decreasing consumption or choosing goods or services whose production or provision needs less material. Various circular economy policies (as part of the EU circular economy action plan) aim to reduce the need for primary material extraction, by keeping materials in the economy for as long as possible while keeping their value as high as possible, and boosting high-quality recycling.

Discounting the temporary dip in 2020, there has been no other sign of a reduction in the material footprint since 2010. Furthermore, available projections for material use, such as the OECD Global Material Resources Outlook, predict an increased future demand for materials in the EU by 2030 [5]. Therefore, at present, it appears unlikely that the EU will significantly reduce its material footprint in the coming decade. It should, however, be noted that the OECD outlook results predate, and therefore do not reflect, the various policies that have recently been adopted by the EU and which aim to temper demand for primary material extraction.

Figure 2. EU Member States' material footprints in 2010 and 2022



Source: Eurostat.

Material footprints vary substantially across EU countries, from 6.6 tonnes/capita in Malta to 46.0 tonnes/capita in Finland. Since 2010, 13 of the 27 Member States have reduced their material footprints, with Malta, the Netherlands, Slovakia and Spain reducing their footprints by more than 30%. On the other hand, Romania, Denmark, Bulgaria, Latvia, Lithuania and Hungary's material footprints have increased by more than 50%.

Switzerland is the only non-EU country that is a member of the European Environment Agency and for which data are available, and it reduced its material footprint between 2010 and 2022.

Differences in the material footprints among countries are difficult to explain, as they are based on citizens' consumption patterns and also on the structure and efficiency of the economy. However, elements such as high levels of circularity (see EEA indicator on the circular material use rate) in the national economy are particularly important. High levels of circularity partly explain the low footprint value in, for instance, the Netherlands, which has the second lowest material footprint in the EU and also the highest circular material use rate.

Supporting information

Definition

The material footprint indicator is based on two components:

· domestic extraction of materials, by material group, as reported to Eurostat

· estimates of raw material equivalents (RMEs) for imports and exports.

The term 'RME' indicates the full accounting for resources extracted to produce final products. While, for domestic extraction, RMEs equal domestic material extraction, RMEs need to be estimated for imports to the EU of raw materials, and semi-finished and finished products.

The difference in the calculations, compared with the more well-known domestic material consumption (DMC) is that the material footprint includes all materials needed to produce the products imported into the EU, while the DMC only includes the weight of imports when these cross the EU border. The material footprint, therefore, is more comprehensive in revealing the actual materials used by EU citizens. For example, in 2019, imports made up 27% of DMC, while they made up 53% of the material footprint.

Methodology

The Eurostat-derived data are described in Eurostat (2021)[6]. Eurostat nowcasts material footprint values for 2022.

For country data, gap filling was performed for (1) missing values at the start or end of time series, where the value was assumed equal to the first available value; and (2) missing values between reported values, calculated by extrapolation.

Policy/environmental relevance

The European Green Deal[7] explicitly calls for a decoupling of economic growth from resource extraction, which translates into continuously decreasing resource consumption in a growing economy. The material footprint accounts for a life cycle approach to material extraction, accounting not only for the weight of materials imported/exported to the EU, but also for the materials needed to produce these imports/exports. The footprint provides a fuller picture of the resources needed to satisfy EU demand.

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes to monitoring aspects of the 8th EAP Article 3.s that requires 'significantly decreasing the Union's material and consumption footprints to bring them into planetary boundaries as soon as possible, including through the introduction of Union 2030 reduction targets, as appropriate'. It also helps monitor progress towards achieving, by 2030, aspects of the 8th EAP priority objective set out in Article 2.2.a: 'advancing towards a well-being economy that gives back to the planet more than it takes and accelerating the transition to a non-toxic circular economy, where growth is regenerative, resources are used efficiently and sustainably, and the waste hierarchy is applied'. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor that the EU 'significantly decrease the EU's material footprint, by reducing the amount of raw material needed to produce the products consumed in the Union.'

Accuracy and uncertainties

No uncertainties have been specified.

Data sources and providers

- Material footprints - main indicators (env_ac_rme), Statistical Office of the European Union (Eurostat)
- Material footprints - main indicators (env_ac_rme), Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

State

Topics

Waste and recycling # Resource use and materials # Sustainability challenges

Tags

Material extraction # WST007 # Material footprint # Consumption # 8th EAP

Temporal coverage

2010-2022

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Ireland

Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Responsible consumption and production

Unit of measure

Tonnes per capita

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. IRP, 2019, *Global Resources Outlook 2019: Natural Resources for the Future We Want*, International Resource Panel, Nairobi, Kenya.
↲
2. IRP, 2019, 'Global Resources Outlook 2019: Natural Resources for the Future We Want', (https://www.resourcepanel.org/reports/global-resources-outlook) accessed July 4, 2022.
↲
3. WU Vienna, 2022, 'Country profiles', *Visualisations based upon the UN IRP Global Material Flows Database, Vienna University of Economics and Business* (http://www.materialflows.net/visualisation-centre/country-profiles/) accessed June 26, 2022.
↲
4. EC, 2022, 'Consumption Footprint Platform', *European Platform on Life Cycle Assessment, European Commission* (https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html) accessed June 26, 2022.
↲

5. The OECD projections refer to the same material categories as the ones used in this indicator. However, the OECD refers to material use, not to material footprint. Material use is defined as domestic material consumption (DMC) which is calculated by the extraction of materials domestically plus imports minus exports. The difference with the material footprint approach is that DMC accounts only for the physical weight of goods imported at the point of entrance into a territory (in our case, the EU). The material footprint, on the other hand, accounts for the full weight of materials extracted in the value chain abroad in order to construct the goods imported. Therefore, the material footprint of a territory (e.g. the EU) is always higher than the DMC. However, the expected increase in the EU’s material footprint based on the OECD projections is still valid, because these projections predict increases in material use in all world regions. ↵

6. Eurostat, 2021, 'Population on 1 January', *Data Browser* (https://ec.europa.eu/eurostat/databrowser/view/tps00001/default/table?lang=en) accessed March 4, 2022. ↵

7. EC, 2022, 'A European Green Deal: striving to be the first climate-neutral continent', *European Commission* (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en) accessed June 27, 2022. ↵

European Environment Agency

8th Environment Action Programme

Waste generation in Europe

8TH EAP HEADLINE INDICATOR, 2023

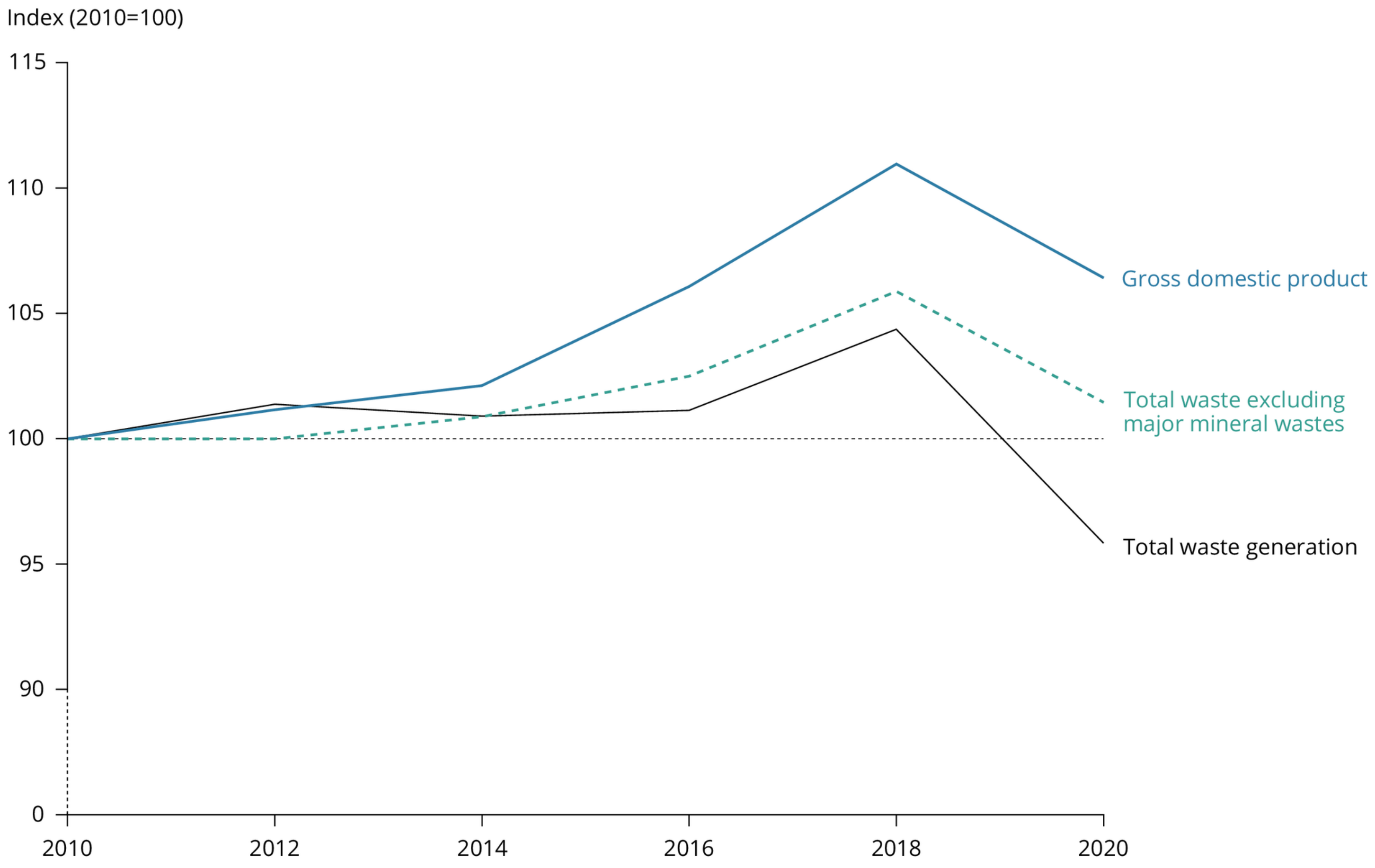
European Environment Agency

Waste generation in Europe

Published 28 Jun 2023

Between 2010 and 2020, total per capita waste generation decreased by 4.2% in the EU. The EU aims to signficantly decrease its total waste generation by 2030 and the observed decrease could indicate some progress towards this. However, the decrease is recent (2018-2020) and coincides with the slow-down of the EU economy due to the COVID-19 pandemic. Waste generation has followed trends in economic growth relatively closely. It therefore does not seem likely that waste generation will significantly decrease by 2030 in context of the current return to economic growth. Substantial additional effort would be required to sustain the decrease in waste generation.

Figure 1. Waste generation and decoupling per capita in the EU-27



Source: Eurostat.

The EU has long strived to fulfil its policy objective to reduce waste though preventing waste generation, which is the first step in the waste hierarchy as laid down in the EU Waste Framework Directive[1]. The zero pollution ambition of the EU is to significantly reduce total waste by 2030[2].

Between 2010 and 2020, total waste generation per capita decreased by 4.2% (or from 5.0 to 4.8 tonnes/capita) in the EU-27. This decrease occurred because of a decrease in 2018-2020, when the COVID-19 pandemic and the ensuing economic slow-down played a key role.

Major mineral wastes, such as hard rocks, concrete, soils and others (all of which are mainly produced in the mining and construction sectors) feature in large quantities in relation to other waste types. They also usually represent an environmental issue of relatively less concern because of their inert nature. If we exclude them from the totals, the remaining and more environmentally significant waste streams still increased by 1.4% (or an increase of 25 kg/capita).

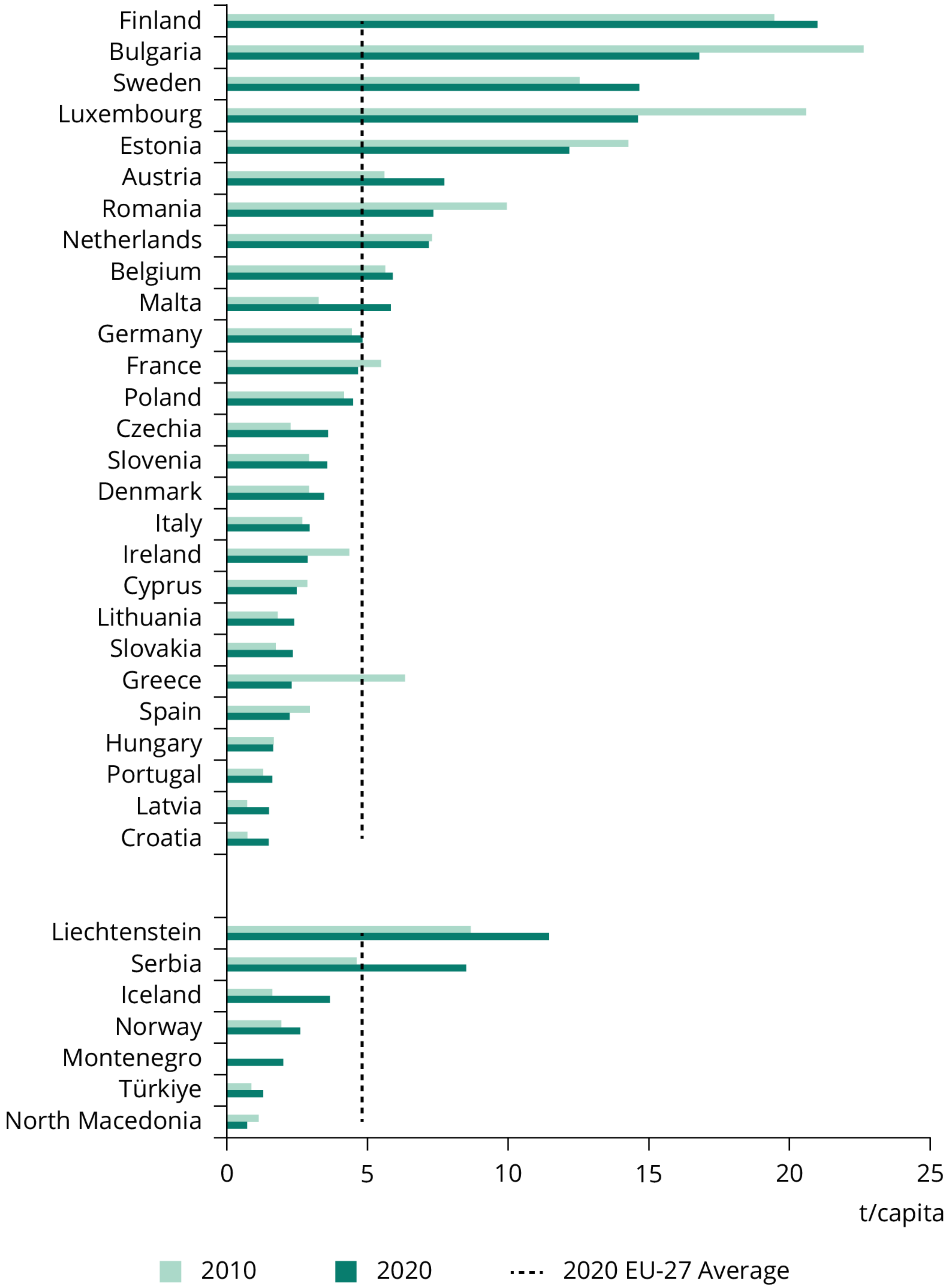
For total waste generation, the observed decrease is driven by waste generated in the mining and quarrying, and construction sectors, which is logical as major mineral waste constitutes a large part of total waste generation (64% in 2020). If this type of waste is excluded, the trend in waste generation is driven by decreasing waste generation in the manufacturing and the energy sectors, and increases in waste generated by households and by water and waste treatment activities. The latter indicates improvements in waste management as the increased presence of secondary waste[3] from waste management indicates increases in recycling.

The main driver for the trend in waste volumes is considered to be economic growth, with gross domestic product (GDP) the most common parameter used to track the economy's size. For the period 2010-2020, the EU's per capita GDP increased in real (deflated) terms by 6% and, although waste generation decreased in the same period, it followed relatively closely trends in GDP development, albeit at a slower pace, indicating a relative decoupling.

In 2020, the EU economy contracted due to measures to contain the COVID-19 pandemic and waste generation registered a substantial decrease of 8% compared with 2018. Therefore, although for the entire period 2010-2020, waste decreased while the economy grew, the EU has not yet achieved absolute decoupling (i.e., constantly decreasing waste generation in a growing economy).

It seems unlikely that the per capita total waste generation will significantly decrease by 2030. The only observed decrease in waste generation is very recent (2018-2020) and has coincided with negative GDP growth rates. In addition, waste generation has historically followed relatively closely GDP growth and since 2020 the GDP growth rates have been positive and the European Central Bank projects this to remain as such in the coming years. Substantial additional effort would be required to significantly decrease the per capita waste generation by 2030.

Figure 2. Generation of waste, excluding major mineral waste, per capita and by European country (2010 and 2020)



Source: Eurostat.

On average, 4.8 tonnes of total waste were generated per EU citizen in 2020, down from 5.0 tonnes/capita in 2010. This average masks large country differences both in absolute waste volumes per capita and in waste generation trends.

Amounts generated ranged from less than 1.5 tonnes per capita (Portugal) to 21 tonnes per capita in 2020 (Finland) for EU Member States, and from less than 1 tonne (North Macedonia) to 11.5 tonnes (Liechtenstein) for other European countries. Different levels partly reflect the different structures of countries' economies, and extreme numbers and significant differences can be influenced by specific country situations. In general, 11 of the 27 EU Member States (14 of the 34 countries with available data) for 2020 were above the EU average.

Trends over time also show a mixed picture between countries: The total waste generated per capita increased in 16 Member States (21 of the 34 countries with available data) and decreased in the rest. In the EU, the largest relative decrease was observed in Greece and the largest relative increase in Latvia (the highest increase overall was in Iceland). In some cases, the trends are influenced by improvements in data quality over time.

Supporting information

Definition

This indicator consists of two figures about waste generation. Figure 1 shows indexed values of waste generation, waste generation excluding major mineral waste and GDP with 2010 taken as a reference year (2010=100%). GDP was chosen as a basic indicator of economic growth. Figure 2 shows total waste generation per capita by European country. Data presented in the form of a bar chart are displayed as a comparison of the reference year (2010) and the last available year.

Methodology

Methodology for indicator calculation

Figure 1: Raw data for waste generation (total and excluding major mineral wastes) and GDP were retrieved from Eurostat. Eurostat aggregates for the EU-27 were used. Data on waste generation contain all NACE activities and households. Frequency of data publishing varies from every 2 years (for waste generation) to every year (for GDP). The aggregated figures are indexed to 2010, which means that the figure for each year is divided by the figure for 2010 and then multiplied by 100. Information on data sets uncertainties can be found directly in the metadata and explanatory notes provided by Eurostat. Only official datasets by Eurostat have been used.

Figure 2: Data for waste generation were retrieved from Eurostat. Data are displayed for country level, contain all NACE activities and households, and are expressed in kg per capita. To provide the broadest possible picture of European countries, geographical coverage was extended to the EEA-32 member countries and West Balkan cooperating countries. Frequency of data publishing is every 2 years. Gap filling was applied for three countries where 2018 data were used to fill the

2020 data gap. Information on data sets uncertainties can be found directly in the metadata and explanatory notes provided by Eurostat. Only official datasets by Eurostat have been used.

Policy/environmental relevance

One of the symbols of the linear economy system, which predominated in recent decades, is the high consumption of resources followed by high waste generation ('take-make-dispose'). This economic model is based on increasing profits generated by the consumption of primary resources and increasing demand for short-cycle products. In 2015, 2018 and 2020, the European Commission adopted Circular Economy packages to make the transition to a circular economic model where resources are used in a more sustainable way. The waste hierarchy serves to set priorities for EU and national waste policies and gives the highest priority to waste prevention, followed by preparing for reuse, recycling, and other methods of recovery and disposal. These priorities are highlighted by recent waste and resource efficiency policies and strategies at EU and national levels.

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP) [4][5]. It contributes mainly to monitoring aspects of the 8th EAP priority objective Article 2.2.c that shall be met by 2030: ‘advancing towards a well-being economy that gives back to the planet more than it takes and accelerating the transition to a non-toxic circular economy, where growth is regenerative, resources are used efficiently and sustainably, and the waste hierarchy is applied’. For the purposes of 8th EAP monitoring, this indicator assesses specifically whether the EU will significantly reduce the per capita total amount of generated waste by 2030[6].

The zero pollution ambition of the EU calls for a significant reduction in EU waste generation by 2030 and this indicator also monitors progress towards this EU policy objective.

Accuracy and uncertainties

Methodology uncertainty

No uncertainty has been specified.

Data sets uncertainty

Rationale uncertainty

No uncertainty has been specified.

Data sources and providers

- Generation of waste by waste category, hazardousness and NACE Rev. 2 activity (env_wasgen), Statistical Office of the European Union (Eurostat)
- GDP and main components (output, expenditure and income), Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Pressure

Topics

Waste and recycling # Resource use and materials # Circular economy

Tags

WST004 # Waste generation # Industrial waste generation # 8th EAP

Temporal coverage

2010-2020

Geographic coverage

Albania
Austria
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Latvia
Liechtenstein
Lithuania
Luxembourg
Malta
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Turkey

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Responsible consumption and production

Unit of measure

· Figure 1: Index (2010=100)

· Figure 2: t/capita

Frequency of dissemination

Every 2 years

Contact

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References and footnotes

1. EU, 2018, Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste, OJ L 150, 14.6.2018, p. 109-140. ↵
2. EC, 2021, 'Zero pollution action plan', (https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en) accessed November 10, 2022. ↵
3. This waste is generated during the treatment of waste and comprises, for example, sorting residues, sludges and incineration ashes. More complex waste management such as recycling and incineration usually results in more secondary waste. ↵
4. EC, 2022, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme’s 2030 and 2050 priority objectives ↵
5. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030 ↵
6. EC, 2021, COMMISSION STAFF WORKING DOCUMENT Digital Solutions for Zero Pollution Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Pathway to a Healthy Planet for All EU Action Plan: ‘Towards Zero Pollution for Air, Water and Soil’ ↵

European Environment Agency

8th Environment Action Programme

Premature deaths due to exposure to fine particulate matter in Europe

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

Premature deaths due to exposure to fine particulate matter in Europe

Published 24 Nov 2023

> The European Commission zero pollution action plan sets a target to reduce the health impacts of air pollution (estimated by the number of premature deaths attributable to fine particulate matter ($PM_{2.5}$)) by at least 55% by 2030, compared to those in 2005. Between 2005 and 2021, the number of premature deaths in the EU attributable to $PM_{2.5}$ fell by 41%. Extrapolating the progress observed over the past ten years shows that the target will be overreached at the EU level. The European Commission also projected that the target will be overreached if the EU policies on air, climate and energy are adequately implemented. Despite the ongoing improvement, in 2021 the premature deaths attributable to $PM_{2.5}$ were 253,000 in the EU.

Figure 1. Premature deaths attributable to exposure to fine particulate matter, EU

Source: EEA.

Data used in the graph

Year	Premature deaths	Zero Pollution Action Plan Target for 2030
2005	431114	
2006		
2007	349416	
2008	354207	
2009	362841	
2010	367732	
2011	392315	
2012	344027	
2013	328912	
2014	290933	
2015	321094	
2016	281995	
2017	303487	
2018	290716	
2019	231286	
2020	237715	
2021	253305	
2022		
2023		
2024		
2025		
2026		
2027		
2028		

Year	Premature deaths	Zero Pollution Action Plan Target for 2030
2029		
2030		194001

Air pollution is a major cause of mortality and disease in Europe and is the largest environmental health risk (WHO, 2023). The air pollutant deemed to cause the most severe impacts on human health is fine particulate matter ($PM_{2.5}$).

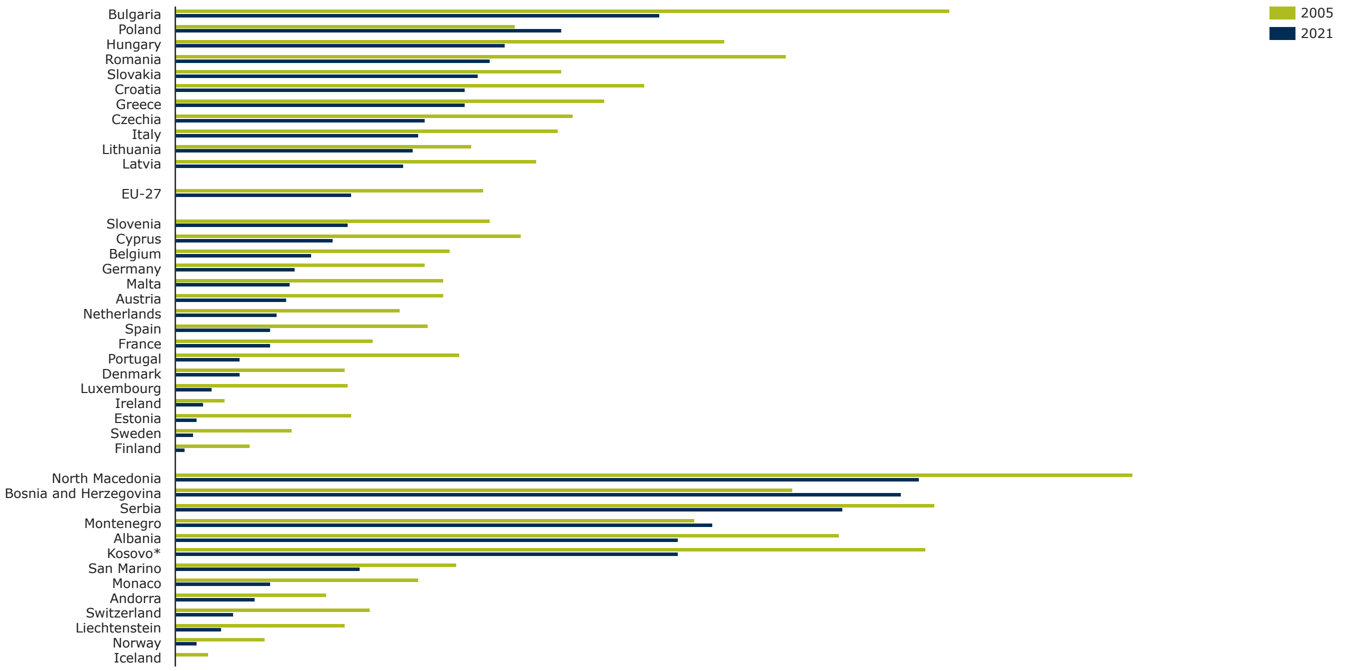
The European Green Deal called for a further improvement of air quality and to revise the EU's air quality standards, aligning them more closely with the latest World Health Organization (WHO) recommendations on air quality. The European Commission zero pollution action plan set the target of reducing the number of premature deaths caused by air pollution by 55% before 2030, relative to those in 2005 (specifying that this target will be measured considering only $PM_{2.5}$). In October 2022, the European Commission also proposed a revision of the current EU Ambient Air Quality Directives, under negotiation during 2023 with the European Parliament and the European Council.

As shown in Figure 1, between 2005 and 2021, premature deaths attributable to $PM_{2.5}$ exposure above the WHO air quality guideline level of 5µg/m^3 fell by 41% in the EU-27 (EEA, 2023). This decrease was caused by a decline in the concentrations of $PM_{2.5}$ and therefore a decrease in the exposure of the population to this air pollutant. Nevertheless, more than 70% of EU population live in urban areas and, according to a related EEA indicator, in 2021 97% of the urban population was still exposed to $PM_{2.5}$ concentrations above the new (2021) WHO air quality guideline level of 5µg/m^3.

The decline in the premature mortality was the result of the implementation of EU, national and local policies to improve the quality of the air (e.g. the EU Ambient Air Quality Directives and the national, regional and local plans and measures derived from them) and to reduce emissions of air pollutants, including particulate matter (e.g. the National Emission Reduction Commitments Directive). These policies succeeded in reducing fine particulate matter emissions from domestic heating, their main source, as well as from other sources such as transport, industry and agriculture.

If the trend seen in the past ten years was to continue, the decline in the premature mortality attributable to $PM_{2.5}$ would reach 68% by 2030 (from 2005 levels), i.e., there will be an overachievement of the 55% zero pollution reduction target. In addition, according to the Third Clean Air Outlook, published by the European Commission, the target is expected to be overreached if the foreseen clean air measures, together with the climate and energy polices of the 'Fit for 55' package are implemented. The outlook foresees a reduction of 66% by 2030 if these conditions are met.

Figure 2. Premature deaths attributable to exposure to $PM_{2.5}$ at country level in 2005 and 2021



Source: EEA.

Data used in the graph

Country	2005	2021
Bulgaria	251	157
Poland	110	125
Hungary	178	107
Romania	198	102
Slovakia	125	98
Croatia	152	94
Greece	139	94
Czechia	129	81
Italy	124	79
Lithuania	96	77
Latvia	117	74
EU-27	100	57
Slovenia	102	56
Cyprus	112	51
Belgium	89	44
Germany	81	39
Malta	87	37
Austria	87	36
Netherlands	73	33
Spain	82	31
France	64	31
Portugal	92	21
Denmark	55	21

Country	2005	2021
Luxembourg	56	12
Ireland	16	9
Estonia	57	7
Sweden	38	6
Finland	24	3
North Macedonia	310	241
Bosnia and Herzegovina	200	235
Serbia	246	216
Montenegro	168	174
Albania	215	163
Kosovo*	243	163
San Marino	91	60
Monaco	79	31
Andorra	49	26
Switzerland	63	19
Liechtenstein	55	15
Norway	29	7
Iceland	11	0

Although the Zero pollution action plan target is set at EU level, it is useful to have a look at the change in the mortality due to exposure to $PM_{2.5}$ at country level. Figure 2 depicts the estimated number of premature deaths per 100,000 inhabitants attributable to exposure to annual $PM_{2.5}$ concentrations above 5µg/m^3 in both 2005 and 2021.

It shows that in all EU Member States, except Poland, mortality per capita has decreased, more than halving in 14 of them.

A decrease in mortality can also be seen in the rest of the European countries considered, with the exception of Bosnia and Herzegovina and Montenegro. In these non-EU countries, five of them have at least halved their number of premature deaths attributable to exposure to $PM_{2.5}$.

This reduction at country level partly reflects the reduction in $PM_{2.5}$ concentrations over the years (see, for instance, the Air quality in Europe – 2020 report). The increasing results found in the three countries mentioned above happened in spite of the decreasing concentrations between 2005 and 2021. This may be due to an increase in total and/or relative mortality between the two years. Specifically, 2021 saw an increase in total mortality due to the impact of COVID-19.

Finally, to allow comparison of the impact of air pollution on human health across the different NUTS3 regions of Europe (NUTS: Nomenclature of territorial units for statistics), this map shows the number of premature deaths attributable to $PM_{2.5}$ expressed per 100,000 inhabitants. Out of the EU regions, the highest relative number of attributable deaths in 2021 were in several regions of Bulgaria (Vidin, Plovdiv and others) and Poland (Miasto Kraków, Katowicki, Sosnowiecki and others). In contrast, within the EU, several Finnish and Swedish regions and one Portuguese region had very low attributable deaths (i.e., less than one per 100,000 inhabitants).

Outside of the EU, the highest number of relative attributable deaths in 2021 were in several regions of North Macedonia (Skopski, Vardarski and others) and of Serbia (Podunavska oblast, Pomoravska oblast, City of Belgrade and others). Regarding the lowest numbers, all the Icelandic regions and a couple of Norwegian regions had less than one attributable death per 100,000 inhabitants.

The high relative numbers of premature deaths attributable to $PM_{2.5}$ in the above-mentioned regions are the result of burning solid fuels for domestic heating and industry. And all the regions (both inside and outside EU) with the lowest relative mortality have population-averaged concentrations below 5µg/m^3.

Supporting information

Definition

This indicator provides information on the number of premature deaths in the EU-27 attributable to long-term exposure to fine particulate matter ($PM_{2.5}$) since the year 2005.

It also shows a comparison in the mortality attributable to $PM_{2.5}$ between years 2005 and the most recent year with available data, at country level, for 40 European countries

Furthermore, it provides European NUTS3 regional-level information on the number of premature deaths adjusted for the number of inhabitants attributable to long-term exposure to $PM_{2.5}$ for the most recent year with available data. Nomenclature of territorial units for statistics, or NUTS classification, is a system for dividing up the European territory for the collection of regional statistics, where NUTS3 corresponds to small regions.

Methodology

The EEA has been estimating the mortality attributable to air pollution in the last years. Until year 2021 (when the mortality for year 2019 was estimated), it used the recommendations provided by the WHO Europe in its 2013 report. This methodology has been explained in several documents, among them:

· the EEA briefing 'Assessing the risks to health from air pollution'

· ETC/ATNI (2019, 2021) .

After the publication of the new WHO global air quality guidelines in 2021, and to reflect the updated recommendations, there has been some changes in the data used in that methodology; those changes were implemented for the first time in 2022 (to estimate the mortality in year 2020):

· The relative risk has been updated from the previous 0.062 to 0.08; this implies that the risk of dying prematurely increases by 8% per each increase in 10µg/m^3 in the $PM_{2.5}$ concentrations (previously the increment in the risk was 6.2%).

· The concentration from which the effect of exposure to $PM_{2.5}$ is considered has changed from 0µg/m^3 to 5µg/m^3; in this way the EEA estimates the mortality attributable to not reaching the air quality guideline level recommended by the WHO, and considers in this way the concentrations for which the form of the concentration-response function is linear and for which this function is more certain. Nevertheless, it should be considered that there is no evidence of a threshold below which air pollution does not impact on health. (Please see additional information at the EEA's briefing *Health impacts of air pollution in Europe, 2022*).

Mortality calculations for all years back from 2005 have been recalculated using this updated methodology.

The aggregations are either at European, EU, country or at NUTS3 level.

Policy/environmental relevance

The zero pollution action plan, adopted in the context of the European Green Deal, has, among other things, set the goal to reduce by 2030 the number of premature deaths in the EU caused by air pollution by at least 55%, relative to 2005 levels and specified that this will be monitored via the premature deaths attributed to $PM_{2.5}$.

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme. It mainly contributes to monitoring aspects of the 8th EAP priority objective Article 2.2.d that shall be met by 2030: 'pursuing zero pollution, including in relation to harmful chemicals, in order to achieve a toxic-free environment, including for air, water and soil, as well as in relation to light and noise pollution, and protecting the health and wellbeing of people, animals and ecosystems from environment-related risks and negative impacts', (European Union Decision on the 8th EAP). In line with the zero pollution action plan, the European Commission's

Communication on the 8th EAP monitoring framework specifies that this indicator monitors progress towards reducing 'premature deaths from air pollution by 55% (from 2005 levels) by 2030', (European Commission Communication on the 8th EAP monitoring framework).

Accuracy and uncertainties

The main uncertainties are those derived from the health risk calculations. They are described at the EEA briefing 'Assessing the risks to health from air pollution'.

Data sources and providers

- Premature deaths due to exposure to fine particulate matter PM2.5 (2005-2021), EU SDG 11_52, European Environment Agency (EEA)

Metadata

DPSIR

Impact

Topics

Environmental health impacts # Air pollution # Pollution

Tags

mortality by exposure to PM2.5 # health impacts # Zero pollution # 8th EAP # Particulate matter # PM2.5 # AIR007 # environmental burden of disease

Temporal coverage

2005-2021

Geographic coverage

Albania	Austria
Belgium	Bosnia and Herzegovina
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Kosovo (UNSCR 1244/99)	Latvia

Liechtenstein
Lithuania
Luxembourg
Malta
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

Number of premature deaths.

Number of premature deaths per 100,000 inhabitants.

Frequency of dissemination

Once a year

Contact

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European Environment Agency

8th Environment Action Programme

Nitrate in groundwater

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

Nitrate in groundwater

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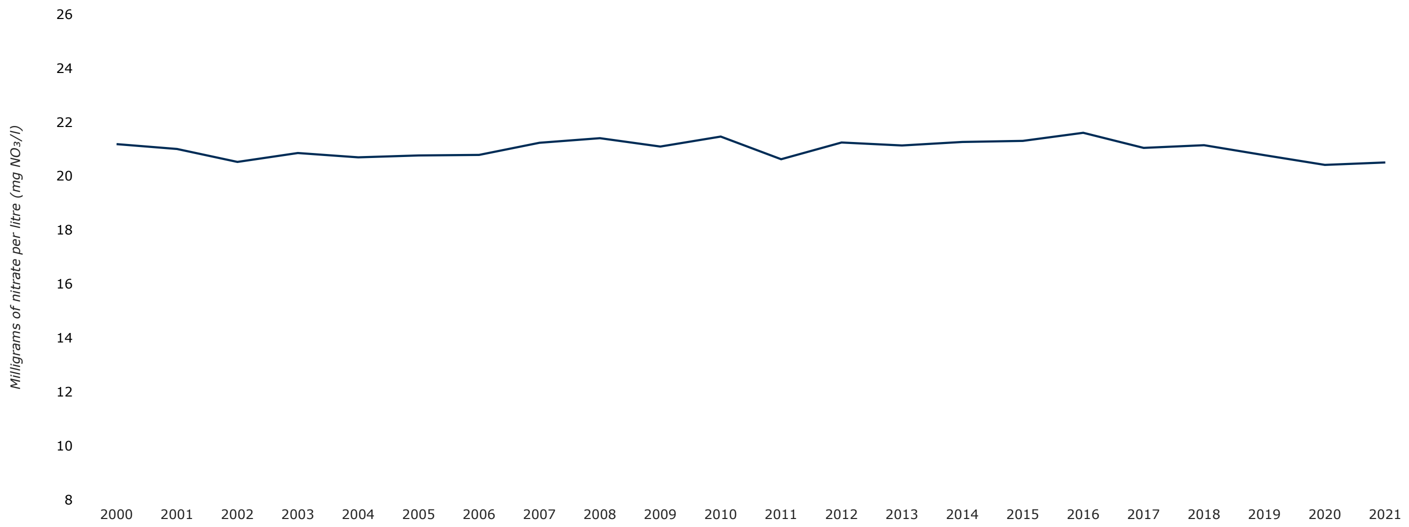
Despite legislation addressing nutrient pollution, the average nitrate concentration in EU groundwaters did not change significantly from 2000 to 2021. In addition, the number of groundwater monitoring stations with nitrate concentrations greater than 50mg/l, has not been reduced. Results from a high ambition model scenario show that potential nutrient load reductions are substantial, but still below the 2030 target. At this stage, it remains unlikely but uncertain whether the trend is sufficient to achieve EU obligations or the 50% nutrient loss reduction target.

Figure 1. Groundwater nitrate 2000-2021



Source: EEA.

Data used in the graph

Year	Concentration
2000	21.19
2001	21.01
2002	20.53
2003	20.86
2004	20.7
2005	20.77
2006	20.79
2007	21.24
2008	21.41
2009	21.1
2010	21.47
2011	20.63
2012	21.25
2013	21.14
2014	21.27
2015	21.31
2016	21.61
2017	21.05
2018	21.15
2019	20.78
2020	20.42
2021	20.51

Nutrients such as nitrogen, that are not taken up by plants, are lost to the environment and become pollutants when present in excessive amounts. This includes high levels of nitrate (NO_3) in groundwater, which pose a threat to the environment and to human health. Reducing high levels of nitrate in groundwater has been a target of EU policy since the adoption of the Nitrates Directive. Mineral fertilisers and manure are the main sources of nitrate concentrations in EU groundwaters and an estimated 80% of the nitrogen discharge to the EU aquatic environment stems from agriculture. Around 30% of surface water and 80% of marine waters are eutrophic [1][2][3][4].

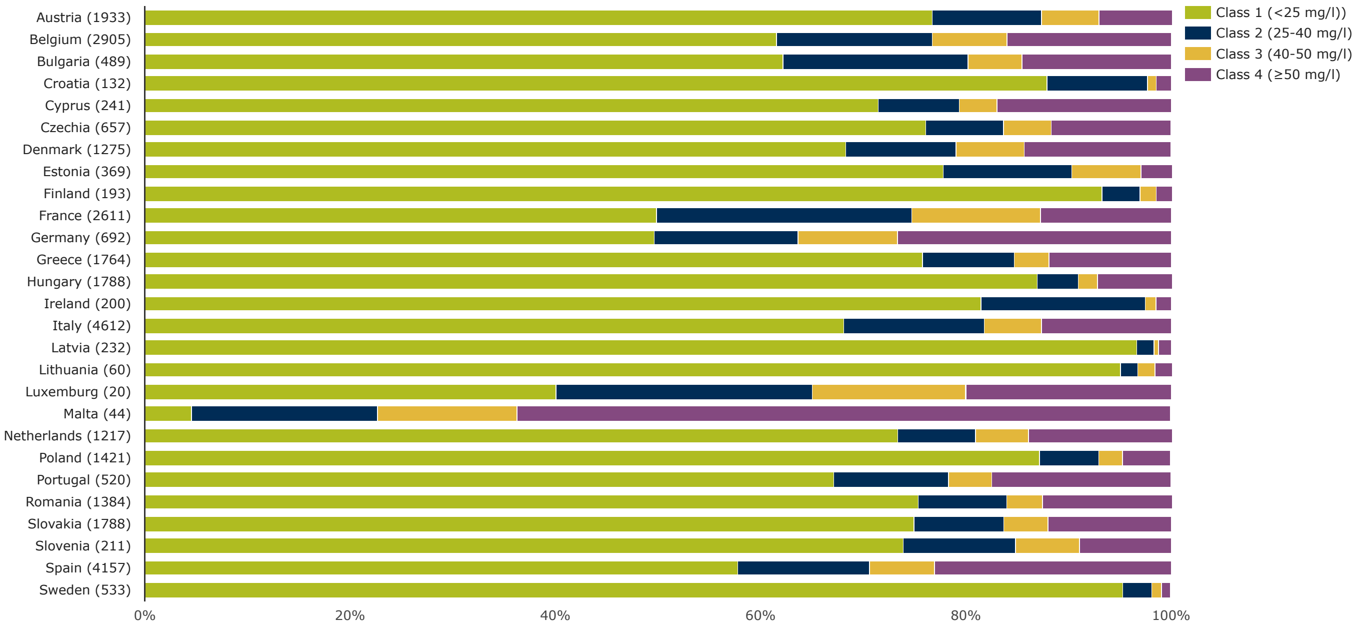
Several Directives address nitrogen losses to the environment[5][4][6][7][8]. The Groundwater Directive [9] and the Drinking Water Directive [10] set the maximum allowable concentration for nitrate at 50mg NO_3/l in order to protect human health and water resources.

The European Green Deal[11] with its initiatives of the Zero pollution action plan [12], and the Biodiversity and Farm to Fork strategies [13][14], set a goal for the EU to reduce nutrient losses to the environment by 50%, by 2030. Such a reduction should result in lower groundwater nitrate concentrations and a reduced number of groundwater monitoring stations with nitrate concentration greater than 50mg/l, compared to the reference period 2012-2015 [15][16].

Despite legislation addressing nutrient pollution, the average nitrate (NO_3) concentration in EU groundwaters did not change significantly from 2000 to 2021 - oscillating around 21mg NO_3/l. In addition, data reported under the Nitrates Directive covering the period 2016-2019 shows, 14.1% of groundwater stations exceeded the maximum allowable concentration of 50mg NO_3/l, which is comparable to 13.2% that was observed in the previous reporting period 2012-2015 [3].

An analysis, from the JRC (Joint Research Centre), modelled impacts in a high ambition scenario of improvements in domestic wastewater treatment, reduction of nutrient emissions to air, and with measures under the CAP 2023-2027 needed to achieve the Biodiversity Strategy and Farm to Fork targets. These measures, where especially the CAP measures are relevant for groundwater, could in combination reduce the nutrient load in European seas by 30% for nitrogen and 20% for phosphorous by 2030 (EC 2022). While these projected reductions are substantial, they are still below the target of 50% reduction overall in nutrient losses.

Figure 2. Nitrate in Groundwater - Nitrates Directive reporting period 7 (2016-2019)



Source: Joint Research Centre.

Data used in the graph

Country	Class 1 (<25 mg/l))	Class 2 (25-40 mg/l)	Class 3 (40-50 mg/l)	Class 4 (≥50 mg/l)
Sweden (533)	95.3	2.8	0.9	0.9
Spain (4157)	57.7	12.9	6.3	23.1
Slovenia (211)	73.9	10.9	6.2	9
Slovakia (1788)	74.9	8.8	4.3	12
Romania (1384)	75.3	8.7	3.5	12.6
Portugal (520)	67.1	11.2	4.2	17.5
Poland (1421)	87.1	5.8	2.4	4.6
Netherlands (1217)	73.3	7.6	5.2	14
Malta (44)	4.5	18.2	13.6	63.6
Luxemburg (20)	40	25	15	20
Lithuania (60)	95	1.7	1.7	1.7
Latvia (232)	96.6	1.7	0.4	1.3
Italy (4612)	68.1	13.7	5.6	12.6
Ireland (200)	81.5	16	1	1.5
Hungary (1788)	86.9	4	1.9	7.3
Greece (1764)	75.8	8.9	3.4	11.9
Germany (692)	49.6	14	9.7	26.7
France (2611)	49.8	24.9	12.6	12.7
Finland (193)	93.3	3.6	1.6	1.6
Estonia (369)	77.8	12.5	6.8	3
Denmark (1275)	68.3	10.7	6.7	14.3
Czechia (657)	76.1	7.6	4.6	11.7
Cyprus (241)	71.4	7.9	3.7	17

Country	Class 1 (<25 mg/l))	Class 2 (25-40 mg/l)	Class 3 (40-50 mg/l)	Class 4 (≥50 mg/l)
Croatia (132)	87.9	9.8	0.8	1.5
Bulgaria (489)	62.2	18	5.3	14.5
Belgium (2905)	61.5	15.2	7.3	16
Austria (1933)	76.7	10.7	5.5	7.2

EU Member States report groundwater nitrate concentrations under the Nitrates Directive. At country level, nitrate concentrations in groundwater for the period 2016-2019 are distributed into four classes (Figure 2). Class one represents groundwaters where concentrations are below 25mg/l, and at the other end of the scale, class four shows the share of stations that exceed the 50mg NO_3/l maximum allowable concentration. In this reporting period, all EU-27 countries had some groundwaters with reported nitrate concentrations above the maximum allowable concentration of 50mg NO_3/l (class four). The seven countries reporting more than 15% of their groundwaters exceeding this maximum level were Belgium, Cyprus, Germany, Luxemburg, Malta, Portugal, and Spain. In contrast, the seven countries with more than 80% of groundwaters below 25mg/l in class one were Croatia, Finland, Hungary, Ireland, Latvia, Poland and Sweden.

Supporting information

Definition

This indicator shows concentrations of nitrate in groundwater bodies. The indicator can be used to illustrate geographical variations in current concentrations and temporal trends. Large inputs of nitrogen to water bodies from urban areas, industry, and agricultural areas, can have negative impacts on the use of water for human consumption and other purposes.

Methodology

This indicator uses data reported under two different obligations. For the time series of average concentrations in figure 1 data from WISE SoE - Water quality (WISE-6) reporting obligation are used used (published in Waterbase – Water Quality ICM). For the country level assessment in figure 2 data from the Nitrates Directive reporting obligation are used.

For the time series in figure 1, annual mean concentrations are used as a basis in the analyses. Unless the country reports aggregated data, the aggregation to annual mean concentrations is done by the EEA. Automatic quality control procedures are applied both to the disaggregated and aggregated data, excluding data failing the tests from further analysis. In addition, a semi-manual procedure is applied, focusing on suspicious values having a major impact on the country time series and on the most recently reported data. This comprises:

- Outliers
- Consecutive values deviating strongly from the rest of the time series
- Whole time series deviating strongly in level compared to other time series for that country and determinant
- Where values for a specific year are consistently much higher or lower than the remaining values for that country and determinant.

Such values are removed from the analysis and checked with the country. For time series analyses, only complete series after inter/extrapolation are used. This is to ensure that the aggregated time series are consistent, i.e. include the same sites throughout.

Inter/extrapolations of gaps up to three years are allowed, i.e. to increase the number of available time series. At the beginning or end of the data series, missing values are replaced by the first or last value of the original data series, respectively. In the middle of the data series, missing values are linearly interpolated. The selected time series are aggregated to country and European level by averaging across all sites for each year.

For analysis of the present state on country level (figure 2), data reported under the Nitrates Directive for reporting period 2016-2019 are used, where data on monitoring station level are collected for each reporting period (four year period) and include characteristics on the water monitoring stations and values for the concentrations of NO_3 for each station. The data is summarised by country and by concentration classes. This information can also be viewed in the JRC exploratory dashboard for reporting period seven.

Policy/environmental relevance

The quality of freshwater, with respect to nutrient concentrations, is an objective of several directives: The Nitrates Directive (91/676/EEC), aimed at reducing nitrate pollution from agricultural land; the Urban Waste Water Treatment Directive (91/271/EEC), aimed at reducing pollution from sewage treatment works and certain industries; the Industrial Emissions Directive (2010/75/EU), aimed at reducing emissions from industry; the Water Framework Directive (2000/60/EC), which requires the achievement of good ecological status; the Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. The Water Framework Directive also requires the reversal of significant and sustained upward trends in the concentrations of pollutants. Based on the Drinking Water Directive (2020/2184), the Nitrates Directive and the Groundwater Directive under the Water Framework Directive, set the maximum allowable concentration for nitrate at 50mg NO_3/l. This is to eliminate the need for expensive water treatment because it has been shown that drinking water in excess of the nitrate limit can result in adverse health effects (WHO 2003).

Reducing nutrient losses by 50% by 2030 is an important aspect of the European Green Deal initiatives: 'Farm to Fork' Strategy; Biodiversity strategy; Zero pollution action plan. The Common

Agricultural Policy (CAP) is a key tool in this respect. The assessment of the 50% target is set out in the Annex to the Recommendations for the CAP Strategic Plans [16] and is evaluated in the context of the Zero Pollution Monitoring Assessment published on 8 December 2022.

The 8th Environment Action Programme supports the objectives of the European Green Deal and forms the basis for the EU to achieve the Sustainable Development Goals of the United Nations.

The 'nitrate in groundwater indicator' is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It mainly contributes to monitoring aspects of the 8th EAP priority objective Article 2.2.d that shall be met by 2030: 'pursuing zero pollution, including in relation to harmful chemicals, in order to achieve a toxic-free environment, including for air, water and soil, as well as in relation to light and noise pollution, and protecting the health and wellbeing of people, animals and ecosystems from environment-related risks and negative impacts'. The European Commission's Communication on the 8th EAP monitoring framework specifies that this indicator should monitor progress towards reducing nutrient losses by at least 50% in safe groundwater resources by 2030.

Accuracy and uncertainties

The indicator is meant to give a representative overview of nitrate conditions in the groundwaters of the European Union. This means it should reflect the variability in conditions over space and time. Countries are asked to provide data on groundwater bodies according to specified criteria.

The Waterbase - Water Quality ICM data for groundwater include almost all countries within the EU, while the Nitrates Directive data includes all EU countries. It is assumed that the data from each country represents the variability in space in their country. Likewise, it is assumed that the sampling frequency is sufficiently high to reflect variability in time. In practice, for Waterbase data, the representativeness will vary between countries, while for the Nitrates Directive data the coverage is more complete but reported at lower frequency.

Annual updates of Waterbase - Water Quality ICM data means that, due to changes in the database, the derived results of the assessment may vary in comparison to previous assessments. Database changes include changes in the QC procedure that excludes or re-includes individual sites or samples and retroactive reporting of data for past periods - which may re-introduce lost time series that were not used in the recent indicator assessments. Through communication with the reporting countries, the quality of the database can be, and incrementally is, further improved.

Data sources and providers

- Nitrates Directive reporting period 7 (2016-2019), Joint Research Centre (JRC)
- Waterbase - Water Quality ICM, 2022, European Environment Agency (EEA)

Metadata

DPSIR

State

Topics

Water   # Agriculture and food

Tags

8th EAP   # WAT004   # Freshwater quality   # Groundwater   # Nitrates

Temporal coverage

2000-2021

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Clean water and sanitation

Unit of measure

FIG1: the concentration of nitrate in groundwater is expressed as milligrams of nitrate per litre (mg NO_3/l)

FIG2: percentage

Frequency of dissemination

Once a year

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References and footnotes

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↵

2. WHO, 2003, 'Nitrate and nitrite in drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality (WHO/SDE/WSH/04.03/56)', (https://cdn.who.int/media/docs/default-source/wash-documents/wash-chemicals/who-sde-wsh-04-03-56-eng.pdf?sfvrsn=e2fe0837_4).
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a b

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a b

5. EU, 1991, Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, OJ L 135, 30.5.1991, p. 40–52 (ES, DA, DE, EL, EN, FR, IT, NL, PT).
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↵

7. EU, 2000, Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1–73 (ES, DA, DE, EL, EN, FR, IT, NL, PT, FI, SV).
↵

8. EU, 2001, Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants, OJ L 309, 27.11.2001, p. 22–30 (ES, DA, DE, EL, EN, FR, IT, NL, PT, FI, SV).
↵

9. EC, 2014, Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration
↩

10. EU, 2020, Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast) (Text with EEA relevance, OJ L 435, 23.12.2020, p. 1–62 (BG, ES, CS, DA, DE, ET, EL, EN, FR, GA, HR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV).
↩

11. EC, 2019, *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal'*, COM(2019) 640 final,
↩

12. EC, 2021, *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'*, COM/2021/400 final, European Commission.
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13. EC, 2020, *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system*, COM/2020/381 final, European Commission.
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14. EC, 2020, *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS EU Biodiversity Strategy for 2030 Bringing nature back into our lives*, COM/2020/380 final, European Commission.
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15. EC, 2020, *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives*, COM/2022/357 final, European Commission.
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16. EC, 2020, *ANNEXES to the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Recommendations to the Member States as regards their strategic plan for the Common Agricultural Policy*, COM(2020) 846 final, European Commission.
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European Environment Agency

8th Environment Action Programme

Designated terrestrial protected areas in Europe

8TH EAP HEADLINE INDICATOR, 2023

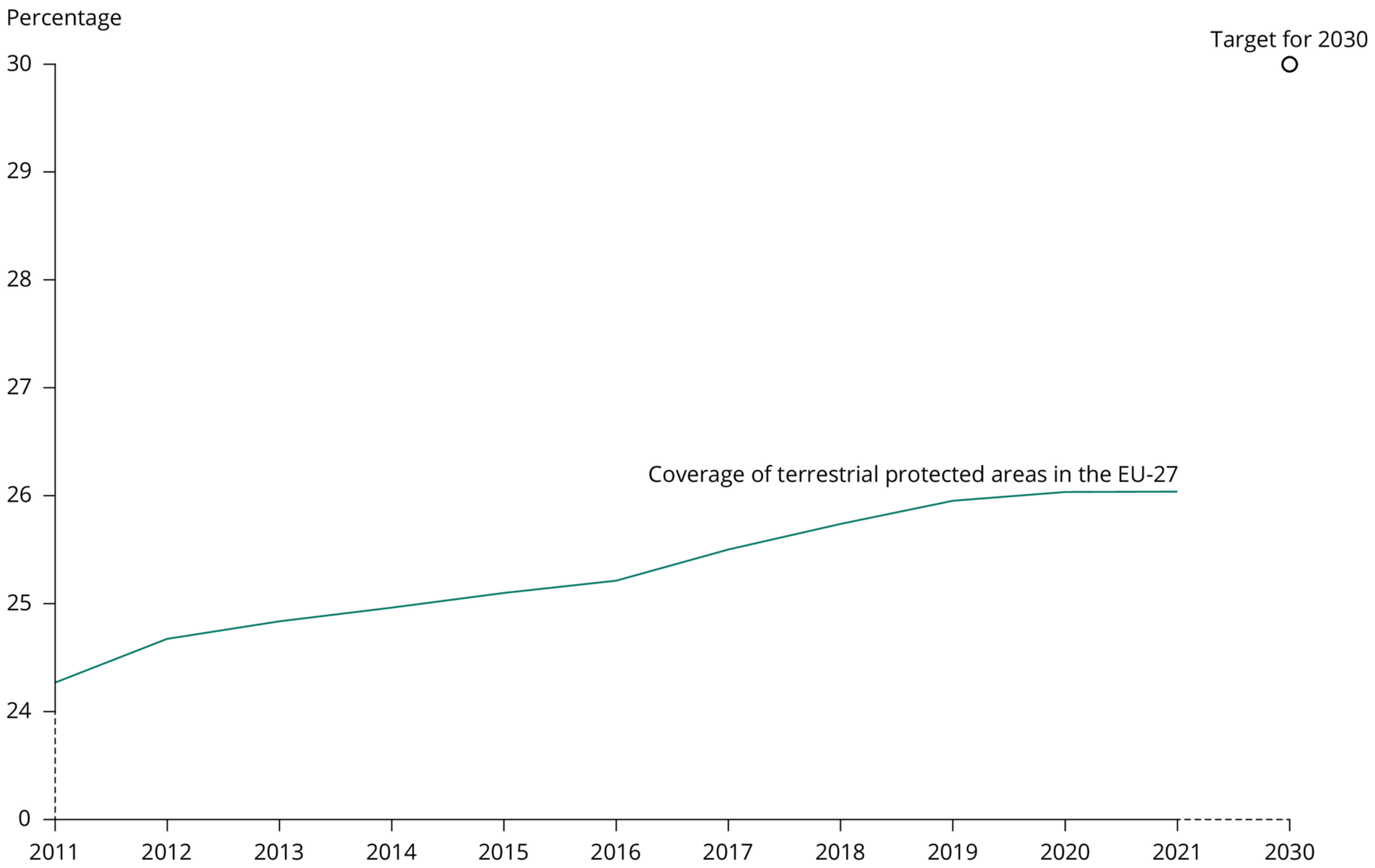
European Environment Agency

Terrestrial protected areas in Europe

Published 29 Aug 2023

By the end of 2021, protected areas covered 26% of EU land, with 18.6% of this area designated as Natura 2000 sites and 7.4% as other national designations. The EU biodiversity strategy for 2030 sets out a target of protecting at least 30% of EU land by 2030, while also ensuring that all protected areas are effectively managed. If the designation of protected areas continues at the rate seen in the past decade (1.7 percentage points increase since 2011), the target will not be met. However, EU Member States are in the process of submitting pledges to designate new areas by 2030. These pledges will provide further insights into the prospects of reaching the target and any major gaps that remain.

Figure 1. Coverage of protected areas in the EU-27 land area in 2011-2021



Source: EEA/EuroGeographics.

Protected areas benefit species, ecosystems and the environment overall. They provide significant economic and societal benefits, including employment opportunities, contribute to human health and well-being and have significant cultural value. Historically, protected areas have taken many forms and have been established for different purposes, such as protecting wild game resources, preserving natural beauty and, more recently, safeguarding biodiversity and ecosystem services.

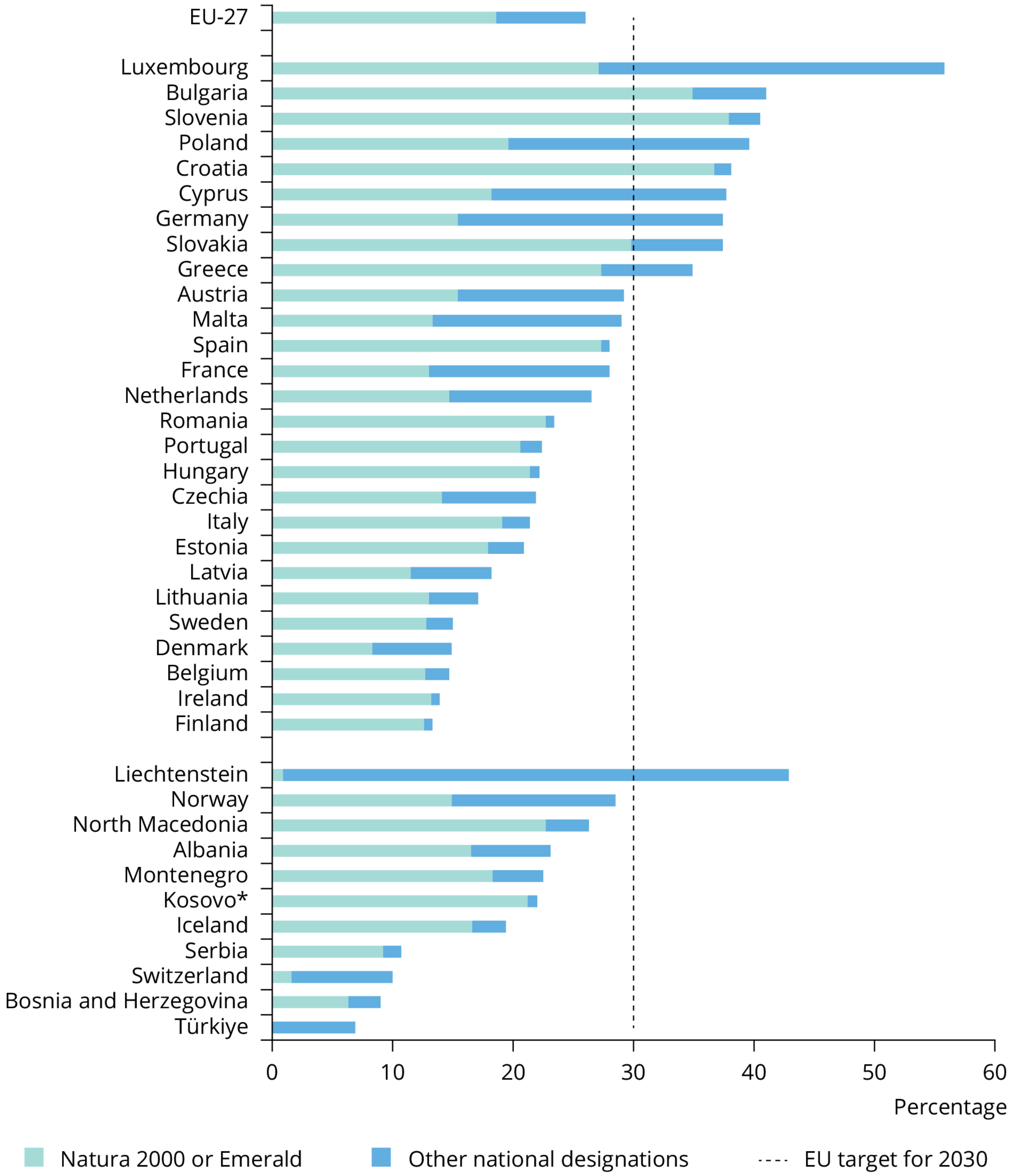
The EU's protected areas are highly diverse, varying in size, aim and management approach. They are large in number – over 100,000 sites in total – but mostly rather small in size. This reflects the high pressure on land use, arising from agriculture, transport and urban development, and the increasing competition for land for production of renewable energy and biofuels.

Designation of protected areas is an important policy tool to halt biodiversity decline. One of the targets of the EU biodiversity strategy for 2030[1] is to legally protect and effectively manage a minimum of 30% of EU land by 2030. Based on Member States reports, 26% of EU land was protected by the end of 2021. 18.6% of this area was designated by Member States as Natura 2000 sites – areas protected under the EU Birds and Habitats Directives – and 7.4% as other complementary national designations.

While the area that is reported as protected has steadily increased since 2011 (1.7 percentage points), at present it is rather uncertain whether the EU will meet the 30% target. For this to happen the rate of designation of protected areas will have to more than double by 2030. The submission of pledges for designating new areas by the EU Member States up to 2030[2] is expected to be available in the course of 2023 and will provide further insights into the prospects of achieving the target. This may help identify any major gaps that remain.

The designation of protected areas is not in itself a guarantee of biodiversity protection as their management is a decisive factor in achieving the conservation aims. However, we currently lack comprehensive information on how effectively these areas are managed. Moreover, protected areas in the EU can no longer be managed as isolated units but need to be understood as part of a wider Trans-European network, as emphasised in the EU biodiversity strategy. This requires building an ecologically coherent network that ensures both spatial and functional connectivity within countries and across borders.

Figure 2. Terrestrial protected area coverage by country and in the EU-27 by end of 2021



Source: EEA/EuroGeographics.

The environmental diversity of Europe's countries and biogeographical regions is matched by the diversity in its protected areas. There are different patterns among Natura 2000 and other national designations, reflecting the diversity of historical, geographical, administrative, political and cultural circumstances and the management regime. It is clear, however, that the designation of Natura 2000 sites by EU Member States has significantly increased protected area coverage in Europe[3][4].

Protected area coverage varies between EU Member States. Figure 2 shows that by the end of 2021 nine Member States had designated more than 30% of their land area as protected: Bulgaria, Croatia, Cyprus, Germany, Greece, Luxembourg, Poland, Slovakia and Slovenia.

While Natura 2000 is the backbone of the Trans-European nature network, it is complemented by additional areas protected at national level. A coherent, well-connected and effectively managed network of protected areas is a pre-condition to prevent many species and habitats being lost forever. To achieve this, Member States will need to establish appropriate conservation objectives and measures as well as monitoring for all the existing and future sites.

Protected areas coverage in the non-EU EEA member countries and cooperating countries varied hugely by the end of 2021 and many countries will need to significantly intensify their efforts to reach the 30% target for protected areas adopted as part of the Kunming-Montreal Global Biodiversity Framework. In addition, figure 2 shows the contribution of the Emerald network of sites, established under the Bern Convention[5], to protect species and habitats in those countries. As the EU is a signatory to the Bern Convention, the Natura 2000 network is considered the EU Member States' contribution to the Emerald Network.

Supporting information

Definition

The indicator illustrates the changes in the share of terrestrial protected areas in the EU-27 land over time. It also distinguishes between protected areas designated as Natura 2000 sites or Emerald sites and other national designations.

A protected area is a clearly defined geographical space, recognised, dedicated and managed through legal or other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values[6].

Methodology

The data for the nationally designated protected areas inventory are delivered by the Eionet partnership countries as spatial and tabular information. The inventory began in 1995 under the CORINE programme of the European Commission.

The Natura 2000 network is based on the 1979 Birds Directive and the 1992 Habitats Directive. The European database of Natura 2000 sites consists of a compilation of the data submitted by the Member States of the European Union. This European database is generally updated once a year to take into account any updating of national databases by Member States.

However, the release of a new EU-wide database does not necessarily mean that a particular national dataset has recently been updated.

The same geographical area may be designated several times under different legislation. When producing area statistics on protected areas, nationally designated protected areas and Natura 2000 datasets are overlayed to avoid double counting of overlapping site designations in the datasets. The Reporting guidelines with full details on the methodology are available from: http://cdr.eionet.europa.eu/help/cdda and https://cdr.eionet.europa.eu/help/natura2000/

Policy/environmental relevance

The indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to the monitoring of the 8th EAP biodiversity-related priority objective Article 2.e that shall be met by 2030: ‘protecting, preserving and restoring marine and terrestrial biodiversity and the biodiversity of inland waters inside and outside protected areas by, inter alia, halting and reversing biodiversity loss and improving the state of ecosystems and their functions and the services they provide, and by improving the state of the environment, in particular air, water and soil, as well as by combating desertification and soil degradation’[7][8]. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor progress towards the target to ‘legally protect at least 30 % of the EU’s land area … by 2030’[7][8].

The establishment of protected areas is a direct response to concerns over biodiversity loss, so an indicator that measures protected area coverage is a valuable indication of commitment to conserving biodiversity and reducing biodiversity loss at a range of levels.

Comprehensive data on officially designated protected areas are regularly compiled and there is international acceptance of the use of the indicator at the global, regional and national scales.

The EU biodiversity strategy for 2030 contains specific commitments and actions to be delivered by 2030, including establishing a larger EU-wide network of protected areas on land and at sea, building upon existing Natura 2000 areas, with strict protection for areas of very high biodiversity and climate value.

The key commitments for nature protection in the EU biodiversity strategy for 2030 are [1]:

"1. Legally protect a minimum of 30% of the EU’s land area and 30% of the EU’s sea area and integrate ecological corridors, as part of a true Trans-European Nature Network.

2. Strictly protect at least a third of the EU’s protected areas, including all remaining EU primary and old-growth forests.

3. Effectively manage all protected areas, defining clear conservation objectives and measures, and monitoring them appropriately."

At the global level, new targets for protected areas have recently been adopted as part of the Kunming-Montreal Global biodiversity framework, including a target to effectively conserve and manage at least 30% of the world’s terrestrial areas.

Accuracy and uncertainties

No uncertainty has been specified.

Data sources and providers

- Natura 2000 data - the European network of protected sites, European Environment Agency (EEA)
- Nationally designated areas (CDDA), European Environment Agency (EEA)
- EuroBoundaryMap 2020 (EBM 2020), Jan. 2020 (copyrights protected), EuroGeographics

Metadata

DPSIR

Response

Topics

Nature protection and restoration # Biodiversity

Tags

protected areas # Birds Directive # 8th EAP # Habitats Directive # SEBI007
Emerald network # Natura 2000

Temporal coverage

2011-2021

Geographic coverage

Albania	Austria
Belgium	Bosnia and Herzegovina
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Kosovo (UNSCR 1244/99)	Latvia
Liechtenstein	Lithuania
Luxembourg	Malta
Montenegro	Netherlands
North Macedonia	Norway

Poland	Portugal
Romania	Serbia
Slovakia	Slovenia
Spain	Sweden
Switzerland	Türkiye

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life on land

Unit of measure

Percentage

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

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5. Council of Europe, 2020, 'Emerald network of Areas of Special Conservation Interest', (https://www.coe.int/en/web/bern-convention/emerald-network) accessed September 23, 2020.
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6. Dudley, 2008, *Guidelines for applying protected area management categories*, International Union for Conservation of Nature, Gland, Switzerland.
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8. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme's 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.
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European Environment Agency

8th Environment Action Programme

Designated marine protected areas in Europe's seas

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

Marine protected areas in Europe's seas

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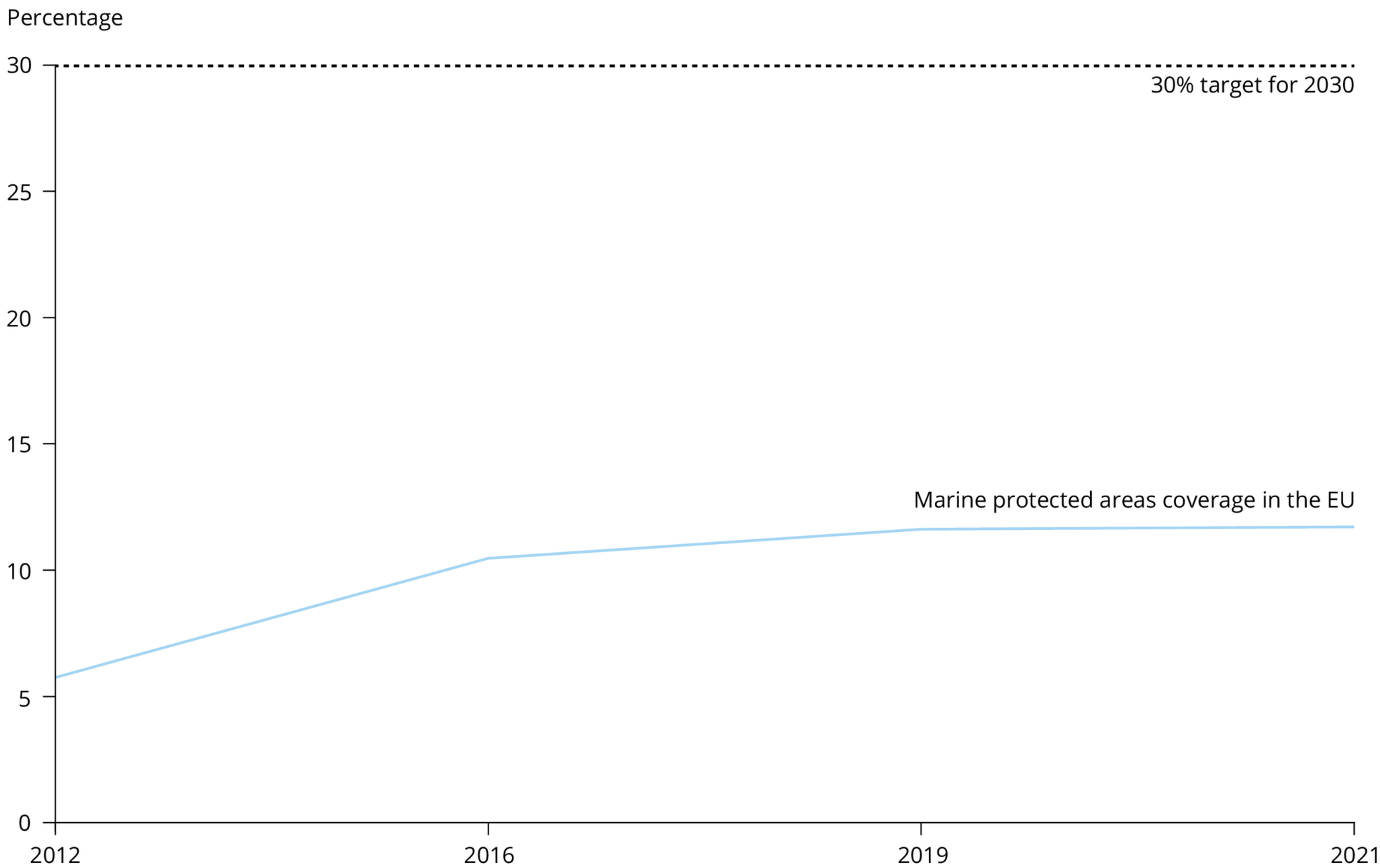
The EU has made substantial progress in designating new marine protected areas, both as part of the EU Natura 2000 network and through complementary national designations. As a result, marine protected area coverage more than doubled, to 12.1%, between 2012 and 2021. However, efforts will need to increase significantly to achieve the EU biodiversity strategy target of protecting at least 30% of EU seas by 2030, while also ensuring that all protected areas are effectively managed. Whether or not this target will be met is uncertain but also rather challenging.

Figure 1. Marine protected area coverage in the EU, 2012-2021



Source: EEA/HELCOM Secretariat/OSPAR Commission.

The conservation of coastal and marine areas is important for maintaining biodiversity and ensuring that ecosystems and their services are fully functional. Marine protected areas (MPAs) play a key role in conserving coastal and marine ecosystems, and provide significant economic and societal benefits and support local livelihoods.

To protect the EU's seas, the EU biodiversity strategy for 2030 set the target that, by 2030, at least 30% of the sea area should be legally protected (with 10% of the sea area to be strictly protected) [1].

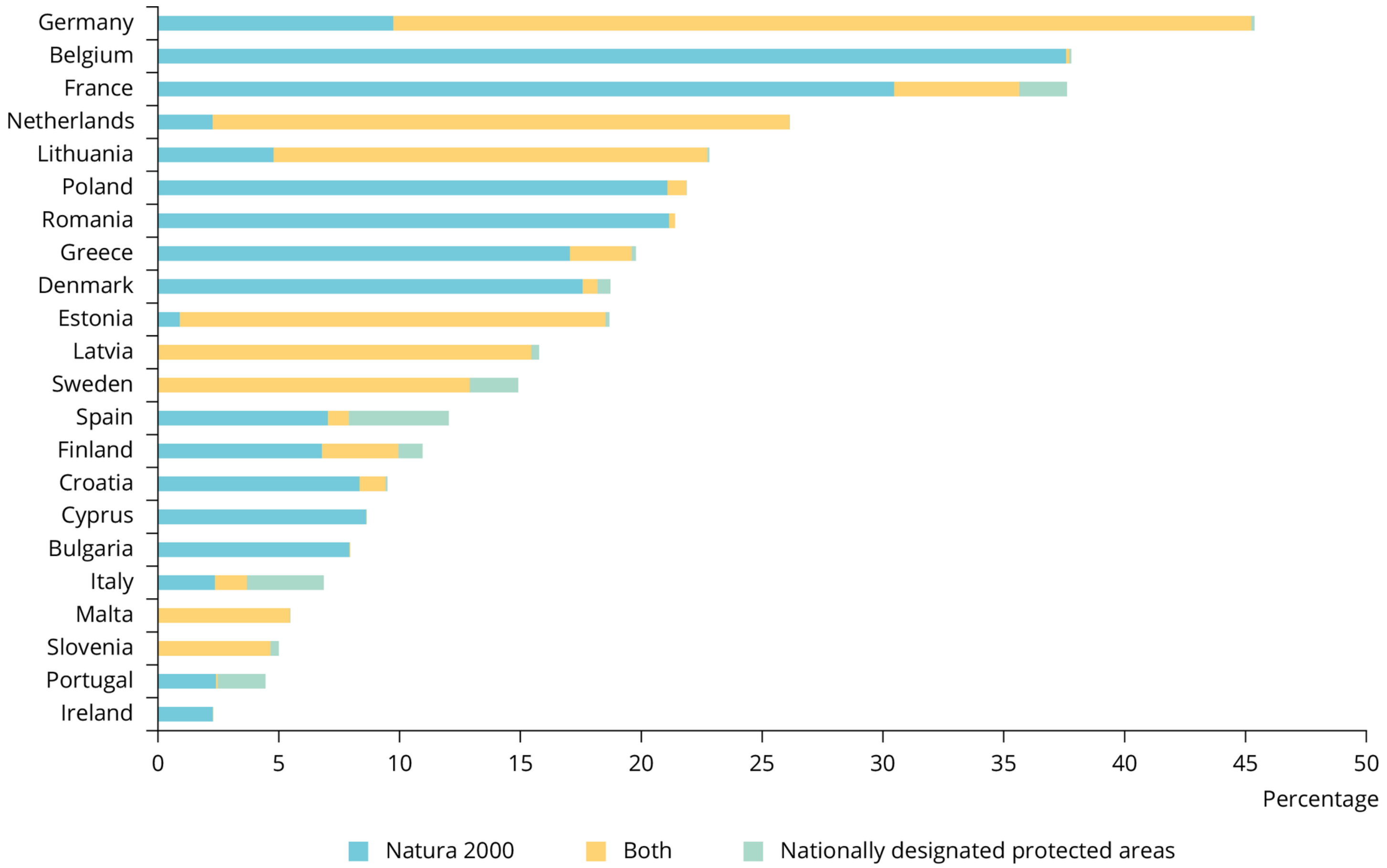
Over the last decade, the total area covered by MPAs in the EU has increased substantially — from 5.9% in 2012 to 12.1% in 2021. This is the result of both the expansion of the Natura 2000 network — a network of protected areas designated under the EU Birds and Habitats Directives — and protected areas established through complementary national designations.

Although this trend is positive, the area protected will need to expand at a significantly faster rate than it has in the last decade if the EU is to meet the 30% biodiversity strategy target by 2030. The submission of protected area pledges by EU Member States, expected by the end of February 2023 and subject to review in 2023, will provide initial insights into how realistic achieving this target is and identify any major gaps that remain.

Furthermore, the EU biodiversity strategy for 2030 highlights the importance of building a truly coherent trans-European network of protected areas through improving their connectivity. It will therefore be particularly important to base the designation of new protected areas in EU seas on sound scientific analysis, to ensure that these areas are ecologically representative and coherent, enhancing connectivity.

In addition, ensuring more effective management of individual MPAs and their networks should become a major focus in the coming years, as the designation of new MPAs alone will not guarantee the conservation of the EU's marine ecosystems. Although no comprehensive information is yet available to provide an overview of how effectively EU MPAs are managed, developing such indicators in the coming years will be essential for tracking progress towards implementing the targets of the EU biodiversity strategy for 2030.

Figure 2. Marine protected area coverage in EU Member States, 2021



Source: EEA.

By 2021, several EU Member States had made significant progress in protecting their marine ecosystems through the designation of MPAs. Germany, Belgium and France had designated more than 30% of their waters [2] as MPAs, while the Netherlands, Lithuania, Poland and Romania had expanded their MPA networks to cover more than 20% of their waters. In most countries, the majority of MPAs are part of the Natura 2000 network, with nationally designated MPAs adding to some countries' networks, most notably in Sweden, Spain, Finland, Italy and Portugal.

Although most Member States have made progress in designating new MPAs over the last 10 years, this progress has been slow in many countries. However, differences between countries are in part the result of the wide variation in ecological conditions between Europe's marine regions. While it is important that Member States continue efforts to define new MPAs at the national level, cooperation across regional seas will also be crucial to support the development of a coherent MPA network across the EU and achieve the target of protecting at least 30% of seas across the EU.

Supporting information

Definition

This indicator measures marine protected area (MPA) coverage at the EU and Member State levels and trends in this coverage over time. It considers MPAs reported as both Natura 2000 sites and nationally designated protected areas.

Methodology

Methodology for data collection

The data for nationally designated protected areas are delivered by Eionet partnership countries as spatial and tabular information and are updated every year. For Natura 2000 MPAs, the European database of Natura 2000 sites is used. This consists of a compilation of the data submitted by the Member States of the European Union. This European database is generally updated once a year to take into account any changes at national level by Member States. However, the release of a new EU-wide database does not necessarily mean that a particular national data set has recently been updated. For total coverage of EU waters, protected areas designated under the Regional Sea Conventions namely the Barcelona Convention, the Helcom Convention and the OSPAR Convention, were also included, using the latest available data from the databases published under these conventions.

Methodology for indicator calculation

The ‘end2012’, ‘end2016 and ‘end2019’ MPA data (meaning the data reported in 2012, 2016 and 2019, respectively) were taken from the respective EEA and European Topic Centre on Inland, Coastal and Marine Water (ETC/ICM) report [3]. These were combined with new data sets produced in 2022 based on the latest available data. An overview of the data sets used to support the analysis is provided in the ‘Data sources and providers’ section (Table 1).

The methodology and the procedure used for selecting marine Natura 2000 and nationally designated sites from the tabular and spatial data are outlined in detail in Section 2.6 of EEA (2015)[4] and in Agnesi et al. (2017)[5].

The spatial statistical analysis was carried out in ArcGIS. The calculations were automated by a series of procedures developed in the Python programming language. The conceptual basis of the analysis procedures can be found in Agnesi et al. (2017)[5] and are therefore only briefly described here. The procedures included the creation of a feature class, for every protected area network, containing Natura 2000 and nationally designated MPAs for every Member State. The dissolve operation was used to calculate the surface coverage so as to exclude any overlap between sites. After obtaining the surface area per network, the overall surface of the combined networks was calculated through the union of the dissolved features of the different networks. Aroutine was written to assign the values of the distinct Natura 2000 and nationally designated sites and the overlapping portion of these networks. The surface area was extracted from each feature class and the percentage cover was obtained by relating the surface of protected area against that of the marine waters of each Member State.

Policy/environmental relevance

The indicator is a headline indicator for monitoring progress towards the goals of the Eighth Environment Action Programme (8th EAP). It will contribute mainly to monitoring progress towards the 8th EAP biodiversity-related priority objective set out in Article 2(e), to be met by 2030: 'protecting, preserving and restoring marine and terrestrial biodiversity and the biodiversity of inland waters inside and outside protected areas by, inter alia, halting and reversing biodiversity loss and improving the state of ecosystems and their functions and the services they provide, and by improving the state of the environment, in particular air, water and soil, as well as by combating desertification and soil degradation'[6]. The European Commission's communication on 8th EAP monitoring specifies that this indicator should monitor progress towards meeting the target to legally protect at least 30% of the EU's sea area by 2030[7].

The EU biodiversity strategy for 2030 contains specific targets for protected areas to be delivered by 2030, including expanding the current network, in line with the following targets:

· to legally protect a minimum of 30% of the EU's land area and 30% of the EU's sea area and integrate ecological corridors, as part of a true trans-European nature network

· to strictly protect at least a third of the EU's protected areas, including all remaining EU primary- and old-growth forests

· to effectively manage all protected areas, defining clear conservation objectives and measures, and monitor them appropriately.

This indicator directly tracks progress towards achieving the 30% target for protecting the EU's seas. The indicator is used by several EU monitoring mechanisms, such as the EU biodiversity dashboard and for the EU's Sustainable Development Goal (SDG) monitoring.

Other relevant EU policy instruments include the EU Marine Strategy Framework Directive (MSFD).

At the global level, new targets for protected areas have recently been adopted as part of the Kunming-Montreal Global biodiversity framework, including a target to effectively conserve and manage at least 30% of the world's coastal and marine areas.

Accuracy and uncertainties

Methodology uncertainty

The selection of marine sites from databases containing both terrestrial and marine protected areas was carried out using different approaches for the Natura 2000 network and the nationally designated protected area data sets. While Natura 2000 site information declares the presence of marine habitats or species, this is not the case for the national designations; therefore, the latter sites were selected based on whether they were reported as having marine ecosystems or not.

Data sources and providers

- HELCOM MPAs, Helsinki Commission (HELCOM)
- OSPAR Marine Protected Areas Network, OSPAR Commision
- EEA coastline for analysis, European Environment Agency (EEA)
- EEA marine assessment areas, European Environment Agency (EEA)
- Natura 2000 data - the European network of protected sites, Directorate-General for Environment (DG ENV)
- Nationally designated areas (CDDA), European Environment Agency (EEA)

Metadata

DPSIR

Response

Topics

 # Biodiversity

Tags

 # Designated areas **# protected areas** **# 8th EAP** **# CDDA** **# Habitats Directive** **# MAR004** **# Natura 2000**

Temporal coverage

2012-2021

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Ireland
Italy	Latvia
Lithuania	Luxembourg
Malta	Netherlands

Poland	Portugal
Romania	Slovakia
Slovenia	Spain
Sweden	United Kingdom

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life below water

Unit of measure

Percentage

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. EC, 2022, 'Biodiversity strategy for 2030', *European Commission* (https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en) accessed December 8, 2022.
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2. This indicator refers to marine waters based on ‘EEA marine waters for analyses, Oct. 2022’, which originates from the second edition of Marine waters used in Marine Strategy Framework Directive (MSFD), which was subsequentially harmonised with maps ‘EEA coastline for analysis’ and ‘MSFD regions and subregions’ from map ‘Regional seas around Europe, Oct. 2022’. The ‘Watercolumn and seabed’ areas mark the area from the Member State coastline to 200NM from the coast except for the ‘Watercolumn and seabed’ areas of Greece, which extend from the coastline to 6NM from the coast. ‘Seabed only’ areas represent extended continental shelf beyond 200NM where some Member States have advanced seabed/subsoil claims.
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3. ETC/ICM, 2020, *ETC/ICM Report 3/2020: Spatial Analysis of Marine Protected Area Networks in Europe’s Seas III*,
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4. EEA, 2015, *Spatial analysis of marine protected area networks in Europe’s seas*, EEA Technical Report, 17/2015, European Environment Agency.
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5. Agnesi, S., Mo, G., Annunziatellis, A., Chaniotis, P., Korpinen, S., Snoj, L., Globevnik, L., Tunesi, L. and Reker, J., 2017, *Spatial analysis of marine protected area networks in Europe’s seas II, Volume A, 2017*, ETC/ICM Technical Report 4/2017, European Topic Centre on Inland, Coastal and Marine Water.
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6. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22–36.
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7. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme’s 2030 and 2050 priority objectives, COM(2022) 357 final.
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European Environment Agency

8th Environment Action Programme

Common bird index in Europe

8TH EAP HEADLINE INDICATOR, 2023

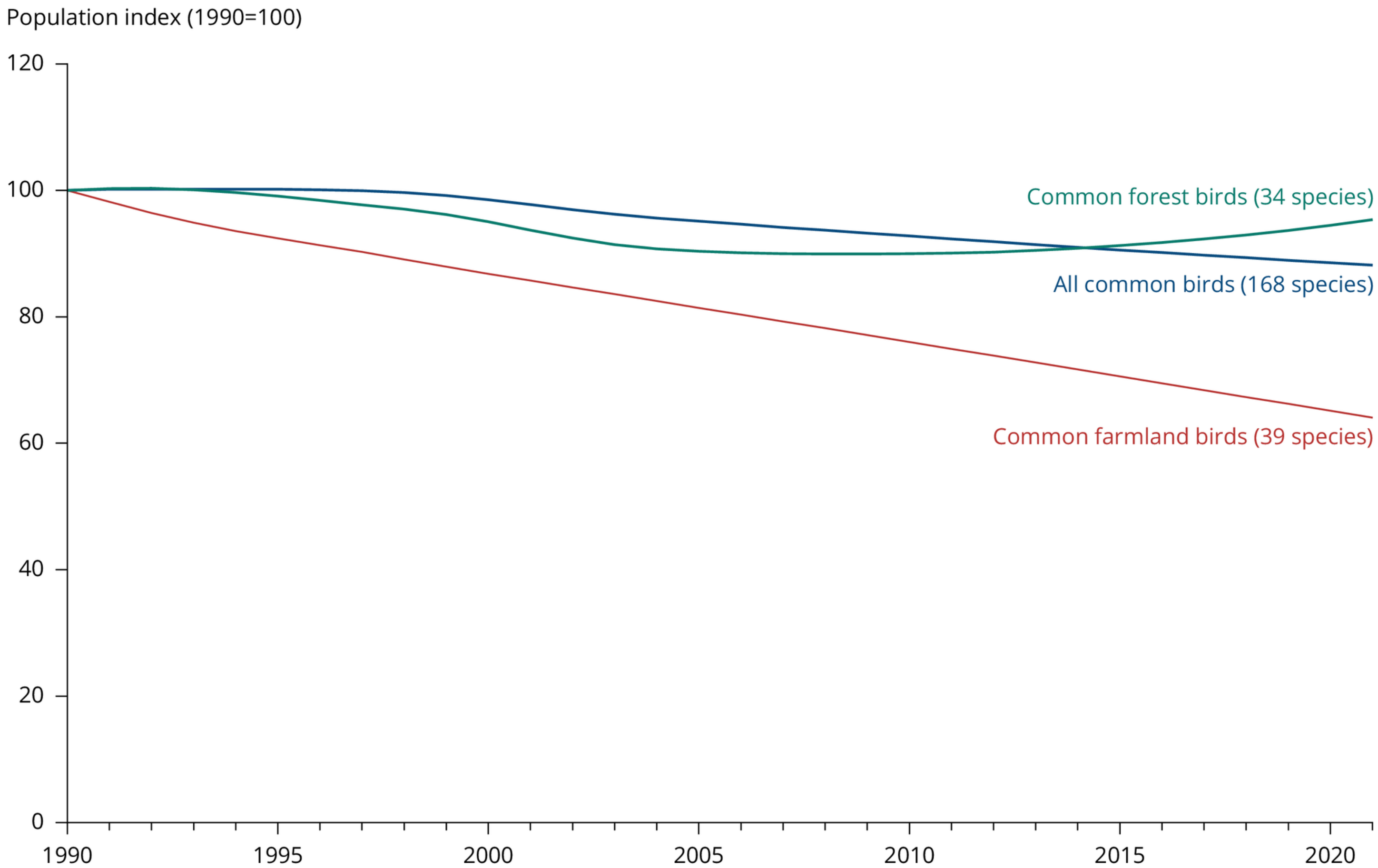
European Environment Agency

Common bird index in Europe

Published 08 Jun 2023

Birds are sensitive to environmental pressures and their populations can reflect changes in the health of the environment. Long-term trends show that between 1990 and 2021, the index of 168 common birds decreased by 12% in the EU. The decline was much stronger in common farmland birds, at 36%, while the common forest bird index decreased by 5%. At present, it seems unlikely that the decline in populations of common birds can be reversed by 2030. To ensure the recovery of common birds, Member States need to significantly increase the implementation of existing policies and put new appropriate conservation and restoration objectives and measures in place.

Figure 1. Common bird index in the EU, 1990-2021



Source: European Bird Census Council/EEA.

The status of birds has been the subject of long-term monitoring in Europe, much of it via voluntary effort, and is a good example of how the power of citizen science can be released through effective targeting [1][2]. Birds are sensitive to environmental pressures and their population numbers can reflect changes in ecosystems and other animal and plant populations. Therefore, trends in bird populations can serve as an indicator of the health of the environment and can help measure progress towards the EU's aim to put biodiversity on the path to recovery by 2030 [3][4][5][6].

Long-term population trends of all common birds in the 26 EU Member States with monitoring schemes reveal significant population declines. Between 1990 and 2021, the common bird index declined by 12%, while the common forest bird index decreased by 5%. The decline in common farmland birds was much more pronounced, at 36%. Although this indicator uses 1990 as a baseline, significant decreases had occurred before this date [7][8].

These trends demonstrate a major decline in biodiversity in Europe, caused by anthropogenic pressures [9]. Agricultural intensification is the main pressure for most bird population declines [10], in particular pesticides and fertiliser use [11][12][13][14], not only for farmland species but for also for many other species whose diet relies on invertebrates during the breeding season [10][15][16][17]. Other factors that have adverse effects on the recovery of populations include land use change and associated habitat loss, fragmentation and degradation [18][19], intensive forest management[20][21], climate change [22] and increasing competition for land for production of renewable energy and biofuels[23][24][25].

It is difficult to forecast how soon biodiversity, as illustrated by the abundance of bird populations, can recover, as it is influenced by a complex combination of socio-economic drivers, environmental factors and policy measures. Measures set out in the Birds and Habitats Directives[26][27] have helped protect target bird species and their habitats [28], however, the overall decline of bird populations in the EU is mainly driven by large declines in a number of common species [8][10]. The proposal for an EU regulation on nature restoration paves the way for a broad range of ecosystems to be restored and maintained by 2050, with measurable results by 2030 and 2040. In particular, the proposal includes binding targets and obligations to reverse the declines of common farmland and forest birds by 2030, which will require Member States to put appropriate restoration measures in place.

Nevertheless, the past trend indicates a steady decline in the population of common birds, which seems unlikely to be reversed by 2030. This is because the type of measures under the EU nature restoration regulation and the timing of their implementation are still unclear, as is the time needed for species' response to conservation and restoration actions. In addition, it is crucial that more effective and ambitious measures to halt biodiversity loss are included in other policies, such as the EU common agricultural policy (CAP)[29]and that CAP Strategic Plans support the implementation and effectiveness of the current and upcoming EU biodiversity and nature legislation.

Supporting information

Definition

This indicator is a multi-species index measuring changes in population abundance of all common bird species (n=168), as well as those associated with specific habitats: common farmland bird species (n=39) and common forest bird species (n=34). The index for each group is calculated at EU level only, using 1990 as reference year. Each of the three EU bird indices is presented as a smoothed time series and is calculated with 95% confidence limits.

Methodology

The data for this indicator originate from national monitoring data collected by the Pan-European Common Bird Monitoring Scheme (PECBMS). PECBMS is a partnership, involving the EBCC, the Royal Society for the Protection of Birds, BirdLife International and Statistics Netherlands, that aims to deliver policy-relevant biodiversity indicators for Europe. The PECBMS coordination unit is part of the Czech Society for Ornithology (CSO), based in Prague, Czechia. The unit collects national indices, produces European indices and indicators, prepares outputs for publication, and communicates outputs to the public, policymakers and scientists.

Trend information spanning different time periods is derived from annual national breeding bird surveys in 26 EU countries. Skilled survey participants, including volunteers, carry out counting and data collection. Data are collected nationally on an annual basis during the breeding season through common bird monitoring schemes. National bird monitoring data are gathered using several count methods (e.g. standardised point transects/line transects, territory mapping), using a variety of sampling strategies (from free choice of plots to stratified random sampling), and individual plot sizes vary within each country (from 1 × 1km or 2 × 2km squares or 2.5 degree grid squares to irregular polygons).

Indicators (multi-species indices) are computed using the MSI-tool (R-script) for calculating multi-species indicators (MSIs) and trends in MSIs. A Monte Carlo method is used to account for sampling error and when not all yearly index numbers for all species are available. The method of calculation is described in Soldaat et al., 2017[30]. European, EU or regional species indices including standard errors are used as source data.

Country coverage (i.e. reflecting the availability of high-quality monitoring data from annually operated common bird monitoring schemes employing generic survey methods and producing reliable national trends): Austria (since 1998), Belgium (Brussels since 1992; Flanders since 2007; Wallonia since 1990), Bulgaria (since 2005), Croatia (since 2015), Cyprus (since 2006), Czechia (since 1982), Denmark (since 1976), Estonia (since 1983), Finland (since 1975), France (since 1989), Germany (since 1989), Greece (since 2007), Hungary (since 1999), Ireland (since 1998), Italy (since 2000), Latvia (since 1995), Lithuania (since 2011), Luxembourg (since 2009), the Netherlands (since 1984), Poland (since 2000), Portugal (since 2004), Romania (since 2007), Slovakia (since 2005), Slovenia (since 2008), Spain (since 1998) and Sweden (since 1975).

The current population index of common birds at EU level was produced for the following 168 species:

- **Common farmland birds**: *Alauda arvensis, Alectoris rufa, Anthus campestris, Anthus pratensis, Bubulcus ibis, Burhinus oedicnemus, Calandrella brachydactyla, Ciconia ciconia, Corvus* *frugilegus, Emberiza calndra, Emberiza cirlus, Emberiza citrinella, Emberiza hortulana, Emberiza malanocephala, Falco tinnunculus, Galerida cristata, Galerida theklae, Hirundo rustica, Lanius collurio, Lanius minor, Lanius senator, Limosa limosa, Linaria cannabina, Melanocorypha calandra, Motacilla flava, Oenanthe hispanica, Passer montanus, Perdix perdix, Petronia petronia, Saxicola rubetra, Saxicola torquatus, Serinus serinus, Streptopelia turtur, Sturnus unicolor, Sturnus vulgaris, Sylvia communis, Tetrax tetrax, Upupa epops and Vanellus vanellus*.

- **Common forest birds**: *Accipiter nisus, Anthus trivialis, Bombycilla garrulous, Bonasa bonasia, Carduelis cintinella, Certhia brachydactyla, Certhia familiaris, Coccothraustes coccothraustes, Columba oenas, Cyanopica cyanus, Dryobates minor, Dryocopus martius, Emberiza rustica, Ficedula albicollis, Ficedula hypoleuca, Garrulus glandarius, Leiopicus medius, Lophophanes cristatus, Nucifraga caryocatactes, Periparus ater, Phoenicurus phoenicurus, Phylloscopus bonelli, Phylloscopus collybita, Phylloscopus sibilatrix, Picus canus, Poecile montanus, Poecile palustris, Pyrrhula pyrrhula, Regulus ignicapilla, Regulus regulus, Sitta europaea, Spinus spinus, Tringa ochropus and Turdus viscivorus.*
- **Other common birds**: *Acanthis flammea, Acrocephalus arundinaceus, Acrocephalus palustris, Acrocephalus schoenobaenus, Acrocephalus scirpaceus, Actitis hypoleucus, Aegithalos caudatus, Alcedo atthis, Anas platyrhynchos, Apus apus, Ardea cinerea, Buteo buteo, Calcarius lapponicus, Cecropis daurica, Cettia cetti, Chloris chloris, Circus aeruginosus, Cisticola juncidis, Clamator glandarius, Columba palumbus, Corvus corax, Corvus corone, Corvus monedula, Cuculus canorus, Cyanecula svecica, Cyanistes caeruleus, Cygnus olor, Delichon urbicum, Dendrocopos major, Dendrocopos syriacus, Egretta garzetta, Emberiza cia, Emberiza schoeniclus, Erithacus rubecula, Fringilla coelebs, Fringilla montifringilla, Fulica atra, Gallinago gallinago, Gallinula chloropus, Grus grus, Haematopus ostralegus, Hippolais icterina, Hippolais polyglotta, Iduna pallida, Jynx torquilla, Larus ridibundus, Locustella fluviatilis, Locustella naevia, Lullula arborea, Luscinia luscinia, Luscinia megarhynchos, Lyrurus tetrix, Merops apiaster, Motacilla alba, Motacilla cinerea, Muscicapa striata, Numenius arquata, Numenius phaeopus, Oenanthe oenanthe, Oriolus oriolus, Parus major, Passer domesticus, Phasianus colchicus, Phoenicurus ochruros, Phylloscopus trochilus, Pica pica, Picus viridis, Pluvialis apricaria, Podiceps cristatus, Prunella modularis, Ptyonoprogne rupestris, Pyrrhocorax pyrrhocorax, Streptopelia decaocto, Sylvia atricapilla, Sylvia borin, Sylvia cantillans, Sylvia curruca, Sylvia hortensis, Sylvia melanocephala, Sylvia nisoria, Sylvia undata, Tachybaptus ruficollis, Tadorna tadorna, Tringa erythropus, Tringa glareola, Tringa nebularia, Tringa totanus, Troglodytes troglodytes, Turdus iliacus, Turdus merula, Turdus philomelos, Turdus pilaris and Turdus torquatus.*

National monitoring schemes and indices can contain a subset of these 168 species, reflecting their varying occurrence in different countries. More information about species indices and trends is available at: https://pecbms.info/

Policy/environmental relevance

The common bird index is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It mainly contributes to monitoring aspects of the 8th EAP priority objective Article 2.2.e that shall be met by 2030: ‘protecting, preserving and restoring marine and terrestrial biodiversity and the biodiversity of inland waters inside and outside protected areas by, inter alia, halting and reversing biodiversity loss and improving the state of ecosystems and their functions and the services they provide, and by improving the state of the environment, in particular air, water and soil, as well as by combating desertification and soil degradation'[6]. For the purposes of the 8th EAP monitoring framework this indicator assesses specifically whether the EU will 'reverse *by 2030* the decline in populations of common birds' [3].

The common bird index is also used to monitor progress toward EU Biodiversity Strategy for 2030 target 4 and as an EU indicator to monitor progress towards the Sustainable Development Goal 15: "Life on land".

Related policy documents

- EU biodiversity strategy for 2030: the European Commission has adopted a new EU biodiversity strategy for 2030 and an associated action plan — a comprehensive, ambitious, long-term plan for protecting nature and reversing the degradation of ecosystems. It aims to put Europe's biodiversity on a path to recovery by 2030, with benefits for people, the climate and the planet. It aims to build our societies' resilience to future threats such as climate change impacts, forest fires, food insecurity and disease outbreaks, including by protecting wildlife and fighting illegal wildlife trade. A core part of the European Green Deal, the biodiversity strategy will also support a green recovery following the COVID-19 pandemic.
- EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJL 114, 12.4.2022, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022D0591 accessed October 24, 2022.
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- The EU has been taking action to protect biodiversity for a considerable number of years, for example by adopting the Birds Directive — Council Directive 79/409/EEC (updated by Directive 2009/147/EC) and the Habitats Directive — Council Directive 92/43/EEC.

Justification for indicator selection

Main advantages of the indicator:

Policy relevant: this indicator contributes to the assessment of biodiversity conservation policies and targets, as well as other sectoral and thematic policies and strategies.

Biodiversity relevant: birds can be excellent indicators of the health of the environment. They occur in many habitats, can reflect changes in other animal and plant populations, and are sensitive to environmental change.

Scientifically sound and methodologically well founded: the methods used have been harmonised (national systems may differ but indices are standardised before being combined), and are peer-reviewed and statistically robust.

Monitors progress towards targets: this indicator provides a tangible basis for measuring progress towards biodiversity targets.

Broad acceptance and understanding: Birds resonate strongly with the public, illustrating how citizen science can be exploited through effective targeting.

Accuracy and uncertainties

No accuracies or uncertainties have been reported.

Data sources and providers

- Common bird index by type of species - EU aggregate (source: EBCC) [sdg_15_60], European Bird Census Council (EBCC)

Metadata

DPSIR

Impact

Topics

Biodiversity   # Nature protection and restoration

Tags

biodiversity   # common birds   # population trends   # bird populations   # Common bird index   # SEBI027   # common farmland and forest birds   # conservation   # birds   # animal and plant population   # 8th EAP

Temporal coverage

1990-2021

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia

Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life on land

Unit of measure

population index (1990=100)

Frequency of dissemination

Once a year

Contact

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References and footnotes

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European Environment Agency

8th Environment Action Programme

Forest connectivity in Europe

8TH EAP HEADLINE INDICATOR, 2023

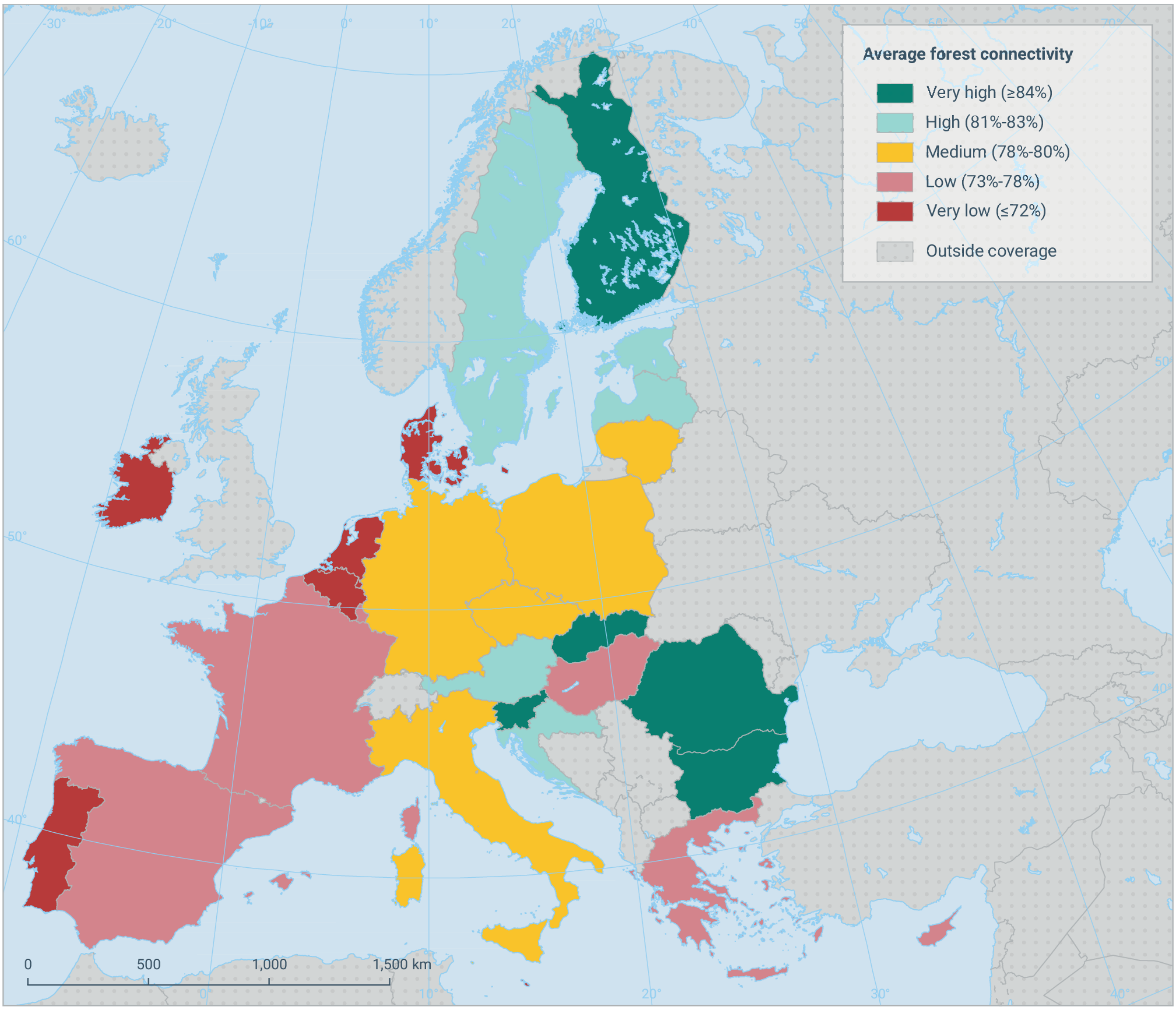
European Environment Agency

Forest connectivity in Europe

Published 30 Sept 2023

Increasing forest connectivity is crucial for supporting biodiversity. Fragmentation of forests is the main factor limiting their connectivity. In 2018, the EU's average forest connectivity was 79%. The indicator is, at present, limited to that year. Forest connectivity shows no significant changes from 2000 to 2018. The EU Forest Strategy for 2030 and the EU Biodiversity Strategy for 2030, which includes a pledge to plant at least three billion additional trees by 2030, promote forest connectivity. However, the effects of these policies will take time to become visible, making an increase in forest connectivity somewhat unlikely by 2030.

Figure 1. Forest connectivity in EU member states



Reference data: © EuroGeographics, © FAO (UN), © TurkStat Source: European Commission – Eurostat/GISCO

Source: EEA, methodology: Joint Research Centre.

Forests have significant cultural and economic value and are vital in supporting biodiversity and human well-being. Historically, forests have become fragmented due to conversion to cropland and pastures, urbanisation and infrastructure developments [1] [2].

Maintaining forest connectivity and avoiding forest fragmentation benefit species that thrive in a larger area and enable species dispersal [3][4]. Forest patches and woody features such as hedges and tree lines can play a key role in bridging gaps between forests, enhancing connectivity and movement of species between suitable habitats.

The EU Forest Strategy for 2030 [5], the EU Biodiversity Strategy for 2030 [6] and the pledge to plant at least three billion additional trees by 2030 [7], highlight the importance of expanding tree and forest cover to safeguard biodiversity.

The forest connectivity indicator measures the degree of forest density. The indicator shows the percentage of forested land not covered by any forest or woody features within a 10-hectare area surrounding a 100m^2 forest grid cell [8]. The indicator assesses the forest's structural connectivity on a grid, meaning it provides a general insight into the environment's capability to connect local habitats regardless of the type and quality of the forest, rather than to specifically account for the needs of individual species or species groups.

In 2018, the average forest connectivity index for the EU was 79%. This indicates that on average, 79% of the 10ha area surrounding a 100m^2 forest pixel was covered by forest or other woody features. The indicator is calculated only on cells of the grid covered by or adjacent to forest land. The indicator shows an average degree of forest connectivity (see Figure 2). However, any statistically averaged indicator value averages out spatial variability and conceals instances where forests can be disconnected or poorly connected. Consequently, regions with large extents of continuous forest cover highly influence the EU average value.

This indicator does not provide a historical trend as data are available only for 2018. However, it uses a similar methodology as the fragmentation indicator reported in Forest Europe [9], Vogt et al. [8], Maes et al. [1], and Vogt and Caudullo [10]. Although these indicators are calculated using different underlying data and resolution, they provide insights into past trends in forest connectivity, which remained relatively stable between 2000 and 2018.

Assessing the prospects for improved forest connectivity by 2030 is challenging and past findings do not show significant changes [9]. The effects of implementing the EU's forest and biodiversity strategies - such as promoting afforestation, reforestation, and restoring forest ecosystems - will most likely only become visible after 2030 due to the time lag between actions in the field and increased connectivity. However, actions to increase forest fragmentation, such as deforestation or removing connecting hedges and tree lines, can have immediate effects.

Figure 2. Share of forest area by forest connectivity classes and average forest connectivity in the EU Member States

Country	Very low (<10%)	Low (10% to <40%)	Intermediate (40% to <60%)	High (60% to <90%)	Very high (≥ 90%)	Average forest connectivity across the country
Slovenia	0%	4%	7%	27%	61%	86%
Romania	1%	7%	8%	22%	63%	85%
Bulgaria	1%	7%	8%	22%	62%	84%
Finland	0%	3%	8%	37%	51%	84%
Slovakia	1%	7%	7%	24%	61%	84%
Sweden	0%	4%	9%	36%	51%	83%
Austria	1%	6%	9%	32%	52%	82%
Estonia	0%	5%	10%	39%	46%	81%
Croatia	1%	8%	10%	27%	54%	81%
Latvia	0%	5%	10%	38%	46%	81%
Czechia	1%	10%	11%	27%	52%	79%
Italy	1%	9%	11%	29%	50%	79%
Lithuania	1%	8%	11%	33%	47%	79%
Poland	2%	10%	10%	27%	51%	79%
Germany	2%	11%	10%	25%	51%	78%
Greece	1%	10%	12%	32%	45%	77%
Spain	1%	9%	13%	32%	44%	77%
Luxembourg	1%	8%	13%	34%	43%	77%
Cyprus	3%	13%	12%	28%	45%	75%
Hungary	2%	13%	12%	27%	45%	75%
France	2%	14%	14%	29%	41%	73%
Belgium	3%	17%	14%	28%	38%	70%
Portugal	1%	14%	18%	38%	29%	69%
Denmark	6%	26%	18%	29%	21%	58%
Netherlands	6%	33%	17%	25%	19%	54%
Ireland	7%	36%	21%	25%	11%	48%
Malta	23%	56%	14%	6%	1%	25%
EU-27	1%	8%	11%	31%	49%	79%

Source: EEA, methodology: Joint Research Centre.

Forest connectivity in the EU Member States correlates strongly to the presence of large forest areas (displayed by the class 'very high connectivity'). In Member States with smaller and fewer continuous forest patches, forest strips play an important role in maintaining connectivity (classes 'low' and 'intermediate' connectivity).

This indicator relies on a map of forest area density at fixed observation scale, prepared following a methodology developed by the European Commission's Joint Research Centre. With this approach, large forest patches show high connectivity (includes not only forest, but also woody features such as treelines). Therefore, most connectivity estimates at the country level range from 70% to 86%. Based on the country quintiles, an indicator above 84% may be considered very high and an indicator below 72% may be considered very low connectivity. The EU average is highly influenced by areas with large continuous forest blocks, mainly in Slovenia, Romania, Finland and Sweden. Few countries show average connectivity below 70%. Experts from a number of EEA Eionet countries have, however, expressed significant reservations concerning the methodology of this current indicator and its ability to properly assess progress towards policy objectives concerning forest connectivity. Reflecting these concerns, the EEA is working to develop an improved indicator to better represent connectivity at both country and EU level.

Supporting information

Definition

Forest connectivity refers to the spatial compactness of forest and woody features within the forest area. It can be seen as the inverse value of fragmentation. It provides an ecosystem level overview, where a higher degree of forest connectivity will favour animal movement, plant dispersal and genetic exchange. More detailed functional connectivity assessments can provide a more specific insight for connectivity of certain species but require local level data and species-specific information on dispersal patterns. A forest with a high degree of structural connectivity faces low fragmentation issues. Structural forest connectivity can be assessed by analysing EU or country level forest maps. While statistical summaries offer an indicative overview for monitoring, connectivity maps aid the design of biodiversity initiatives, like tree planting, by identifying areas to enhance connectivity and combat fragmentation. Forest connectivity may however also have unintended effects such as spreading invasive species, pests, and diseases [11] and facilitating fire spread [12].

The forest definition used in this indicator is derived from the definition used in the Forest resource assessment of the Food and Agriculture Organisation of the United Nations [13]: land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. This definition is extended to small woody features as mapped in the Copernicus Woody vegetation map. Since the map layers used to calculate the indicator are sourced from remote sensing (Copernicus), an area is considered forest only when tree cover becomes visible on the images. This creates a delay between the land use change, at the time of plantation, and the time the forest cover is reported in this indicator (canopy cover reaching the thresholds). This delay is however quite consistent with the new forest reaching characteristics that make it play a role in connectivity.

Methodology

The methodology used for assessing forest connectivity is called Forest Area Density (FAD) at fixed observation scale, defined as the proportion of all forest area within a fixed local neighbourhood area of each forest pixel [8]. FAD measures the spatial integrity of forest land cover and accounts for key fragmentation aspects, such as isolation of small fragments and perforations within compact forest patches [14] . The degree of forest connectivity is measured for each focal grid cell covered by forest and small woody features by analysing the local neighbourhood of a 10-hectare area surrounding the focal forest grid cell. The indicator is derived from a 10-metre resolution forest and woody vegetation layer covering the EU and neighbouring countries, combining the new FAO compliant 10 metre Forest type product 2018 and a generalisation at 10 metres of the 5-metre woody vegetation map product 2018 from Copernicus.

The primary result is a spatially explicit map showing the degree of forest connectivity for each 10 x 10-metre forest grid cell. The grid cell values are divided into five categories, where forest connectivity is either very high (90% – 100% FAD), high (60% – <90% FAD), intermediate (40% – <60% FAD), low (10% – <40% FAD), or very low (0% – <10% FAD). The connectivity map can be used to aggregate the grid cell level values to an average indicator value at a specific reporting level, for example, at country or EU-level. This aggregated average value indicates the overall degree of structural connectivity of forest and woody features in the reporting unit. This is one of the summary statistics available to characterise forest connectivity, which is highly influenced by the presence of large continuous forest patches. Ongoing work will aim to refine the indicator's capacity to represent connectivity at both country and EU level.

Policy/environmental relevance

Forest connectivity is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It mainly contributes to monitoring aspects of the 8th EAP priority objective (Article 2.2.e) that shall be met by 2030: 'protecting, preserving and restoring marine and terrestrial biodiversity and the biodiversity of inland waters inside and outside protected areas by, inter alia, halting and reversing biodiversity loss and improving the state of ecosystems and their functions and the services they provide, and by improving the state of the environment, in particular air, water and soil, as well as by combating desertification and soil degradation' [15]. For the purposes of the 8th EAP monitoring framework, this indicator assesses whether the EU will 'increase the degree of connectivity in forest ecosystems' by 2030 [16]. Ensuring connectivity between and inside habitats is a goal set in the EU Biodiversity Strategy for 2030 [6]. The 3-Billion-Tree Pledge For 2030 indicates that 'afforestation should be carried out at landscape level in order to strengthen connectivity with natural or semi-natural areas' and therefore lead to increased forest connectivity.

Accuracy and uncertainties

Data sources and providers

- Forest Type 2018 (raster 10 m), Europe, 3-yearly, Oct. 2020, European Environment Agency (EEA)
- Small Woody Features 2018 (raster 5 m), Europe, 3-yearly, May 2023, European Environment Agency (EEA)

Metadata

DPSIR

State

Topics

Nature protection and restoration # Forests and forestry # Biodiversity

Tags

biodiversity # Forest fragmentation # 8th EAP # forests # Forest connectivity # SEBI029

Temporal coverage

2018

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Ireland
Italy	Latvia
Lithuania	Luxembourg
Malta	Netherlands
Poland	Portugal
Romania	Slovakia

Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life on land

Unit of measure

The degree of forest connectivity is measured in a range from 0% to 100%, with 0% meaning no forest connectivity (very small patches not surrounded by any forest in a 10 hectare surrounding), and 100% meaning full connectivity (full continuous cover of forest). The indicator is calculated as the average of local forest area density (i.e. within a local neighbourhood area of 10 hectares) estimated for each 10 x 10 metre grid cell ($100m^2$) covered by forest.

Frequency of dissemination

Every 3 years

Contact

info@eea.europa.eu

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European Environment Agency

8th Environment Action Programme

Energy consumption: primary and final energy consumption in Europe

8TH EAP HEADLINE INDICATOR, 2023

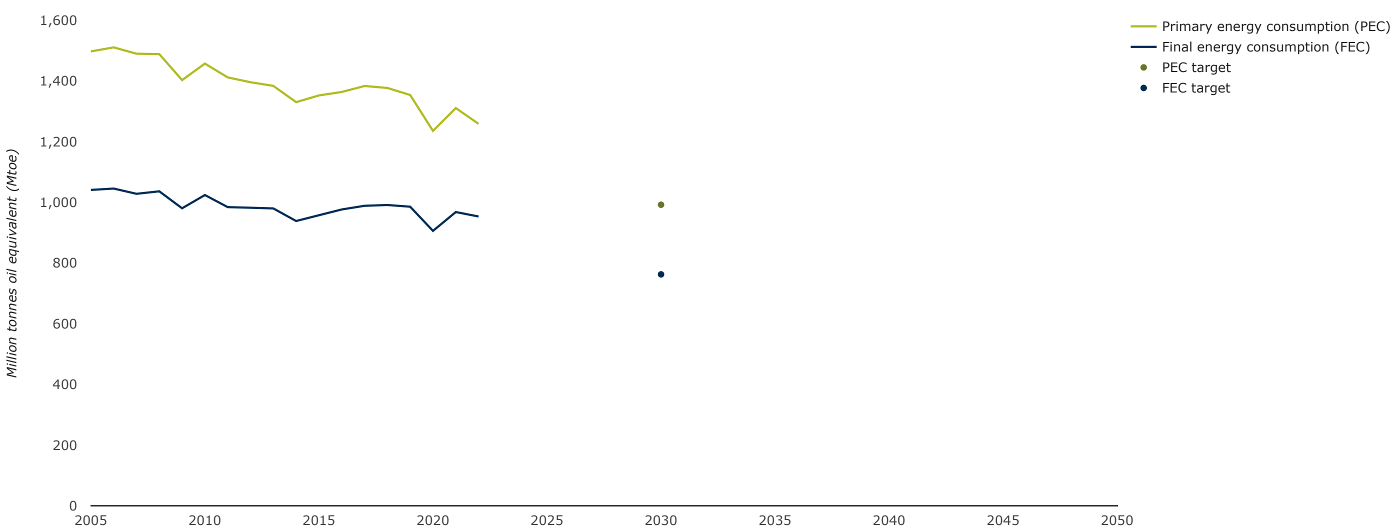
European Environment Agency

Primary and final energy consumption in Europe

Published 24 Oct 2023

According to European Environment Agency (EEA) early estimates, in 2022, the EU's final energy consumption by end users fell by 1.5% compared to 2021 levels. Primary energy consumption, which includes all energy uses, also fell by 4% from 2021 to 2022. Despite this recent progress and an overall reduction in energy consumption since 2005, achieving the 2030 targets will require annual reductions in energy consumption at a much faster rate than has been reached over the last decade. It is very unlikely that the EU will meet its energy efficiency targets for 2030 without strong, immediate, and decisive actions to reduce energy consumption in the coming years.

Figure 1. Primary and final energy consumption in the European Union



Source: Eurostat/EEA.

Reducing energy consumption typically leads to a reduction in environmental pressures associated with the production and consumption of energy. It supports the achievement of the EU renewable energy and greenhouse gas targets, lowers emissions of air pollutants with its associated health benefits and enhances energy security.

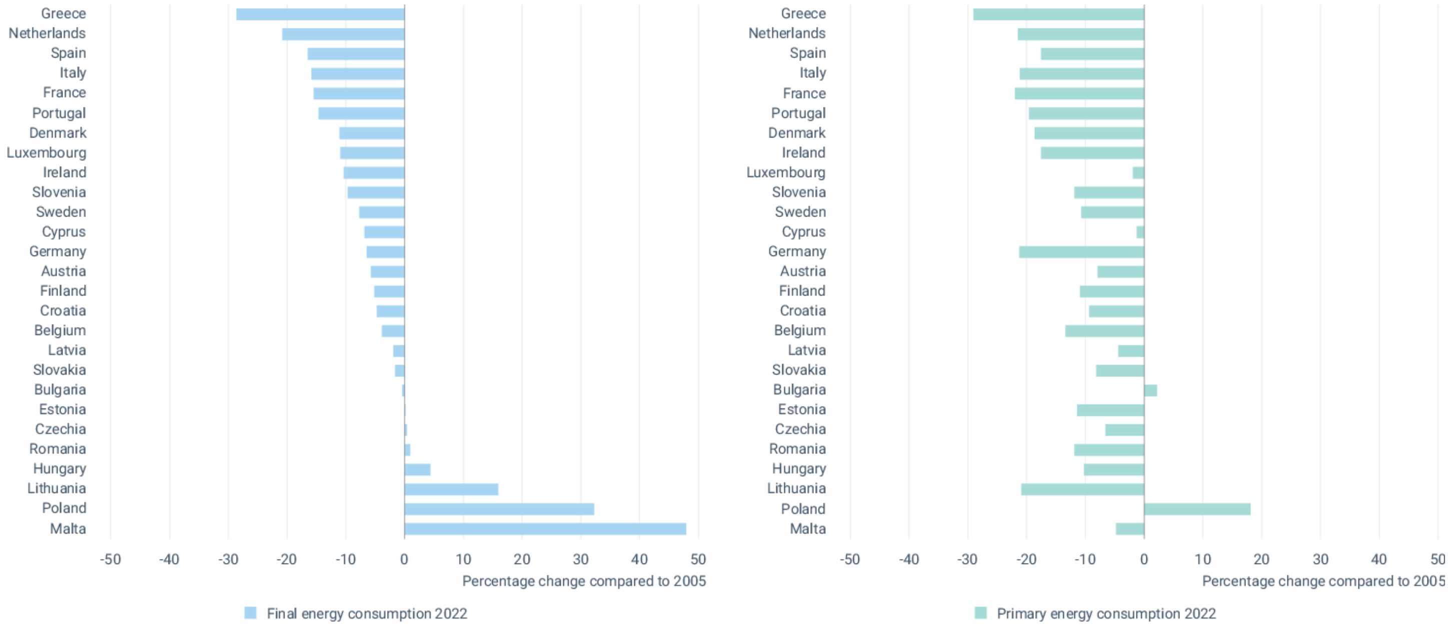
In September 2023, the EU adopted the recast Energy Efficiency Directive (EU) 2023/1791, which set a binding target for 2030 of 763 million tonnes of oil equivalent (Mtoe) for final energy consumption (FEC), and an indicative target of 992.5Mtoe for primary energy consumption (PEC). FEC represents the energy used by final consumers. PEC represents the total energy demand within a country, including losses.

According to EEA early estimates for 2022, the EU-wide PEC levels were 1,259Mtoe, while EU-wide FEC levels were 954Mtoe, which represents a decrease of 1.5% and 4% respectively, compared to 2021. The reductions can be largely attributed to high energy prices, especially for gas. These developments occurred mainly as a result of the invasion of Ukraine and the EU's reduction in Russian fossil fuel imports. The EU and its Member States also took active measures to save energy, such as the Council Regulation on coordinated demand reduction measures for gas (EU/2022/1369), according to which Member States agreed to reduce their gas demand by 15% compared to their average consumption in the past five years. All this led to significant decreases in energy consumption by industry and, to a lesser extent, households. Further, outages in nuclear reactors in France had a significant impact in PEC. On the contrary, energy consumption in transport and of liquid fuels more generally saw an increase during 2022.

Looking at the full time-series of developments in energy efficiency in Europe since 2005, overall reductions been more pronounced for PEC (-16%) than for FEC (-8%). The replacement of fossil fuels and nuclear energy by renewables in electricity generation typically reduces PEC without affecting FEC, and the share of renewable energy in the EU has more than doubled since 2005. Various other factors have contributed to the reduction of the energy demand in the EU, such as energy saving measures, energy transformation improvements, structural changes towards less energy intensive industries and gradually warmer winters because of climate change.

Compared with the average annual reductions of the last ten years, reaching the PEC target for 2030 would require multiplying the annual reductions by three, and for the FEC target by nine, in each year for the rest of this decade. Based on this trend, the EU is currently not on track to meet the 2030 targets on energy consumption. Deep and fast transformation of the energy sector is necessary during this decade if the targets are to be met. A stronger emphasis on efforts to conserve energy and deploy renewable sources faster are also needed. To maximise benefits, new measures could empower users to operate in response to the system's needs. Member States will develop their policies and measures in updated National Energy and Climate Plans, due to be submitted to the European Commission in June 2024. These may include pathways to address the energy efficiency shortfall.

Figure 2. Change in energy consumption of EU Member States between 2005 and 2022



Source: Eurostat/EEA.

Twenty Member States have decreased their FEC between 2005 and 2022, with Greece, the Netherlands and Spain achieving the highest reductions. Twenty-five Member States have decreased their PEC during the same time period, with Greece as the biggest achiever followed by France, Germany and Italy. Bulgaria's PEC 2022 remained slightly above their 2005 level, while Poland is the only country to experience a substantial increase in PEC. Poland's significant decrease in coal consumption was overcompensated by an increase in the consumption of gas, liquid fuels and, especially, by more than tripling the consumption of renewable energy since 2005.

Looking at the short-term trend, 18 Member States saw a decrease in FEC between 2021 and 2022, with the Netherlands, France and Austria reducing FEC the most. Malta saw the highest increase in FEC in the same time period, driven by a revitalisation of international aviation. The Netherlands and France experienced the strongest drop in PEC, with lower consumption of coal, gas and, especially, nuclear being a key factor. Twelve Member States saw an increase in PEC in 2022, with Malta, Ireland, Greece, Cyprus, Bulgaria and Estonia experiencing growth of more than 5%.

Supporting information

Definition

Final energy consumption (FEC) represents the energy used by final consumers (such as households, transport, industry etc) for all energy uses. It is the energy that reaches the final consumer's door.

Primary energy consumption (PEC) represents the total energy demand within a country, excluding the energy products consumed for purposes other than producing useful energy (non-energy uses, e.g., oil for plastics). For example, the electricity consumed by a household counts towards FEC; the fuel burned to generate that electricity and bring it to the household counts towards PEC.

Methodology

PEC-FEC

To ensure comparability with energy efficiency targets, this indicator is defined according to Eurostat methodology for final energy consumption (Europe 2020-2030) [FEC2020-2030] and primary energy consumption (Europe 2020-2030) [PEC2020-2030].

Primary energy consumption (Europe 2020-2030) = gross inland consumption (all products total) - gross inland consumption (ambient heat (heat pumps)) - final non-energy consumption (all products total).

Final energy consumption (Europe 2020-2030)=final energy consumption (all products total)-final energy consumption (ambient heat (heat pumps))+international aviation (all products total)+transformation input blast furnaces (all products total)-transformation output blast furnaces (all products total)+energy sector blast furnaces (solid fossil fuels)+energy sector blast furnaces (manufactured gases)+energy sector blast furnaces (peat and peat products)+energy sector blast furnaces (oil shale and oil sands)+energy sector blast furnaces (oil and petroleum products)+energy sector blast furnaces (Natural gas).

Data set used: 'Complete energy balances nrg_bal_c'

Codes:

- FEC2020-2030 Final energy consumption (Europe 2020-2030)/all products
- PEC2020-2030 Primary energy consumption (Europe 2020-2030)/all products
- GIC Gross inland consumption/all products
- NRG_BF_E Energy sector — blast furnaces — energy use/all products
- FC_NE Final non-energy consumption/all products
- FC_TRA_E Final consumption — transport sector — energy use/renewables and biofuels
- FC_E Final consumption — energy use/ambient heat
- PPRD Primary production/ambient heat

Details about this methodology are available from Eurostat at: ENERGY BALANCE GUIDE (Draft 31 January 2019) .

The time series for the EU-27 was made by summing the values for each year of the 27 countries that are currently Member States, regardless of whether they were members of the EU in any given year.

Proxy data

Values for 2022 are approximated and have been estimated using an array of methods and sources. This includes, in order of priority, direct consultation with Member States, official national statistics, unofficial data sets, grey literature and mathematical interpolation. The amount and quality of available data differ by country. More information can be found on the EEA's datahub on FEC and PEC proxies. Values for 2005-2021 are compiled by Eurostat.

Policy/environmental relevance

The Energy Efficiency Directive (2012/27/EU) established a set of binding measures to help the EU reach its target of decreasing energy consumption by 20% by 2020, compared with projected levels. This was amended by Directive (EU) 2018/2002, which provides a policy framework for 2030 and beyond. A new amendment was agreed in 2023, which set new targets for 2030.

The composition of the energy mix and the level of consumption provide an indication of the environmental pressures associated with energy consumption. The type and magnitude of the environmental impacts associated with energy consumption, such as resource depletion, greenhouse gas emissions, air pollutant emissions, water pollution and the accumulation of radioactive waste, strongly depend on the types and amounts of fuels consumed, as well as on the abatement technologies applied.

This indicator is a headline indicator for monitoring progress towards achieving the aims of the Eighth Environment Action Programme (8th EAP). It contributes mainly to monitoring progress towards energy efficiency aspects of Article 2.f of the 8th EAP which requires: 'promoting environmental aspects of sustainability and significantly reducing key environmental and climate pressures related to the Union's production and consumption, in particular in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system' [1]. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor the achievement by 2030 of the recently agreed 2030 EU targets as detailed in the next paragraph [2].

Targets

On 20 September 2023 the EU officially published the recast Energy Efficiency Directive (EU) 2023/1791, which set a target for the reduction of final energy consumption (FEC) of at least 11.7% in 2030, compared with the energy consumption forecasts for 2030 made in 2020. This translates into a mandatory target of 763Mtoe for FEC, and an indicative target of 993Mtoe for primary energy consumption (PEC). Member states will benefit from flexibilities in reaching the target.

For more information see the European Commission website on the Energy Efficiency Directive and the recent agreement.

Sources:

EEA, 2022. Trends and projections in Europe 2022. EEA Report No 10/2022.
https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2022

EC, 2022a, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives, COM/2022/357 final, EUR-Lex - 52022DC0357 - EN - EUR-Lex (europa.eu)

Eurostat, 2023. Complete energy balances (NRG_BAL_C), PEC (2020-2030) and FEC (2020-2030). https://ec.europa.eu/eurostat/databrowser/bookmark/dea184ea-4883-453d-ba24-71e960a4f161?lang=en. Accessed May 2023.

Accuracy and uncertainties

Methodology uncertainty

No uncertainty has been specified.

Data sets uncertainty

No uncertainty has been specified.

Rationale uncertainty

No uncertainty has been specified.

Data sources and providers

- EEA 2022 proxies on primary and final energy consumption, European Environment Agency (EEA)
- Complete energy balances (NRG_BAL_C), PEC (2020-2030) and FEC (2020-2030), Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Driving forces

Topics

Energy # Climate change mitigation # Energy efficiency

Tags

8th EAP # ENER016 # Energy # Energy efficiency # Targets

Temporal coverage

2005-2030

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Efficiency indicator (Type C - Are we improving?)

UN SDGs

Affordable and clean energy

Unit of measure

FIG1: Million tonnes of oil equivalent (Mtoe);

FIG2: Percentage change compared to 2005

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJ L. ↲

2. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives. COM(2022) 357 final
↩

European Environment Agency

8th Environment Action Programme

Share of energy consumption from renewable sources in Europe

8TH EAP HEADLINE INDICATOR, 2023

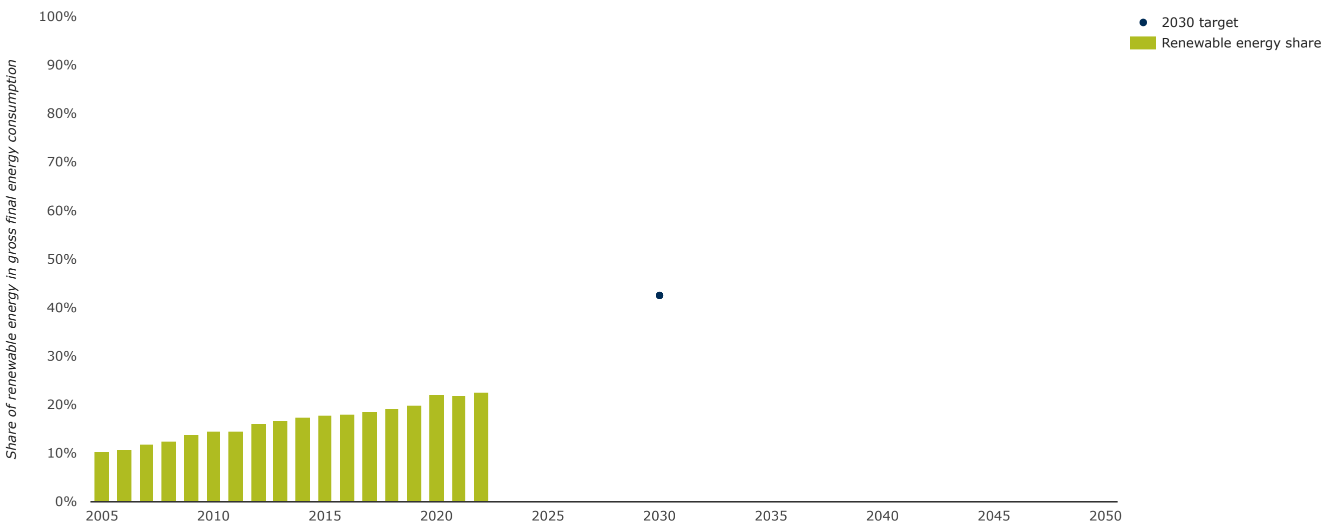
European Environment Agency

Share of energy consumption from renewable sources in Europe

Published 24 Oct 2023

According to European Environment Agency (EEA) early estimates, 22.5% of energy consumed in the EU in 2022 generated from renewable sources. This slight increase compared to 2021, was largely driven by strong growth in solar power. The share is also amplified by a 2022 reduction in non-renewable energy consumption linked to high energy prices. The share of renewables in Europe is expected to keep growing. However, meeting the new target of 42.5% for 2030 will demand more than doubling the rates of renewables deployment seen over the past decade, and requires a deep transformation of the European energy system.

Figure 1. Progress towards renewable energy source targets for EU-27



Source: Eurostat/EEA.

Growth in the use of renewable energy sources (RES) has diverse benefits for society such as mitigating climate change, reducing the emission of air pollutants and improving energy security. The EU formally adopted an update of the Renewable Energy Directive in October 2023 that, among other measures, increases the binding 2030 target from 32% to 42.5%, with the aim of achieving 45%. Each Member State will contribute to this common target, while no targets were introduced for individual countries.

According to EEA early estimates, at 22.5% in 2022, the share of renewable energy in the EU increased slightly (+0.6%) from 2021. Although this value represents a historical high, the growth rate of renewables has slowed since 2020. In absolute values, renewable consumption grew by a modest 1.4 million tonnes oil equivalent (Mtoe) between 2021 and 2022, mainly driven by a substantial increase in solar power generation (+28%). Non-renewables, on the contrary, saw a significant reduction (-2%) linked to high gas prices and nuclear shutdowns. This in turn increased the relative share of renewables in total energy consumption.

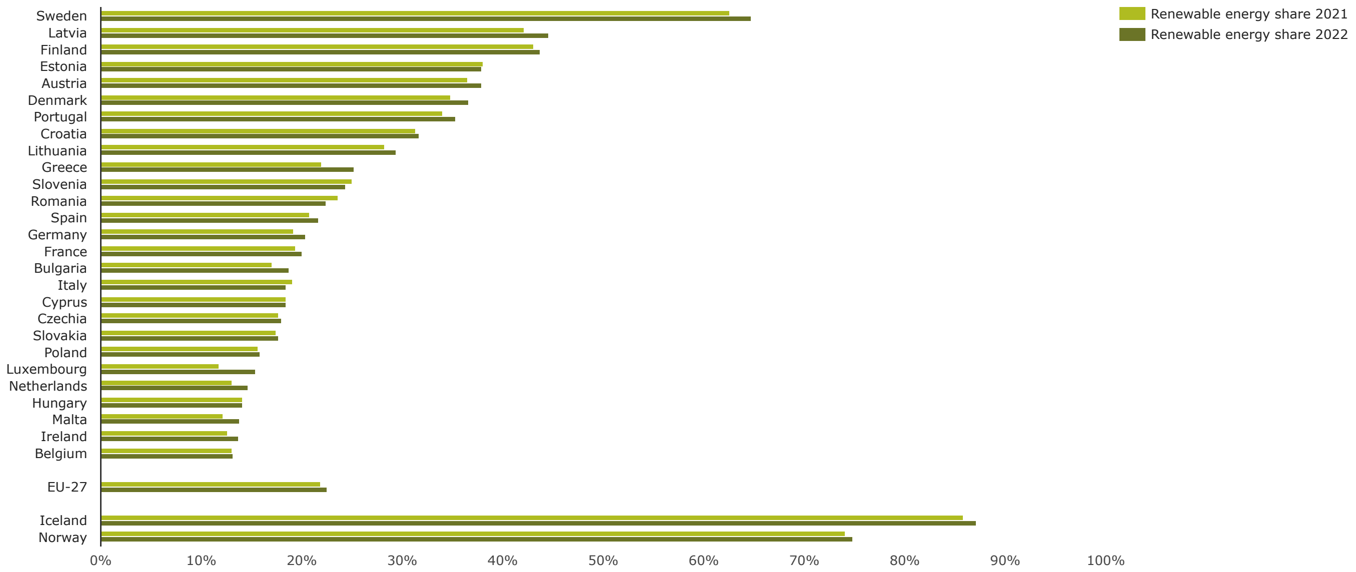
The highest penetration of renewables in 2022 occured in the power sector, with a representation of 40.7% of all electricity generated in the EU. It was followed by the heating and cooling sector with a RES share of 23.2%. The RES share in transport was 8.7%.

Among renewable energy sources, the largest by far is solid biomass, which could have implications in terms of carbon sinks and biodiversity. Solid biomass is widely used in electricity generation, industry and residential heating. Combined, it represented 41% of the total renewable energy supply in Europe in 2021 [1]. It is followed by wind (13%), hydropower (12%), liquid biofuels (8%) and biogas (6%). Heat pumps and solar photovoltaics each represented less than 6% of all renewables. However, they are the fastest growing sources, having increased by more than 13% between 2020 and 2021.

Looking at the longer-term trends, the RES share more than doubled between 2005 and 2022. This was driven by dedicated policies and support schemes, as well as increased economic competitiveness of renewable energy sources. The increase represents a compound annual growth rate (CAGR) of 3.5% over the last decade.

Modelling from the IEA and Ember indicate that reaching the new 42.5% target might be feasible if fast and decisive action is taken to promote renewables and reduce energy consumption. The surprisingly rapid deployment of certain technologies such as solar photovoltaics and heat pumps also provides optimism. However, reaching the target will require a very challenging CAGR of 8.3% on the share until 2030, which is more than double the observed rate over the last 10 years. Considering this, it is unlikely but still uncertain that the EU will meet its target unless a deep transformation of the European energy system takes place within this decade, encompassing all sectors.

Figure 2. Share of energy from renewable sources, by country



Source: Eurostat/EEA.

Data used in the graph

Country	Renewable energy share 2021	Renewable energy share 2022
Sweden	62.57	64.65
Latvia	42.11	44.59
Finland	43.1	43.74
Estonia	38.01	37.94
Austria	36.44	37.84
Denmark	34.72	36.65
Portugal	33.98	35.28
Croatia	31.33	31.61
Lithuania	28.23	29.37
Greece	21.93	25.23
Slovenia	25	24.36
Romania	23.6	22.35
Spain	20.73	21.61
Germany	19.17	20.37
France	19.34	20.01
Bulgaria	17.02	18.72
Italy	19.03	18.45
Cyprus	18.42	18.38
Czechia	17.67	17.98
Slovakia	17.41	17.69
Poland	15.62	15.84
Luxembourg	11.74	15.42
Netherlands	13	14.66
Hungary	14.11	14.05

Country	Renewable energy share 2021	Renewable energy share 2022
Malta	12.15	13.79
Ireland	12.55	13.62
Belgium	13.01	13.14
EU-27	21.81	22.47
Iceland	85.78	87.13
Norway	74.09	74.78

Figure 2 shows that Sweden, Latvia, and Finland had the highest RES share among Member States in 2022. All three countries have strong hydropower industries and wide use of solid biofuels. Malta and Belgium reported the lowest penetration of renewables, representing around 13% of their respective total energy consumption.

Over the long term, Sweden, Denmark and Estonia have experienced the highest growth in RES shares, with more than 20 percentage points increase since 2005. Romania and Slovenia, on the contrary, have seen an increase of less than six percentage points between 2005 and 2022.

On a shorter timescale, 21 of the 27 EU Member States saw an increase in their renewable energy shares between 2021 and 2022. Luxembourg and Greece topped the list, having increased their RES share by more than three percentage points in 2022. In contrast, the RES share of Romania decreased by more than one percentage point compared to 2021.

In the European Economic Area, Norway and Iceland both have RES shares above 70%. The two countries generate most of their electricity from hydropower while, in Iceland, geothermal energy provides most of the heating.

Supporting information

Definition

This indicator measures the EU’s progress towards achieving its 2020 and 2030 renewable energy targets. Gross final renewable energy consumption is the amount of renewable energy consumed for electricity, heating and cooling, and transport in the 27 EU Member States, and is expressed as a share of gross final energy consumption.

The Renewable Energy Directive (2009/28/EC) defines gross final energy consumption as the energy commodities delivered for energy purposes to final consumers (industry, transport, households, services, agriculture, forestry and fisheries), including the consumption of electricity and heat by the energy branch for electricity and heat production, and including losses of electricity and heat in transmission and distribution.

Figure 1 shows consumption of energy from renewable sources (including only certified biofuels complying with the Renewable Energy Directive (RED) sustainability criteria) as a proportion of gross final energy consumption and the recently adopted 2030 target.

Figure 2 shows the consumption of energy from renewable sources as a proportion of gross final energy consumption by country in 2021 and 2022. It illustrates the progress made by the EU and its Member States in the last year.

For more information, please refer to the EEA's annual Trends and projections in Europe, Eurostat's page on renewable energy statistics, and the Commission's Energy Union reports.

Methodology

Eurostat data

The renewable energy share data used for 2005-2021 were taken directly from the Eurostat SHARES tool. The SHARES tool focuses on the harmonised calculation of the share of energy consumption from renewable sources among the 27 EU Member States. This is done in accordance with the RED guidelines and is based on national energy data reported to Eurostat. The Shares tool detailed results and manual are available online: (https://ec.europa.eu/eurostat/web/energy/database/additional-data).

Electricity generation from hydropower and wind power must be normalised to smooth the effect of weather-related variations. In the case of hydropower, the normalisation is based on the ratio of electricity generation to the installed capacity averaged over 15 years; in the case of wind power, a similar normalisation formula is applied over five years. The Shares tool takes into account all biofuels consumed in transport between 2005 and 2010, and only biofuels certified as being in compliance with the RED sustainability criteria for the years starting from 2011.

With regard to the calculation of the gross final energy consumption for Cyprus and Malta, the derogation in RED was used. This derogation allows these countries to consider the amount of energy consumed in aviation, as a proportion of their gross final energy consumption, to be no more than 4.12%.

The discussion on individual renewable energy sources was based on Eurostat energy balances, since the SHARES tool focus on sectors, rather than individual sources. The comparison is made based on their primary energy supply.

Proxy data

Values for 2022 are approximate (proxies) and have been estimated by the EEA with the intention of providing early indications of recent shares. These proxies were not obtained following the formal collection process for official statistics and are therefore less accurate and reliable than official statistics. Estimates will be replaced with Eurostat official statistics once they become available. More information can be found on the EEA proxies web page.

Targets

The 2030 target presented in this indicator was adopted in October 2023 and is defined as a share of renewable energy in the EU's gross final energy consumption of 42.5% by 2030 with an additional "aspirational" 2.5% indicative top up that would allow to reach 45%.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards achieving the aims of the Eighth Environment Action Programme (8th EAP). It contributes mainly to monitoring progress towards sustainable energy aspects of Article 2.f of the 8th EAP which requires: 'promoting environmental aspects of sustainability and significantly reducing key environmental and climate pressures related to the Union's production and consumption, in particular in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system' [2]. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor the achievement by 2030 of the EU target of 42.5% renewable energy share in gross final energy consumption[3].

The RED (2009/28/EC) and its recast directive RED II (2018/2001/EU) establish an overall policy for the production of energy from renewable sources and the promotion of its use in the EU. The RED III was adopted in 2023, introducing stronger measures and a new 2030 target for renewables, aimed at achieving climate neutrality by 2050.

Achieving the 2030 target will depend on the fast implementation of the reinforced policy and legal framework in the Member States, especially via speeding up permitting procedures, better visibility of auctions for renewables and a better integration of the different sectors. Implementation needs to be accompanied by accelerated grid developments in order to absorb more renewables and the full implementation of a guarantee-of-origin system with energy purchase agreements to allow further development of the renewable consumer market. In addition, better and more integrated planning will be required to ensure not only a high efficiency of investment and an accelerated pace of development, but also that the market penetration of these renewable sources takes into account other policy objectives such as environment protection.

The share of renewable energy consumption in final energy consumption is a broad indicator of progress towards reducing the impact of energy consumption on the environment (i.e., through decreased greenhouse gas emissions and air pollutant emissions). At the same time, impacts of increasing renewable energy consumption on landscapes, habitats and ecosystems, namely from construction, the use of water, the use of fertilisers and pesticides for biomass and biofuel crops, and the extraction of heavy metals for photovoltaic cells must also be considered.

Replacing fossil fuels with renewables results in lower carbon emissions. However, total carbon emissions are not necessarily determined by the share of renewable energy in final energy consumption, but by the total amount of energy consumed from fossil sources.

Accuracy and uncertainties

Methodology uncertainty

Data for 2015-2021 were compiled by Eurostat using annual joint questionnaires, which are shared by Eurostat and the International Energy Agency, following a well-established and harmonised methodology. Methodological information on the annual joint questionnaires and data compilation can be found on Eurostat's web page on metadata on energy statistics.

Values for 2022 are approximate (proxies) and have been estimated by the EEA. These proxies were not obtained following the formal collection process for official statistics and are therefore less accurate and reliable than official statistics.

Notes on uncertainties in the underlying statistics and methodology:

Biomass and bio-waste, as defined by Eurostat, cover organic, non-fossil material of biological origin, which may be used for heat production or electricity generation. They comprise wood and wood waste, biogas, municipal solid waste (MSW) and biofuels. MSW comprises biodegradable and non-biodegradable wastes produced by different sectors. Non-biodegradable municipal and solid wastes are not considered renewable, but current data availability does not allow the non-biodegradable content of wastes to be identified separately, except in industry. Large data-gaps also exist regarding the energy use of wood, which further adds to the methodological uncertainty.

The electricity produced from hydropower storage systems is not classified as a renewable source of energy in terms of electricity production, but is considered part of the gross electricity consumption of a country. Hydropower and wind power generation are calculated as actual generation and normalised generation. Normalised generation is calculated using the weighted average load factor over the last 15 years for hydropower and the last five years for wind power.

The indicator measures the consumption of energy from renewable sources relative to total energy consumption for a particular country. The share of renewable energy could increase even if actual energy consumption from renewable sources falls. Similarly, the share could fall despite an increase in energy consumption from renewable sources.

Electricity consumption within a national territory includes imports of electricity from neighbouring countries. It excludes electricity produced nationally but exported abroad. In some countries, the contribution of electricity trade to total electricity consumption and the changes observed from year to year need to be looked at carefully when analysing trends in electricity from RESs. Impacts on the (national) environment are also affected, since emissions are taken into account for the country in which the electricity is produced, whereas consumption is taken into account for the country in which the electricity is consumed.

Data sets uncertainty

No uncertainty has been specified.

Rationale uncertainty

No uncertainty has been specified.

Data sources and providers

- Share of energy from renewable sources [NRG_IND_REN], Statistical Office of the European Union (Eurostat)
- Approximated estimates for the share of gross final consumption of renewable energy sources, 2022, European Environment Agency (EEA)

Metadata

DPSIR

Response

Topics

Energy   # Renewable energy

Tags

renewable energy   # Energy   # 8th EAP   # ENER028

Temporal coverage

2005-2030

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Latvia	Lithuania
Luxembourg	Malta
Netherlands	Norway
Poland	Portugal
Romania	Slovakia
Slovenia	Spain
Sweden	

Typology

Policy-effectiveness indicator (Type D)

UN SDGs

Affordable and clean energy, ,Climate action

Unit of measure

Share of renewable energy in gross final energy consumption (%);

Share of energy from renewable sources (%)

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. The comparison among renewable energy sources is done based on total energy supply from the EU energy balance (Eurostat). The 2022 balance was not available at the time of writing this indicator and, consequently, that paragraph refers to 2021 data. ↲

2. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJ L. ↲

3. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives. COM(2022) 357 final ↲

European Environment Agency

8th Environment Action Programme

Circular material use rate in Europe

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

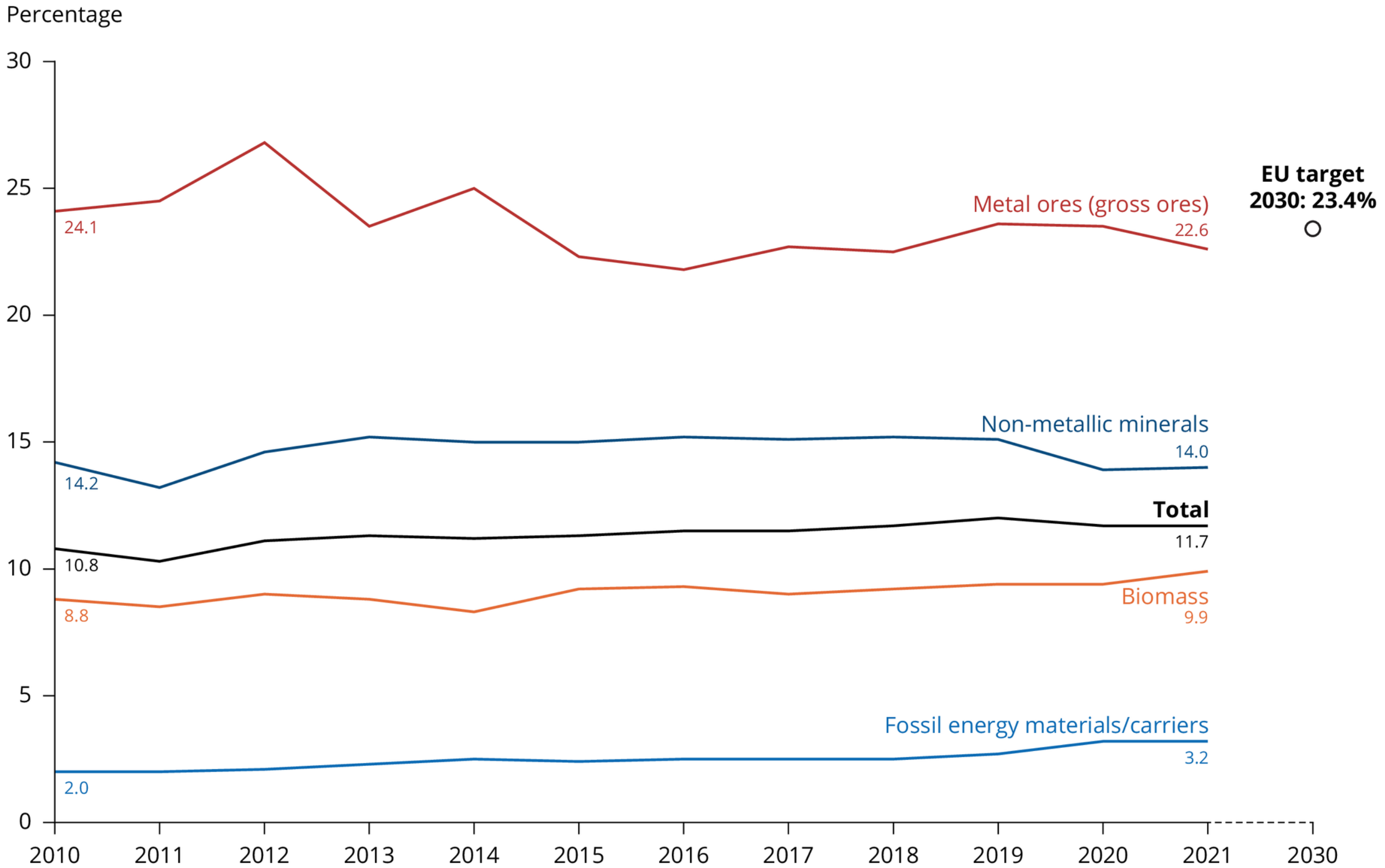
Circular material use rate in Europe

Published 20 Apr 2023

Analysis and data > Indicators > Circular material use rate in Europe

The EU aims to double its use of recycled material, in terms of its share in the total amount of material used by the economy, between 2020 and 2030, as set out in the circular economy action plan. Increasing the use of secondary materials would reduce the extraction of primary raw materials and related environmental impacts. In 2021, recycled material accounted for 11.7% of material used, an increase of less than 1 percentage point since 2010. This rather slow progress together with projections for increased material demand in the EU by 2030 signify that currently the EU is not on track to double the circular material use rate by 2030.

Figure 1. Circular material use rate in the EU and breakdown by material group between 2010 and 2021



Source: Eurostat.

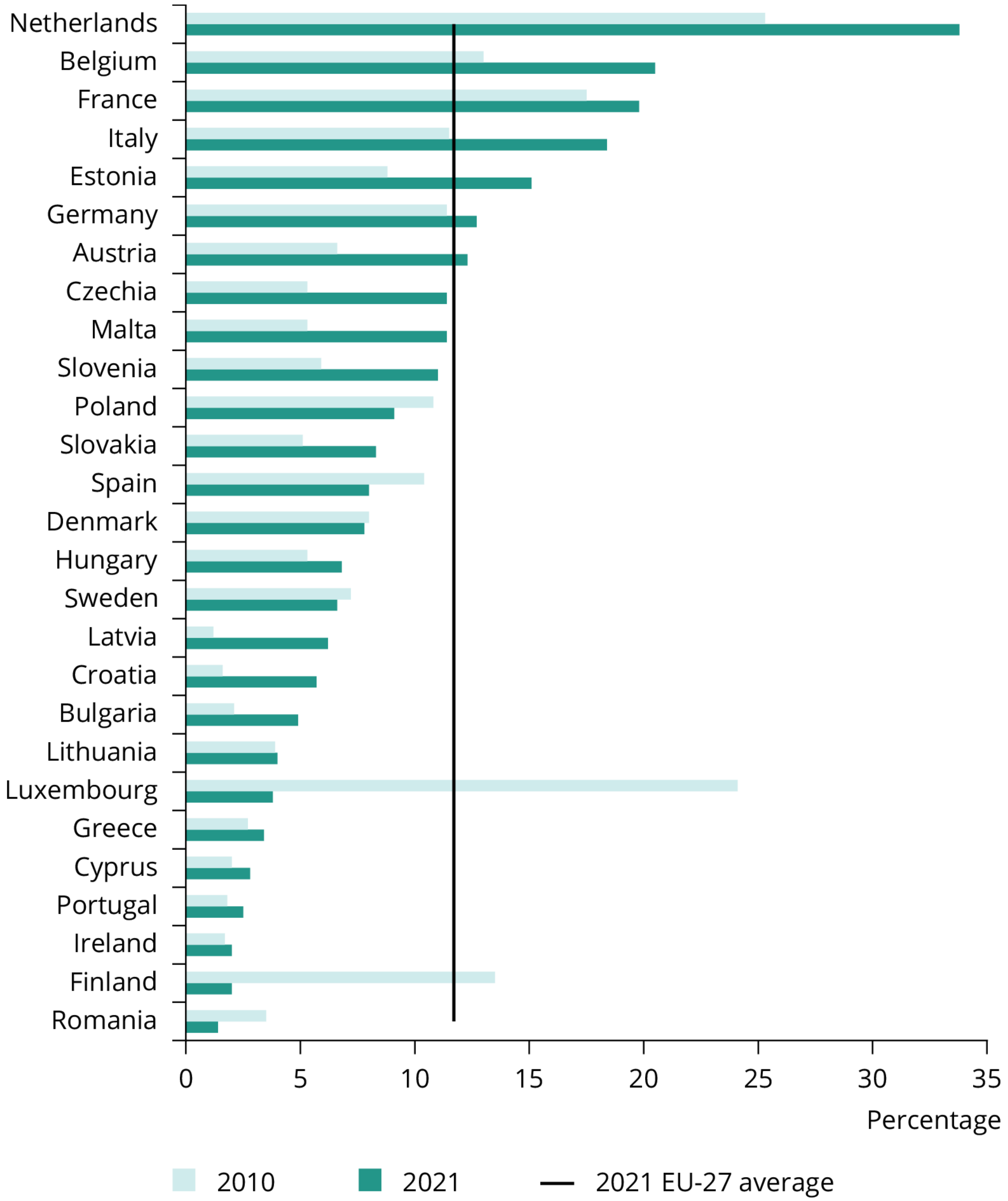
The EU's circular economy action plan aims to reduce pressure on natural resources and states that the EU aims to double its circular material use rate in the coming decade [1][2]. The circular material use rate (CMUR) indicates the circularity of materials in the economy and refers to the share of the total amount of material used in the economy that is accounted for by recycled waste. Increasing the CMUR — either by increasing the amount of recycled waste or decreasing the amount of material used — would reduce the amount of primary material extracted for production and the associated negative impacts on the environment and climate. Moreover, a reduction in the EU's reliance on primary resources, including imported materials, would increase its strategic autonomy, as the EU would increase its ability to meet its own needs, without relying on countries outside the EU.

Although the EU's CMUR has increased slightly in the past decade, from 10.8% in 2010 to 11.7% in 2021, it is still considered low. This trend is explained mainly by increases in the amount of waste recycled, while the domestic material consumption has remained rather stable [3]. Non-metallic minerals account for more than half of total material consumption and decreases in the consumption of these materials could contribute significantly to an increase in the CMUR.

The CMURs increased for the biomass and fossil-based materials, but decreased for metals and non-metallic minerals between 2010 and 2021. The CMURs for the various material groups differ significantly, however, being above 22% for metal ores in 2021 and only 3% for fossil fuels. This reflects the different natures of the materials and how they are used. For instance, metals are technically easier and economically more attractive to recycle and feed back into the economy, while fossil fuels are mostly burned and therefore cannot be recycled.

Circular economy strategies, by aiming to retain the value and extend the life of products, can reduce resource consumption and consequently reduce the impacts on the environment and climate. Meeting the target of doubling the CMUR would mean an increase from 11.7% in 2021 to 23.4% by 2030 and the average CMUR growth rate of 2011-2021 would have to increase sixfold. This is rather unlikely, considering the very slight increase in the CMUR in the previous decade, no increase at all between 2020 and 2021 and projections by the OECD predicting an increased future demand for materials in the EU by 2030. The latter is important, since increasing recycling alone will not allow the EU to achieve the target. Increased recycling coupled with reduced material use would be required. Reducing the use of heavier material groups like non-metallic minerals and metals has a greater potential for increasing the CMUR. However, since material extraction has different environmental impacts, measures should also focus on reducing the consumption of fossil energy materials and increasing the sustainability of biomass production in view of reducing environmental pressures.

Figure 2. Circular material use rate by EU country, 2010 and 2021



Source: Eurostat.

Considerable differences in CMURs are observed among countries, ranging from 33.8% (in the Netherlands) to 1.4% (in Romania) in 2021. This reflects significant structural difference in countries' recycling capacities and in their levels of material consumption [3]. In the Netherlands and Belgium, more than 20% (1 out of 5 tonnes) of material used was recycled material, while the CMUR level for the

Netherlands is already much higher than the EU target for 2030. Countries with the highest CMURs have both high recycling capacities and low levels of material consumption.

Most (20 out of 27) countries' CMURs have increased since 2010. The largest absolute CMUR increases (between 6 and 8.5 percentage points) were seen in the Netherlands, Belgium, Italy, Estonia, Czechia and Malta. Some countries show impressive relative increases in their CMURs, with Latvia, Croatia, Bulgaria, Czechia and Malta more than doubling their CMURs between 2010 and 2021. On the other hand, significant decreases in CMURs were seen in Finland, Luxembourg and Romania.

Supporting information

Definition

The CMUR measures an economy's circularity. This is defined by the circular use of materials, which is approximated by the amount of waste recycled in domestic recovery plants minus imported waste destined for recovery plus exported waste destined for recovery abroad, divided by the material use. The material use is the sum of domestic material consumption and the aforementioned circular use of materials [4].

Methodology

This indicator is directly based on data published by Eurostat and the underpinning methodology can be found in Eurostat (2021)[5].

Policy/environmental relevance

The EU's circular economy action plan calls for a doubling of the Union's CMUR in the coming decade[1]. This policy objective aims to increase the EU economy's circularity and thus benefit the environmental and climate. These benefits would mainly stem from the reduced need for natural resource extraction.

This indicator is a headline indicator for monitoring progress towards achieving the aims of the Eighth Environment Action Programme [6]. By measuring the use of secondary materials in the economy, it is used to evaluate the sustainability of the industrial sector towards the 8th EAP priority objective for 2030 set out in Article 2.f which requires: 'promoting environmental aspects of sustainability and significantly reducing key environmental and climate pressures related to the Union's production and consumption, in particular in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system'. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor the 'doubling of the ratio of circular material use by 2030 compared to 2020'. The CMUR is also a performance indicator in the Long-Term Competitiveness Strategy recently adopted by the Commission to set the direction for industry beyond 2030.

Accuracy and uncertainties

No uncertainties have been specified.

Data sources and providers

- Circular material use rate (CEI_SRM030), Statistical Office of the European Union (Eurostat)
- Circular material use rate by material type (env_ac_curm), Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Impact

Topics

Waste and recycling # Resource use and materials # Circular economy

Tags

8th EAP # Material use # waste # WST009 # Circular economy

Temporal coverage

2010-2021

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Performance indicator (Type B - Does it matter?)

UN SDGs

Responsible consumption and production

Unit of measure

Percentage

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. EC, 2020, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘A new circular economy action plan for a cleaner and more competitive Europe’, COM(2020) 98 final.
   a b
2. EC, 2022, 'Circular economy action plan', *European Commission* (https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en) accessed June 29, 2022.
   ↲
3. Eurostat, 2018, *Circular material use rate — calculation method*, Manuals and Guidelines, Publications Office of the European Union, Luxembourg.
   a b
4. Eurostat, 2020, 'Circular material use rate', *Product Datasets* (https://ec.europa.eu/eurostat/web/products-datasets/-/cei_srm030) accessed June 30, 2022.
   ↲
5. Eurostat, 2021, 'Circular economy — material flows', *Statistics Explained* (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Circular_economy_-_material_flows#Circularity_rate_.E2.80.93_methodology) accessed June 30, 2022.
   ↲
6. EC, 2022, 'Environment action programme to 2030', *European Commission* (https://environment.ec.europa.eu/strategy/environment-action-programme-2030_en) accessed June 24, 2022.
   ↲

European Environment Agency

8th Environment Action Programme

Share of buses and trains in inland passenger transport

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

Share of buses and trains in inland passenger transport

Published 10 Oct 2023

Promoting sustainable transport modes such as public transport can reduce greenhouse gas emissions and other environmental pressures such as air pollution and noise. The EU Sustainable and Smart Mobility Strategy calls for decisive action to shift towards more public passenger transport like buses and trains. However, the share of buses and trains in total passenger transport has changed very little since 2005, albeit with fluctuation and rebound in 2020 and 2021 due to the COVID-19 pandemic. Without decisive action, it is unlikely but uncertain that a modal shift towards public transport will occur in the near future.

Figure 1. Share of bus and trains in total inland passenger transport activity in the EU-27

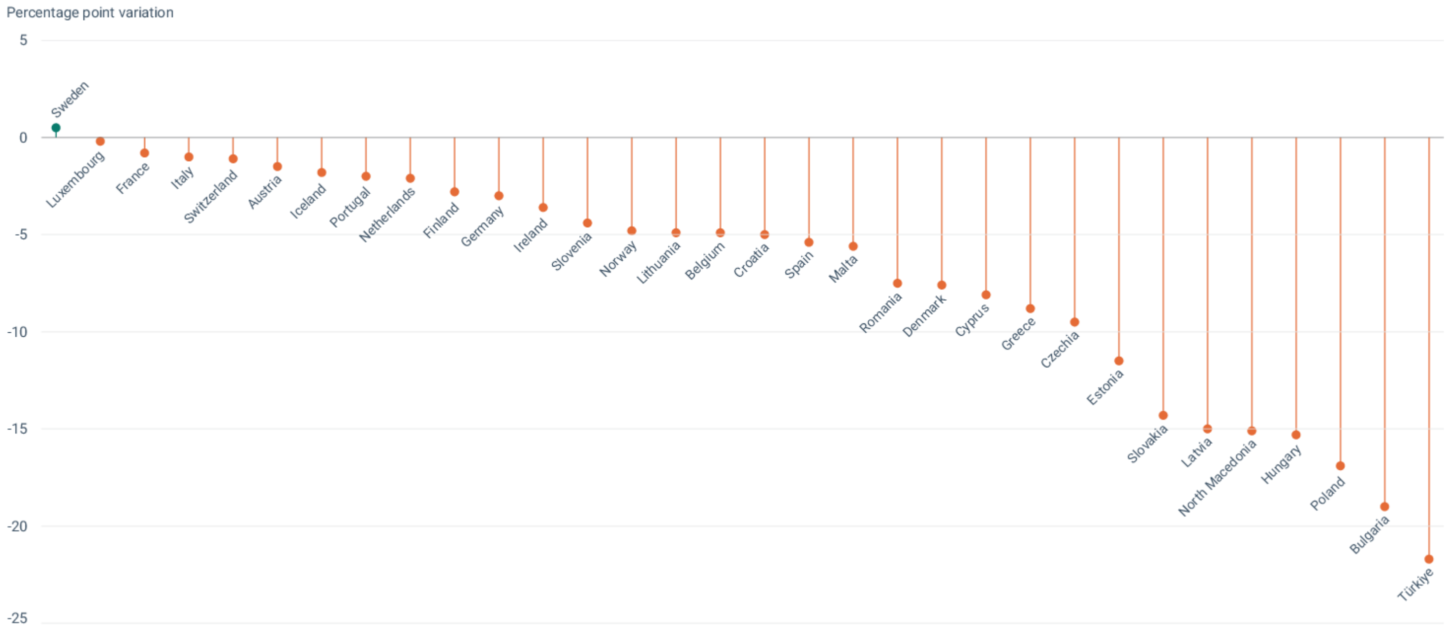
Source: Eurostat.

Changes to the EU's mobility system will be vital if the EU is to realise its green and digital transformation ambitions and become more resilient to future crises. In 2020, under the umbrella of the European Green Deal, the European Commission adopted, a Sustainable and Smart Mobility strategy aimed at promoting, inter alia, the use of more sustainable transport modes. One of the objectives of the strategy is to increase the number of passengers travelling by rail and commuting by public transport, instead of with a personal car. Achieving this objective could reduce greenhouse gas and air pollutant emissions and other environmental pressures [1].

In the period 2005-2019, the share in the EU of total passenger transport demand met by buses and trains remained relatively constant, at around 18%. It fell sharply to 13% in 2020 as a result of COVID-19 pandemic-driven travel restrictions and changed mobility habits, then recovered slightly in 2021 [2]. However, at 14%, the 2021 share may reflect continued mobility restrictions associated with the pandemic. At the same time, total inland passenger transport activity increased by 11% between 2005 and 2019, indicating an increase in the use of both private cars and public transportation in absolute terms. These trends suggest that it may be unlikely that the share of passenger transport demand met by buses and trains will increase significantly in the coming years compared to the 2005-2019 period, beyond the continued pandemic recovery.

Significant efforts to encourage the use of public transport would be needed to achieve this objective and would require changes in the way Europeans commute and travel and in the way European cities are planned. On the supply side, the European Commission launched important initiatives, such as the TEN-T revision, rail capacity regulation, which are aimed to increase the availability of public transport modes. National policies that reduce public transport ticket prices could further contribute to a higher uptake of public transport. Digitalisation can also provide practical tools to internalise the external costs of transport and raise awareness of the pressures exerted by our mobility needs and preferences [3]. For example, the European Commission is working on frameworks supporting modal shifts and multimodal trips, as also discussed in the last TERM report from EEA [3]. In this context, investments and funding are also needed to finance safe, clean and modern infrastructure to ensure access to public transport for all.

Figure 2. Percentage point variation in the share of bus and trains (collective modes) in total inland passenger transport activity by country



Source: Eurostat.

There are large country differences in the use of shared modes in passenger transport activity, both in terms of share values and time evolution. In all EU countries except for Sweden (+0.5%), the share of collective modes in total inland passenger transport decreased between 2005 and 2021, with the decline exceeding 3% in 19 countries and exceeding 5% in 14 countries. For all other European Environment Agency member and for cooperating countries for which data are available, the share is decreasing, with figures varying from -1.1% to -21.7%. Note that for Serbia and Montenegro passenger transport data are available only from year 2010[4].

Importantly, to fully realise a transition to a more sustainable mobility system, a combination of approaches will be needed including, but not limited to, a more efficient and attractive public transport system. For example, active modes such as walking and biking are important in reducing the impacts of mobility in cities. However, as data are not currently available for these modes, they are not presented as part of this indicator for the time being.

Supporting information

Definition

Share of collective modes in total inland passenger transport. Collective modes refer to passenger transport via buses, coaches, and trains. Total inland passenger transport performance includes transport by passenger cars, buses and coaches, and trains. All data are based on movements within national territories, regardless of the vehicle's nationality.

Methodology

Figure 1: raw data for the EU-27 share (in %) of collective modes in total inland passenger transport performance were retrieved from Eurostat. Raw data for the increase in total inland

passenger transport demand were retrieved from the 2023 version of the EU transport in figures statistical pocketbook published by DG MOVE. EU-27 aggregate data were used. No additional gap filling was applied to the data. Information on data set uncertainties can be found directly in the metadata and explanatory notes provided by Eurostat. Only official Eurostat data sets have been used.

Figure 2: raw data by country of variation (2005-2021) in the share of collective modes in total inland passenger transport performance were retrieved from Eurostat. Data are displayed at country level and are expressed in percentage points. To provide the broadest possible picture of European countries, geographical coverage was extended to the 32 EEA member countries and the Western Balkan cooperating countries when data were available. No additional gap filling was applied to the data. Information on data set uncertainties can be found directly in the metadata and explanatory notes provided by Eurostat. Only official Eurostat data sets have been used.

Additional information on the methodology used for data collection can be found here: Share of buses and trains in inland passenger transport (sdg_09_50) (europa.eu)

Policy/environmental relevance

The indicator is part of the indicator set tracking EU Sustainable Development Goals (SDG) and their related 169 targets, which are at the heart of the UN's 2030 Agenda for Sustainable Development. It is used to monitor trends on modal shift to environment-friendly transport modes and the progress towards building resilient infrastructure (SDG 9), promoting inclusive and sustainable industrialisation and fostering innovation and towards on making cities and human settlements inclusive, safe, resilient and sustainable (SDG 11). These targets are embedded in the European Commission's Priorities under the 'European Green Deal', 'A Europe fit for a digital age' and 'An economy that works for people'. The indicator is relevant also in the framework of the Commission 'Sustainable and Smart Mobility strategy' adopted in 2020. This strategy lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises.

The share of buses and trains in inland passenger transport is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring mobility aspects of the 8th EAP priority objective Article 2.(2)(f) that shall be met by 2030: *'promoting environmental aspects of sustainability and significantly reducing key environmental and climate pressures related to the Union's production and consumption, in particular in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system.'* For the purposes of the 8th EAP monitoring framework this indicator assesses specifically whether the EU will increase the share of buses and trains in inland passenger transport expressed in passenger-kilometres.

Accuracy and uncertainties

The accuracy of the is currently limited due to the voluntary collection of road passenger data. As a result, the transport performance data are based on a large variety of statistical sources and some data gaps are filled with estimates. Additional information can be found here: Share of buses and trains in inland passenger transport (sdg_09_50) (europa.eu)

Data sources and providers

- Share of buses and trains in inland passenger transport (SDG_09_50), Statistical Office of the European Union (Eurostat)
- Statistical pocketbook 2023, Directorate General for Mobility and Transport (DG MOVE)

Metadata

DPSIR

Pressure

Topics

Transport and mobility   # Urban sustainability

Tags

mobility   # Buses   # modal shift   # 8th EAP   # TERM046   # Passenger transport   # Trains   # Transport

Temporal coverage

2005-2021

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Latvia	Lithuania
Luxembourg	Malta
Netherlands	North Macedonia
Norway	Poland
Portugal	Republic of Turkey
Romania	Slovakia

Slovenia	Spain
Sweden	Switzerland

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Industry, innovation and infrastructure, ,Sustainable cities and communities

Unit of measure

Percentage, billion passenger km and percentage points

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. EEA, 2021, *Transport and environment report 2020 — Train or plane?*, EEA Report, 19/2020, European Environment Agency, Copenhagen.
↵
2. Lozzi, G. and et al., 2022, *Relaunching transport and tourism in the EU after COVID-19 — Part VI: Public transport*, European Parliament, Directorate-General for Internal Policies of the Union.
↵
3. EEA, 2022, *Digitalisation in the mobility system: challenges and opportunities. TERM 2022: Transport and Environment Reporting Mechanism (TERM) report*, EEA Report, 07/2022, European Environment Agency.
a b

4. For additional details on the methodology, see the supporting information. In particular, the limited accuracy of passenger data could impact data comparability between countries and the reported trends.
↵

European Environment Agency

8th Environment Action Programme

Agricultural area under organic farming in Europe

8TH EAP HEADLINE INDICATOR, 2023

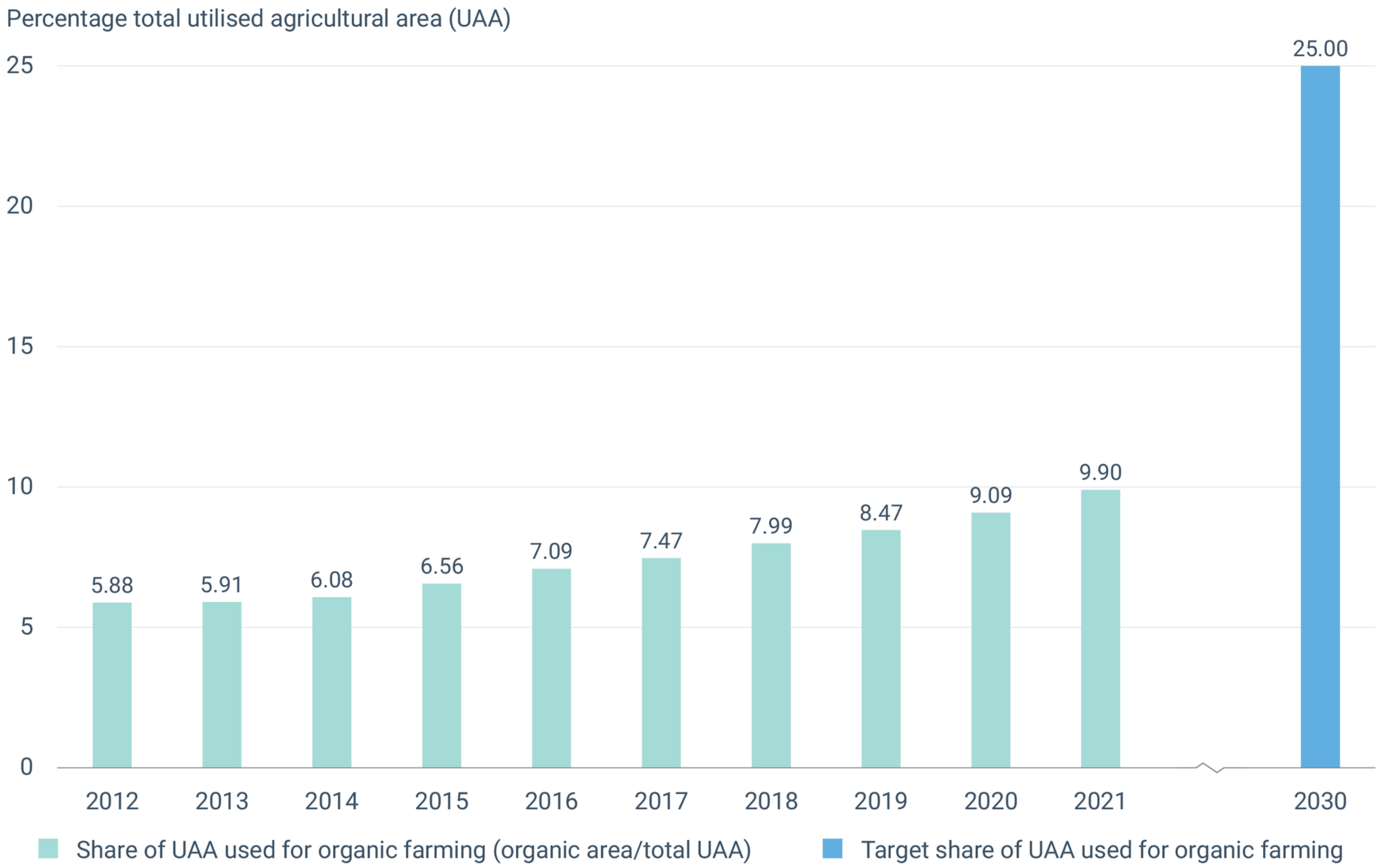
European Environment Agency

Agricultural area under organic farming in Europe

Published 14 Nov 2023

The European Green Deal's farm to fork strategy sets the target that, by 2030, at least 25% of the EU's agricultural area should be under organic farming. The share of the EU's agricultural land under organic farming increased from 5.9% in 2012 to 9.9% in 2021 as a result of an increasing demand for organic products and policy support. To meet the target, the pace will need to almost double in the remaining years up to 2030. Although the policies currently in place are expected to increase the share of organic farming, this will not be enough to meet the target.

Figure 1. Share of the utilised agricultural area used for organic farming in the EU-27 over the period 2012-2021



Source: Eurostat.

Organic farming refers to the production of food using natural substances and processes. It avoids or markedly reduces the use of synthetic chemicals, applies high standards of animal welfare and excludes the use of genetically modified organisms (GMOs). It has benefits for biodiversity, soil health and water quality.

European Green Deal initiatives, particularly the EU Biodiversity strategy for 2030[1] and the Farm to Fork strategy[2], set the target that at least 25% of the EU's utilised agricultural area (UAA) should be under organic farming by 2030. The UAA under organic farming in the EU has increased since 2012 continuously, due to demand for organic products and policy support. In 2021 it covered an estimated 16 million hectares, 9.9% of the EU's UAA.

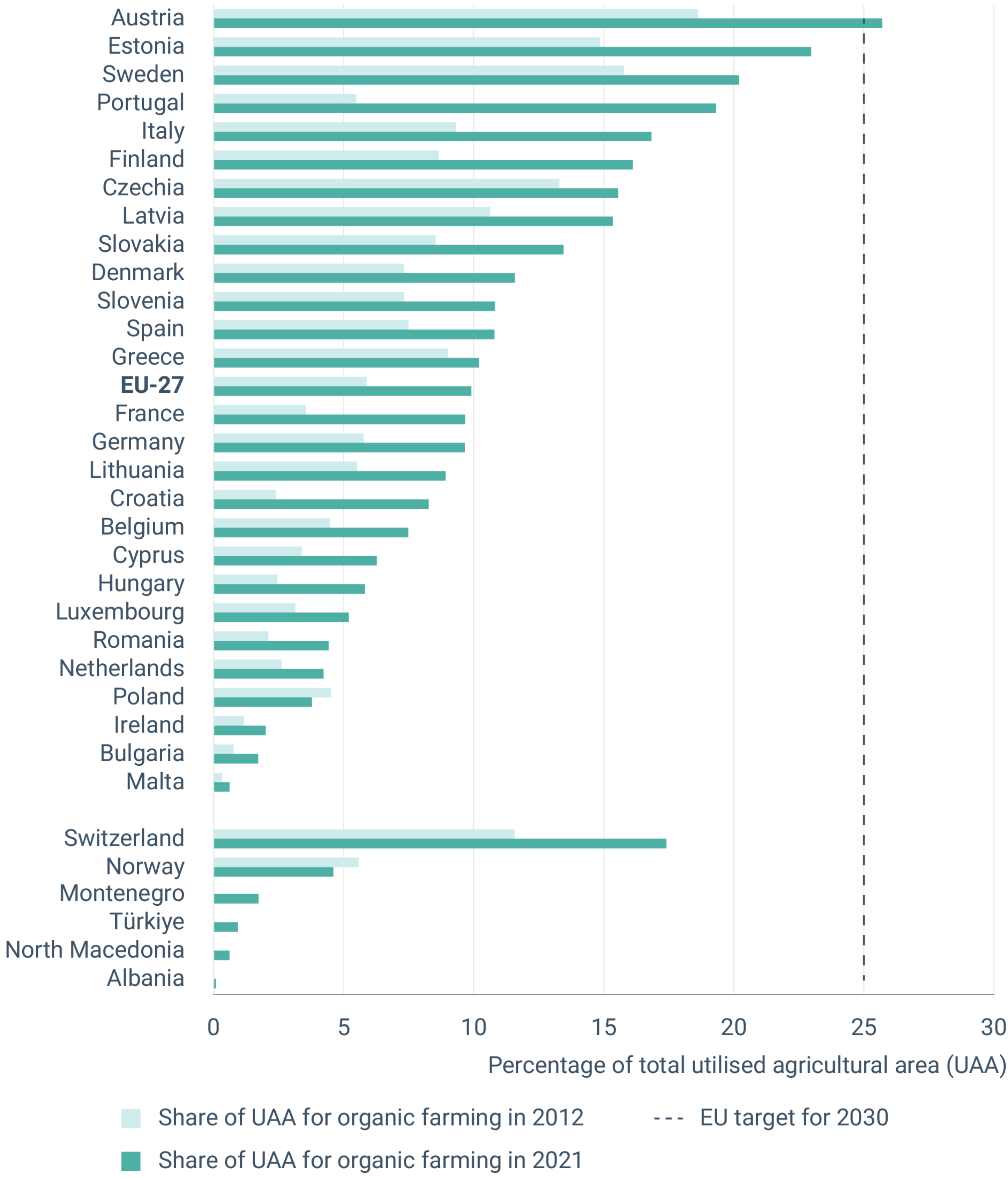
The annual compound growth rate between 2012 and 2021 was 6%. Meeting the 25% target by 2030 would require a nearly doubled annual compound growth rate of 10.8% for the 2021-2030 period. This would require the conversion of 27 thousand km^2 per year in 2021-2030.

The share of the organic farming area is expected to further increase by 2030[3]. The growth rate is projected to remain stable and to lead to a 15% organic farming area share in 2031[4], with the assumption of a growing demand and continuing policy support [5].

The European Green Deal introduced new initiatives to increase demand and supply of organic products, such as the new EU Organic Action Plan[6]. In this context, the new Common Agricultural Policy (CAP) 2023-2027[7] aims to encourage support to organic farming. In its first year of implementation, the national CAP strategic plans of Member States set a level of area targets and financial allocation to organic farming to increase the support to about 10% of the total utilised agricultural area in 2027 [8].

At present, it is very unlikely that the 2030 target will be met because of the large distance to the target. The current policy support, in itself, is not sufficient to reach the target. More time is needed for the implementation of European Green Deal actions. Furthermore, the evolution of the demand for organic products has become more unstable since 2022. To reach the target, accelerated development and implementation of coherent policies with increased ambition levels need to support a fundamental transformation of food production and consumption.

Figure 2. Share of total utilised agricultural area used for organic farming by country and in the EU-27, in 2012 and 2021



Source: Eurostat.

In 2021, Austria [9], Estonia and Sweden had more than 20% of their UAA under organic farming, the highest shares of all EU Member States. By contrast, in six Member States less than 5% of their UAA were under organic farming, the lowest shares being in Ireland, Bulgaria and Malta.

In the EEA member and cooperating countries for which data are available, less than 5% of their UAA were under organic farming, except Switzerland (with 17%). The share of organic farming area increased in Switzerland, and decreased in Norway between 2012 and 2021.

The shares of UAA under organic farming increased between 2012 and 2021 in all EU Member States, except Poland, where the share decreased.

Supporting information

Definition

This indicator shows the share of the utilised agricultural area (UAA) used for organic farming in the EU. According to the EU definition, the 'total organic area' includes both the 'certified organic farming area' and the 'area under conversion to organic farming', with farms undergoing a conversion process that typically takes 2-3 years, depending on the crop, before being certified as organic.

Organic farming is an integrated agricultural production system. It combines environment- and climate-friendly practices with benefits for biodiversity, the sustainable use of natural resources and the adoption of high animal welfare standards. This is in line with the demand of a growing number of consumers for products produced using natural substances and processes. Organic production thus plays multiple societal roles. It provides for a specific market, responding to consumer demand for organic products, and it delivers publicly available goods that contribute to benefits for environmental and human health, animal welfare and rural development.

The legal framework for organic farming in the EU is defined by Council Regulation 2018/848[10], which came into force on 1 January 2022. Organic agriculture is defined by regulated standards (production rules), certification procedures (compulsory inspection schemes) and a specific labelling scheme in the EU.

Utilised agricultural area (UAA): the total area taken up by arable land, permanent grassland, permanent crops and kitchen gardens, regardless of the type of tenure or whether or not it is used as a part of common land. It excludes land used for mushroom cultivation; unutilised agricultural land (NUAA); woodland (WA); other land occupied by, for example, buildings, farmyards, tracks or ponds; UAA that is the property of the owner but is leased or rented to someone else; and common land that is not used (NUAA).

See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Utilised_agricultural_area_(UAA)

Methodology

The total organic agricultural area is reported by countries in accordance with Regulation (EU) 2018/848 [10]. The data from non-EU EEA member countries and cooperating countries are transmitted annually to Eurostat on a voluntary basis, based on the European Statistical System Agreement.

The EU's total organic agricultural area is calculated by Eurostat as the sum of the areas reported by the EU Member States. The total organic agricultural area as a share of the UAA is calculated as a percentage by Eurostat. The data set is updated annually by Eurostat, as soon as the underlying data become available and have been validated by Eurostat.

Switzerland provides the percentage of the organic area calculated from the national UAA excluding summer pastures and from the national data on the organic farming area.

Methodology for gap filling

EU aggregates were calculated from available national data except in a few cases for which national data were not yet available and the data reported for the previous year by a country were taken into account in the calculation of the EU aggregate. Data gaps for Greece and Austria in 2021 were filled by using data from 2020.

Methodology references

https://ec.europa.eu/eurostat/cache/metadata/en/org_esms.htm

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards achieving objectives of the Eighth Environment Action Programme (8th EAP)[11][12]. It mainly contributes to monitoring food system aspects of the 8th EAP priority objective under Article 2(f), to be met by 2030: 'promoting environmental aspects of sustainability and significantly reducing key environmental and climate pressures related to the Union's production and consumption, in particular in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system[12].' The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor whether the EU will reach '25% of EU agricultural land organically farmed by 2030'[11].

The indicator is also used for several monitoring frameworks such as for EU monitoring related to the United Nations Sustainable Development Goals.

Organic farming is one of the areas covered by the European Green Deal's Farm to Fork strategy, which sets a target that: 'at least 25% of the EU's agricultural land should be under organic farming by 2030'[2]. To achieve this target and to help the organic farming sector reach its full potential, a comprehensive action plan for organic production in the EU was set out[6]. It includes 23 actions, some of which follow on from the actions successfully undertaken in the period 2014-2020 and some of which are new, complementing existing actions and mobilising different sources of funding.

The three interlinked axes of the action plan reflect the structure of the food supply chain and the European Green Deal's sustainability objectives.

· Axis 1: stimulate demand and ensure consumer trust

· Axis 2: stimulate conversion and reinforce the entire value chain

· Axis 3: organics leading by example — increase the contribution of organic farming to environmental sustainability.

As part of the action plan, the regulation laying down the rules related to organic production in the EU has been revised. Since 1 January 2022, Regulation (EU) 2018/848[10] of the European Parliament and of the Council of 30 May 2018 has been the applicable legislative act, also known as the 'basic act'. It lays down rules on organic production and the labelling of organic products, and repeals and replaces Council Regulation (EC) No 834/2007 of 28 June 2007[13]. It aims, among other things, to:

· strengthen the control system to build increased trust in EU organic certification

· make the organic conversion easier for smaller-scale farmers

· ensure the same standards for imported organic products as for EU organic products

· increase the range of products that can be marketed as organic.

Related policy documents

· Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007[10].

· Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an action plan for the development of organic production. COM/2021/141 final[6].

· Stakeholder Consultation — Synopsis report accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an action plan for the development of organic production. SWD/2021/65 final[14].

Rationale

Organic farming is a farming system that has been explicitly developed to be environmentally sustainable. It is governed by clear, verifiable rules. In the EU, farming is considered organic only if it complies with Regulation (EU) No 2018/848 (Council Regulation (EC) No 834/2007 of 28 June 2007 before Regulation (EU) No 2018/848 entered into force). In line with this legislation, organic farming is differentiated from other approaches to agricultural production by the application of a monitored conversion period (from conventional farming), regulated standards (production rules), certification procedures (compulsory inspection schemes) and a specific labelling scheme. It is thus more suited to identifying environmentally friendly farming practices than other types of farming that also consider environmental aspects.

Accuracy and uncertainties

The accuracy of the data varies in the reporting countries. In most countries, a large share of the data comes from the responsible national control body. There are only provisional or estimated values for a few countries.

Data sets uncertainty

Geographic coverage:

· Data are presented for all EU Member States.

· Non-EU EEA member countries with available data for 2021: Norway, Switzerland, Türkiye and for 2012: Norway, Switzerland.

· Non-EU EEA cooperating countries with available data for 2021: Albania, Montenegro, North Macedonia. No data for 2012.

Time coverage: 2012-2021. Data from before 2012 are not used for the indicator assessment, as these data are not comparable with data series from 2012-2021 because of methodological changes in data collection and reporting procedures.

Representativeness of data at the national level:

· The level of representativeness is high.

Comparability:

· The level of comparability is high. An EU-harmonised questionnaire is available for collecting data on organic farming, which guarantees geographical comparability. The actual comparability depends on national practices, left to subsidiarity.

· Length of comparable time series without methodological break is longer than four data points.

Rationale uncertainty

No uncertainty has been specified.

Data sources and providers

- Organic crop area by agricultural production methods and crops (ORG_CROPAR), Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Pressure

Topics

Agriculture and food   # Land use

Tags

Utilised agricultural area   # AGRI001   # Organic farming   # 8th EAP

Temporal coverage

2012-2021

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece

Hungary
Iceland
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Türkiye

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life on land

Unit of measure

Percentage of total utilised agricultural area (UAA)

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. EC, 2020, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: EU biodiversity strategy for 2030 — Bringing nature back into our lives, COM(2020) 380 final. ↵

2. EC, 2020, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A farm to fork strategy for a fair, healthy and environmentally-friendly food system, COM(2020) 381 final.
a b

3. European Commission. Directorate General for Agriculture and Rural Development., 2022b, *EU agricultural outlook for markets, income and environment 2022-2032.*, Publications Office, LU.
↩

4. EC, 2021, 'EU agricultural outlook 2021-31: sustainability and health concerns to shape agricultural markets', (https://agriculture.ec.europa.eu/news/eu-agricultural-outlook-2021-31-sustainability-and-health-concerns-shape-agricultural-markets-2021-12-09_en) accessed January 19, 2023.
↩

5. Projections about the share of organic farming in 2030 are uncertain due to different reasons such as the evolution of the organic farming market becoming less predictable due to current uncertainty in economic developments. High inflation levels might affect food prices on the short- and medium-term, which might slow down the increase in demand for organic products (EC, 2022b). Support for research and innovation in organic farming is being increased in the EU (EC, 2023), but it is not yet possible to factor in the development and uptake of research & innovation in organic farming practices, which is key to improve their competitiveness and hence uptake.
↩

6. EC, 2021, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS ON AN ACTION PLAN FOR THE DEVELOPMENT OF ORGANIC PRODUCTION
a b c

7. EU, 2021, Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP strategic plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013, OJ L 435, 6.12.2021, p. 1-186.
↩

8. Some Member States set organic farming area targets for 2027 some others for 2030. The targets are set only for areas receiving CAP support for organic farming. Areas farmed organically without receiving CAP support are not included. In 2020, 61.6% of organically farmed land received specific organic CAP payment.

↩

9. Based on 2020 data.
↩

10. EU, 2018, Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007, OJ L 150, 14.6.2018, p. 1-92., 848
a b c d

11. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the programme's 2030 and 2050 priority objectives, COM(2022) 357 final.
a b

12. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22–36.
a b

13. EU, 2007, Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91, OJ L 189, 20.7.2007, p. 1-23.
↩

14. EC, 2021, Stakeholder consultation — synopsis report accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an action plan for the development of organic production, SWD(2021) 65 final.
↩

European Environment Agency

8th Environment Action Programme

Share of environmental taxes in total tax revenues

8TH EAP HEADLINE INDICATOR, 2023

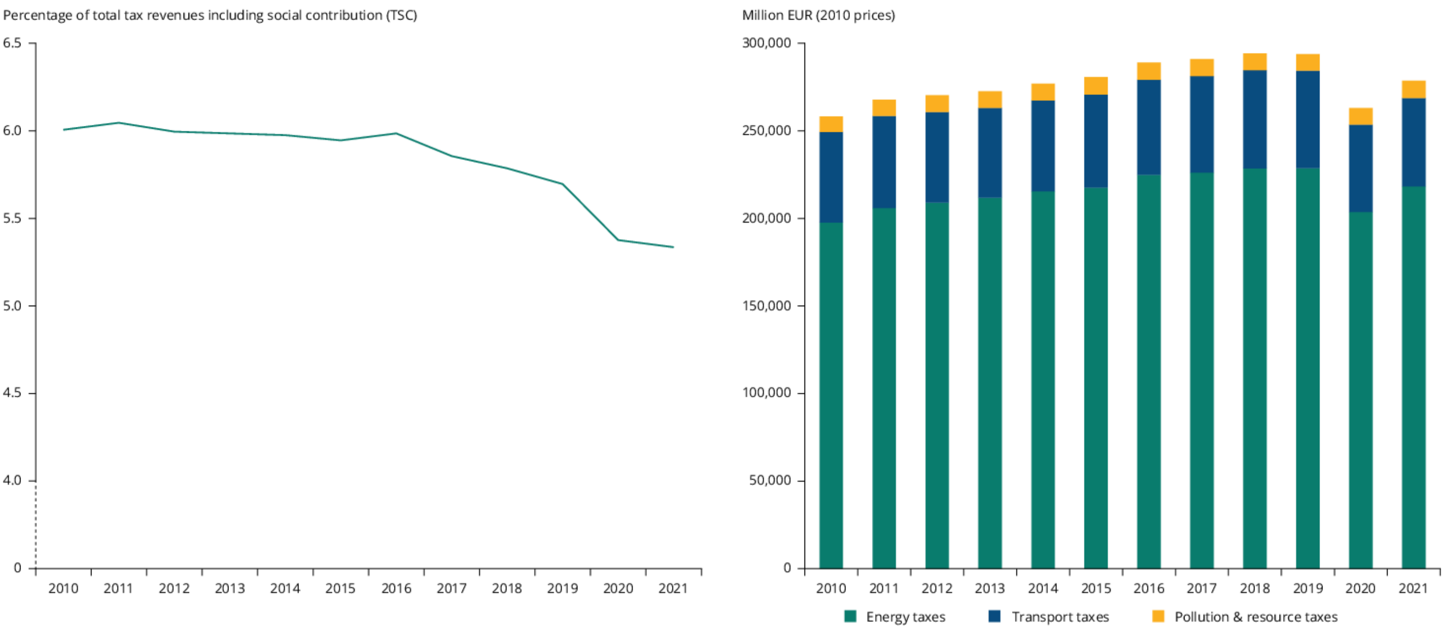
European Environment Agency

Share of environmental taxes in total tax revenues

Published 26 Apr 2023

> Despite the essential role of environmental taxation for the transition to a greener economy the share of environmental taxes in total revenues from taxes and social contributions in the EU decreased from 6% in 2010 to 5.4% in 2021. The share may increase by 2030 as a result of the plans to increase the ambition and scope of EU emissions trading. This is relatively uncertain because increased revenues from emission trading schemes may be offset by decreased revenues from energy taxation as future greenhouse gas emissions reductions erode the tax base.

Figure 1. Revenue from environmental taxes in the 27 EU Member States, in terms of absolute revenue and as a share (%) of total tax revenue including social contributions, 2010-2021



Source: Eurostat.

Environmental taxes encourage producers and consumers to pollute less and use resources more sustainably. Making polluters pay is at the core of EU environmental policy [1], and both the Eighth Environment Action Programme [2] and the European Green Deal [3] acknowledge that environmental taxation is crucial for driving the transition to a greener, more sustainable economy.

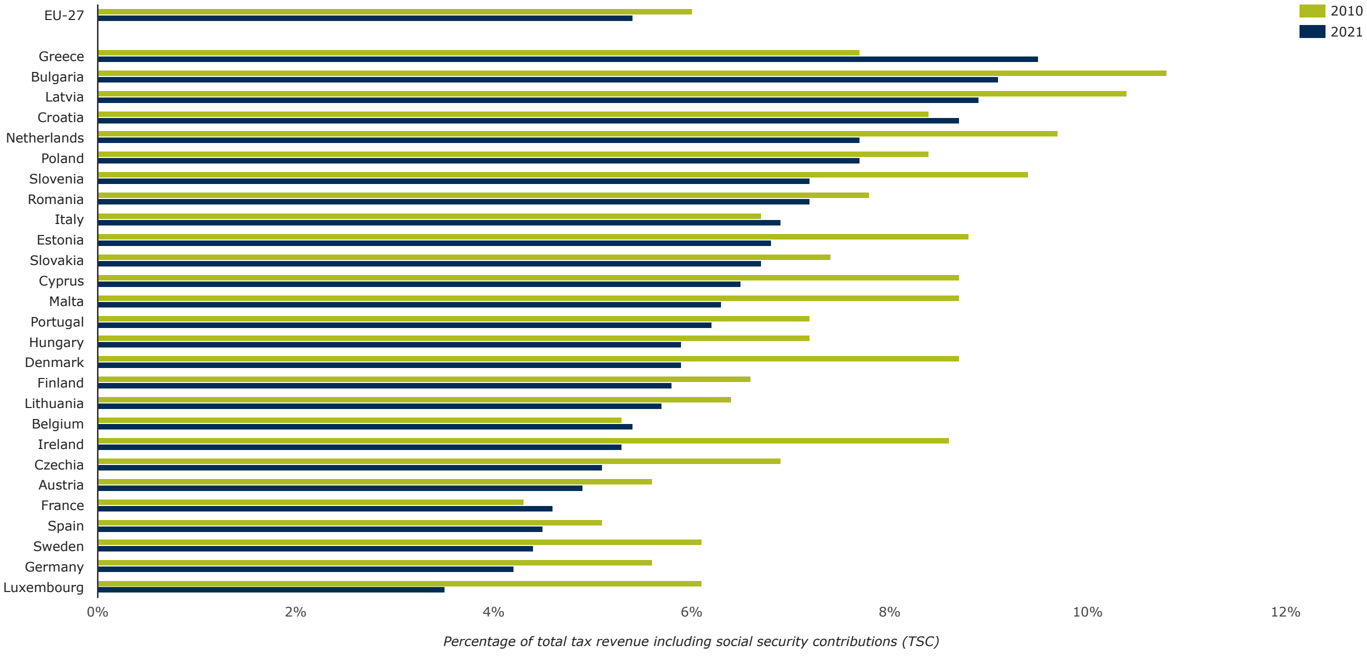
Despite this, the share of total tax revenue accounted for by environmental taxes fell from 6% in 2010 to 5.4% in 2021. This lack of progress is mainly attributed to the social and economic difficulties that countries can face in maintaining or increasing environmental taxes, which can have the effect of increasing the cost of necessary goods such as food and energy. The marked decline in environmental tax revenue in 2020 can be largely attributed to restrictions (e.g. on transport) related to the COVID-19 pandemic. Environmental tax revenue had increased again in 2021, by 5.9% compared with 2020, but was still lower than before the pandemic.

In 2021, energy and transport taxes combined accounted for 96% of total environmental tax revenue, with energy taxes, including revenue from the EU Emissions Trading System (EU ETS), accounting for 78% and transport taxes for 18% [4].

Whether or not environmental taxes will account for a larger share of total tax revenue by 2030 is uncertain. On the one hand, changes as part of the Fit for 55 policy package [5] are expected to increase EU ETS revenue, as sectors already covered by the EU ETS will have more ambitious greenhouse gas (GHG) emission reduction targets and new sectors (road transport, heating of buildings, fuel use in certain industrial sectors) will be included in a new EU ETS [6]. On the other hand, this revenue is expected to reach a peak and then decline as more stringent GHG emission reduction requirements are introduced and drive down emissions. Moreover, technological breakthroughs in the energy and transport sectors are expected to further drive the EU's transition to a low-carbon, green economy. The resulting erosion of the environmental tax base will make it difficult to increase environmental tax revenue during the 2030s.

Research and analysis suggest that environmental taxation schemes are more likely to succeed, with minimal negative economic and social impacts, if they are carefully planned and based on widespread consultation [7]. This should be borne in mind when devising environmental taxation strategies for the coming years.

Figure 2. Revenue from environmental taxes as a share (%) of total tax revenue, including social security contributions, by EU Member State, 2010 and 2021



Source: Eurostat.

Data used in the graph

Countries	2010	2021
EU-27	6	5.4
Greece	7.7	9.5
Bulgaria	10.8	9.1
Latvia	10.4	8.9
Croatia	8.4	8.7
Netherlands	9.7	7.7
Poland	8.4	7.7
Slovenia	9.4	7.2
Romania	7.8	7.2
Italy	6.7	6.9
Estonia	8.8	6.8
Slovakia	7.4	6.7
Cyprus	8.7	6.5
Malta	8.7	6.3
Portugal	7.2	6.2
Hungary	7.2	5.9
Denmark	8.7	5.9
Finland	6.6	5.8
Lithuania	6.4	5.7
Belgium	5.3	5.4
Ireland	8.6	5.3
Czechia	6.9	5.1
Austria	5.6	4.9

Countries	2010	2021
France	4.3	4.6
Spain	5.1	4.5
Sweden	6.1	4.4
Germany	5.6	4.2
Luxembourg	6.1	3.5

Trends in the share of total tax revenue accounted for by environmental taxes vary across the Member States. Between 2010 and 2021, this share increased in only five Member States (Greece, Croatia, Italy, Belgium and France). The largest increase, from 7.7% to 9.5%, occurred in Greece, although this level was still lower than its share in the mid-1990s, which was more than 10%. The largest fall between 2010 and 2021 — of more than 2 percentage points — occurred in Ireland, followed by Denmark, Luxembourg, Malta, Slovenia, Cyprus and Estonia.

Supporting information

Definition

'An environmental tax is a tax whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is defined in the ESA [European System of Accounts] as a tax' [8]. This indicator measures environmental tax revenue as a share of total tax revenue, including social contributions, and is calculated by dividing environmental tax revenue by total tax revenue including social contributions.

Methodology

This indicator is based directly on data published by Eurostat, and the underpinning methodology can be found in Eurostat [8].

The absolute amount of environmental tax revenue was deflated based on 2010 prices using the Eurostat gross domestic product (GDP) deflator.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting the objectives of the Eighth Environment Action Programme (8th EAP). It contributes mainly to monitoring progress in relation to aspects of Article 3(v), which requires 'making the best use of environmental taxation, market-based instruments and green budgeting and financing tools, including those required to ensure a socially fair transition' [9]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the 'increase inthe share of environmental taxes in total revenues from taxes and social contributions' [9].

Accuracy and uncertainties

Data sources and providers

- GDP and main components (output, expenditure and income) [NAMA_10_GDP__custom_3489075], Statistical Office of the European Union (Eurostat)
- Environmental tax revenues [ENV_AC_TAX__custom_4559839], Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Response

Topics

 # Sustainable finance

Tags

 # environmental tax **# SUFI001** **# green economy** **# budget revenue** **# public budget** **# 8th EAP** **# Tax** **# total tax** **# Sustainable finance**

Temporal coverage

2010-2021

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia

Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

Environmental tax revenue as a percentage of total tax revenue including social contributions, and the absolute amount of environmental tax revenue, in million euros, in 2010 prices.

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. https://environment.ec.europa.eu/economy-and-finance/ensuring-polluters-pay_en ↩
2. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22-36. ↩
3. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions ‘The European Green Deal’, COM (2019) 640 final of 11 December 2019.

↩

4. EEA calculation based on national tax lists, downloaded from the Eurostat Statistics Explained article ‘Tax revenue statistics’ (Eurostat, 2022)
↩

5. EC, 2021, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘“Fit for 55”: delivering the EU’s 2030 climate target on the way to climate neutrality’, COM(2021) 550 final of 14 July 2021.
↩

6. See the press release of the European Council ‘“Fit for 55”: Council and Parliament reach provisional deal on EU emissions trading system and the Social Climate Fund’ of 18 December 2022 and amended on 8 February 2023 (European Council, 2022). This deal sets out an increase in emission reduction targets for the sectors covered by the existing ETS to 62% by 2030 compared with 2005 levels. These targets are to be achieved via an increase in the annual reduction rate of the existing EU ETS to 4.3% per year from 2024 to 2027 and to 4.4% from 2028 to 2030 as compared with the linear reduction rate of 1.74% per year during phase 3 of the EU ETS between 2013 and 2020 and the annual reduction rate of 2.2% from 2021 for phase 4
↩

7. IEEP, 2015, 'Overcoming obstacles to green fiscal reform', in: Institute for European Environmental Policy, University of Venice, Venice, Italy.
↩

8. Eurostat, 2023, 'Environmental tax statistics — detailed analysis', *Eurostat Statistic Explained* (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_tax_statistics_-_detailed_analysis) accessed January 16, 2023.
a b

9. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme’s 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.
a b

European Environment Agency

8th Environment Action Programme

Fossil fuel subsidies

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

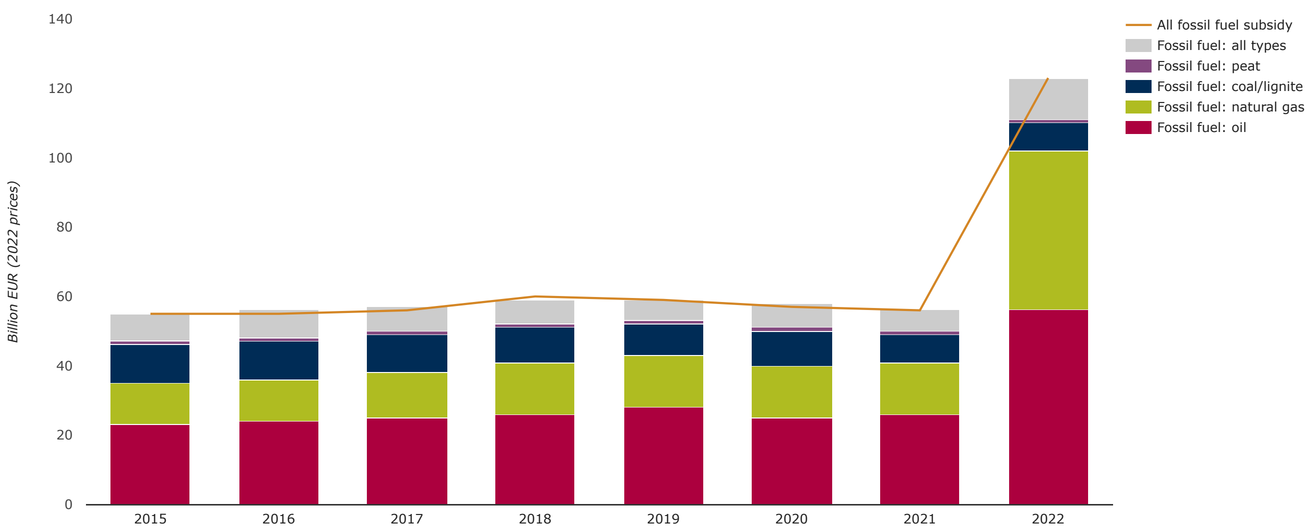
Fossil fuel subsidies

Published 17 Nov 2023

Analysis and data > Indicators > Fossil fuel subsidies

The EU's Eighth Environment Action Programme, in line with EU and international commitments, calls for an immediate phase out of fossil fuel subsidies. Fossil fuel subsidies remained relatively stable at about EUR 56 billion (2022 prices), over the period 2015-2021, yet increased to EUR 123 billion in 2022. This can be interpreted as a result of high energy prices related to post-COVID recovery and Russia's invasion of Ukraine. Most EU Member States have no concrete plans on how and when they will phase out these subsidies, therefore, it is unlikely but uncertain that the EU will make much progress towards phasing out fossil fuel subsidies by 2030.

Figure 1. Fossil fuel subsidies in the 27 EU Member States, 2015-2022



Source: European Commission.

Data used in the graph

Year	Fossil fuel: oil	Fossil fuel: natural gas	Fossil fuel: coal/lignite	Fossil fuel: peat	Fossil fuel: all types	All fossil fuel subsidy
2015	23	12	11	1	8	55
2016	24	12	11	1	8	55
2017	25	13	11	1	7	56
2018	26	15	10	1	7	60
2019	28	15	9	1	6	59
2020	25	15	10	1	7	57
2021	26	15	8	1	6	56
2022	56	46	8	1	12	123

Note for all figures: All monetary values are expressed in 2022 prices. Data for 2022 are provisional as fossil fuel subsidy figures (about 7% of total) are still under evaluation.

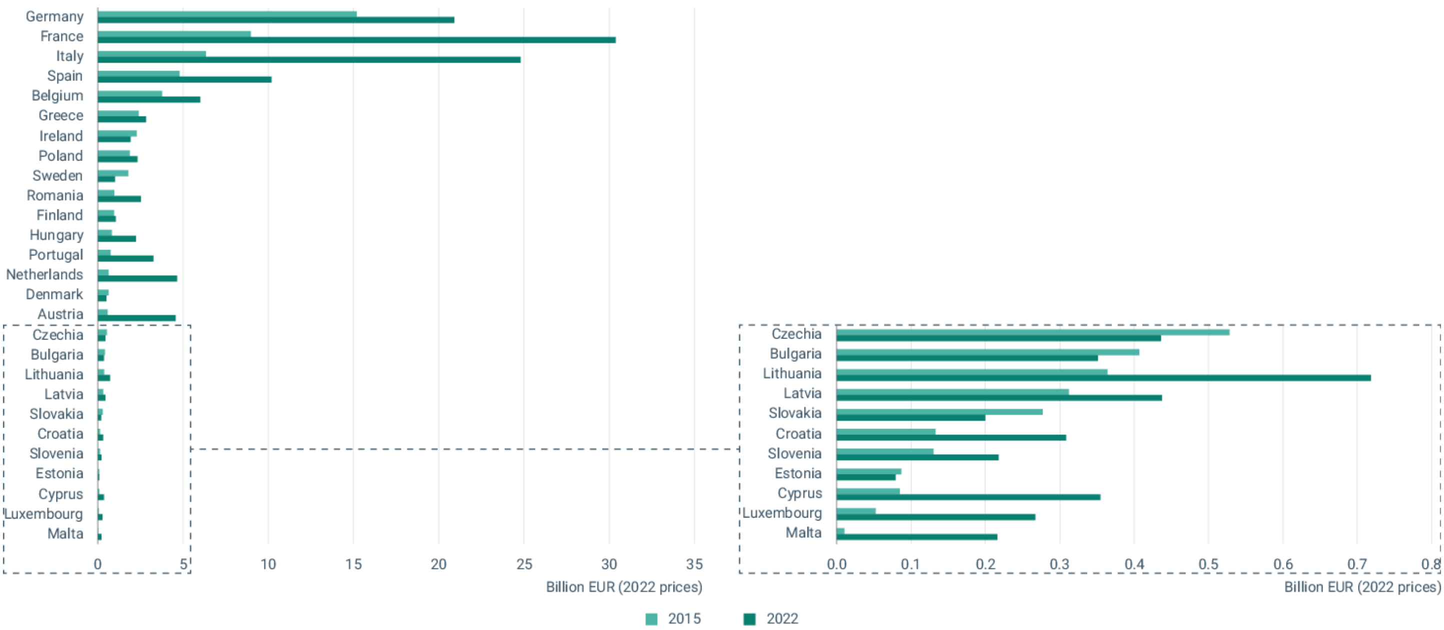
Fossil fuels are non-renewable sources of energy, and their production and use contribute significantly to climate change and pollution. In line with international commitments — such as the G20 Pittsburgh Summit [1] and COP26 Glasgow Climate Pact [2] — and the European Green Deal [3], the EU's Eighth Environment Action Programme (8th EAP) [4] calls for an immediate phase out of subsidies for fossil fuels (such as coal, gas and oil). Progress towards this is monitored as part of the European Commission's State of the Energy Union report [5] [6].

Fossil fuel subsidies remained more or less stable, at about EUR 56 billion (2022 prices), over the period 2015-2021. The increase of EUR 5 billion from 2015 to 2018 was mainly due to an increase in subsidies in the transport and industry sector. The decrease of EUR 4 billion from 2018 to 2021 was mostly due to decreases in the energy sector and decreases in subsidies for coal and lignite. The growth in fossil fuel subsidies in 2022 can be attributed to the energy price crisis and was intensified by the Russian invasion of Ukraine as EU Member States implemented more than 230 temporary subsidy measures to protect households and industries [7][8].

Member States are required to include information in their annual national energy and climate progress reports on phasing out energy subsidies, particularly fossil fuels. According to these reports , many countries have ambitions to move away from fossil fuel use, but only a few (Denmark, Germany, Ireland, Italy and Sweden) have translated these ambitions into laws or clear plans that specify when they intend to phase out fossil fuel subsidies [9].

It can be expected that the sharp rise in fossil fuel subsidies is an outlier as 47% of total fossil fuel subsidies in 2022 amounting to EUR 58 billion have a planned end-date before 2025 and only about 1% have an end-date between 2025 and 2030. There is no end-date provided or the end-date is after 2030 for the largest part of fossil fuel subsidies [8].

Figure 2. Fossil fuel subsidies in EU Member States, 2015 and 2022 (in 2022 prices)



Source: European Commission.

An assessment of the progress towards phasing out fossil fuel subsidies – based on the amount of fossil fuel subsidies of 2022 – is difficult in the current political and economic environment. The EU Member States responded very different as most of them provided generous financial support through fossil fuel subsidies. On the contrary, the amount of fossil fuel subsidies declined in four EU Member States (Czechia, Denmark, Poland and Slovakia) between 2021 and 2022. When analysing the trend between 2015 and 2022 then seven EU Member States made progress in phasing out fossil fuel subsidies as fossil fuel subsidies are lower in these countries in 2022 as compared to 2015 (in 2022 prices).

It should be noted that, in terms of absolute value, that more than 60% of all fossil fuel subsidies granted in 2022 were spent in three countries: Germany (EUR 21 billion), Italy (EUR 25 billion) and France (EUR 30 billion).

The extent to which fossil fuel subsidies contribute to national economies also varies considerably across Member States. Fossil fuel subsidies represent the highest shares of gross domestic product

(GDP) in Portugal, Greece, Cyprus, Hungary and Malta (1.3%) and the lowest share in Slovakia, Sweden, Czechia and Denmark (less than 0.2% of GDP) [8].

Additional figure: Fossil fuel subsidies as a share of national gross domestic products, 2020.

Supporting information

Definition

This indicator is based on the concept developed by the World Trade Organization (WTO) through the Agreement on Subsidies and Countervailing Measures (ASCM), which classifies subsidies and government interventions into four main categories:

1. direct transfers: direct expenditures by governments to recipients, which could be either consumers or producers;
2. tax expenditures: the amounts of tax benefits, or preferences, received by taxpayers and forgone by governments;
3. income or price support mechanisms: various types of economic mechanisms, most of which can be considered cross-subsidies, i.e. involve transferring amounts of money from groups of people/technology/territory to another specific group;
4. RD&D budgets: various types of provisions for financial and/or other preferential mechanisms to support innovation.

For more information on the concept and definition of energy subsidies, see Annex 5 to EC.[9]

Methodology

A recurring obstacle preventing the pledge to phase out fossil fuel subsidies from being realised is the lack of a shared definition internationally [10]. This repeatedly stressed barrier is addressed by the Commission under the Regulation on the Governance of the Energy Union and Climate Action [11] through the adoption of 'implementing acts… , including a methodology for the reporting on the phasing out of energy subsidies, in particular for fossil fuels' [12]. As the European Commission published Implementing Regulation (EU) 2022/2299 [13] in November 2022, the basis of the current assessment for this indicator is the data-gathering exercise performed by external consultants for the European Commission and published in the Commission report on energy subsidies in the EU [14] accompanying the 2023 State of the Energy Union report. The methodology behind the data collection and validation process is discussed in detail in Annex 5.1 to EC [9].

The data were deflated to 2022 prices as published in EC [14][9].

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting the objectives of the 8th EAP. It contributes mainly to monitoring progress in relation to aspects of Article 3(h), which requires, inter alia, 'phasing out environmentally harmful subsidies, in particular fossil fuel subsidies, at Union, national, regional and local level, without delay… by… (ii) setting a deadline for the phasing out of fossil fuel subsidies consistent with the ambition of limiting global warming to 1,5°C’ [15]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the reduction in ‘environmentally harmful subsidies, in particular fossil fuel subsidies, with a view to phasing them out without delay’ [4].

Accuracy and uncertainties

Data sources and providers

- Fossil fuel subsidies (No direct URL to dataset), European Commission

Metadata

DPSIR

Response

Topics

Sustainable finance

Tags

SUFI002 # 8th EAP # subsidies # Fossil fuel

Temporal coverage

2015-2022

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Ireland
Italy	Latvia
Lithuania	Luxembourg
Malta	Netherlands
Poland	Portugal
Romania	Slovakia

Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

Absolute subsidy amounts are measured in billion euros (EUR) and the contributions of fossil fuel subsidies to GDPs are given as percentages (%).

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. OECD, 2009, *Leaders' statement: the Pittsburgh Summit — September 24-25 2009*, Organisation for Economic Co-operation and Development.
↩
2. UK Government, 2022, *COP26: the Glasgow Climate Pact*, United Nations Climate Change Conference UK 2022.
↩
3. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal', COM (2019) 640 final of 11 December 2019.
↩
4. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme's 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.
a b
5. EC, 2023, Report from the Commission to the European Parliament and the Council '2023 report on energy subsidies in the EU' (COM(2023) 651 final of 24 October 2023).
↩

6. EC, 2023, Study on energy subsidies and other government interventions in the European Union — 2023 edition, Final Report, Directorate-General for Energy (https://op.europa.eu/en/publication-detail/-/publication/32d284d1-747f-11ee-99ba-01aa75ed71a1/language-en) doi: 10.2833/571674
↵
7. EC, 2023, Report from the Commission to the European Parliament and the Council '2023 report on energy subsidies in the EU' (COM(2023) 651 final of 24 October 2023).
↵
8. EC, 2023, Study on energy subsidies and other government interventions in the European Union — 2023 edition, Final Report, Directorate-General for Energy (https://op.europa.eu/en/publication-detail/-/publication/32d284d1-747f-11ee-99ba-01aa75ed71a1/language-en doi: 10.2833/571674
a b c
9. EC, 2022, *Study on energy subsidies and other government interventions in the European Union — 2022 edition*, Final Report, Directorate-General for Energy.
a b c d
10. OECD and IEA, 2021, *Update on recent progress in reform of inefficient fossil-fuel subsidies that encourage wasteful consumption 2021*, Contribution by the Organisation for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA) to G20 Environment, Climate and Energy Ministers, in consultation with the Organization of Petroleum Exporting Countries (OPEC), Climate and Energy Joint Ministerial Meeting, Naples, 23 July 2021.
↵
11. EU, 2018, Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJ L 328, 21.12.2018, p. 1-77.
↵
12. EU, 2021, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), OJ L 243, 9.7.2021, p. 1-17.
↵
13. EU, 2022, Commission Implementing Regulation (EU) 2022/2299 of 15 November 2022 laying down rules for the application of Regulation (EU) 2018/1999 of the European Parliament and of the Council as regards the structure, format, technical details and process for the integrated national energy and climate progress reports, OJ L 306, 25.11.2022. p. 1-98.
↵
14. EC, 2022, Report from the Commission to the European Parliament and the Council '2022 report on energy subsidies in the EU', COM(2022) 642 final of 15 November 2022.
a b
15. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22-36.
↵

European Environment Agency

8th Environment Action Programme

Environmental protection expenditure

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

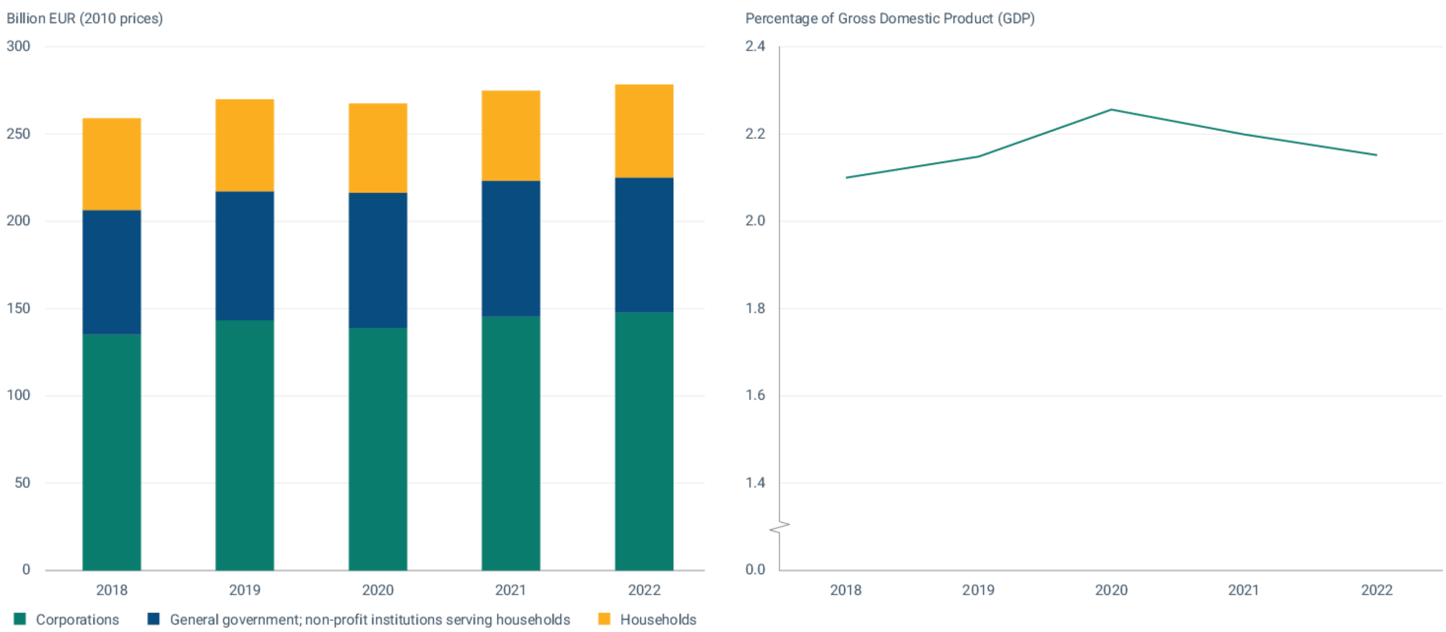
Environmental protection expenditure

Published 11 Sept 2023

Analysis and data > Indicators > Environmental protection expenditure

The EU must increase environment- and climate-related expenditure to meet the objectives of the European Green Deal. Environmental protection expenditure (EPE) mainly includes expenditure related to the abatement of air, water, soil and noise pollution, the protection of biodiversity, the management of wastewater and waste, and environmental research and development. In real terms, the expenditure increased by 7% between 2018 and 2022 in the EU, reaching EUR 278 billion in 2022. It is very likely that it will continue to increase in the coming years, as additional funds will be made available.

Figure 1. Environmental protection expenditure by institutional sector in the period 2018-2022, EU–27



Source: Eurostat.

Building on the European Green Deal policy objectives [1], the Eighth Environment Action Programme (8th EAP) aims to accelerate the green transition [2]. To achieve this, environmental protection expenditure (EPE) must be increased in the Member States, and so must green expenditure beyond that directly related to environmental protection, such as expenditure on renewables, energy and resource efficiency, and the circular economy transition. EPE includes expenditure on the protection of ambient air, soil and water; wastewater and waste management; noise abatement; biodiversity protection; protection against radiation; and environmental research and development (R&D). EPE only partly captures expenditure related to the climate-related expenditure [3][4] and the circular economy [5][6].

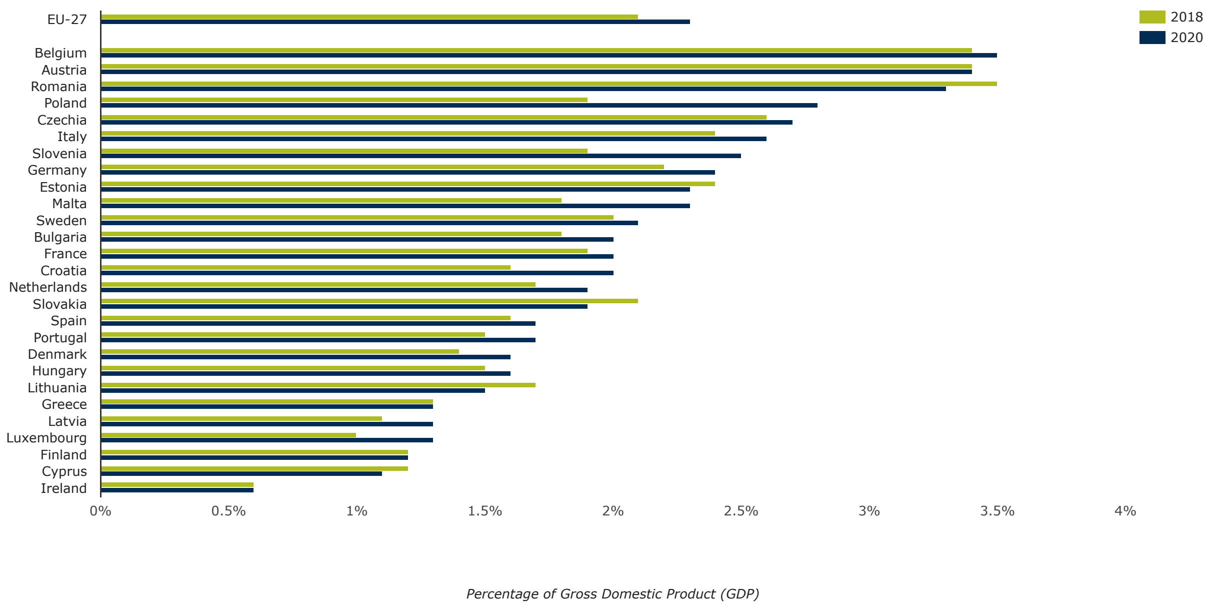
EPE includes both operating expenditure and investments. In real terms, it grew by 7% in the period 2018-2022, reaching an estimated EUR 278 billion by 2022 (2010 prices). Most EPE is spent by corporations, and this spending increased by 9% between 2018 and 2022, while the EPE of general governments and non-profit institutions serving households increased by 8%. Most EPE was spent on waste management and wastewater treatment activities in this period [7].

Since 2018, the share of overall EPE in gross domestic product (GDP) has remained relatively stable, at around 2%. The increase in this share in 2020 was an anomaly caused by the decline in GDP during the COVID-19 pandemic. In absolute terms, EPE was roughly the same in 2020 as in 2019 and increased by about 4% and EUR 11 billion (2010 prices) in 2022.

It is very likely that EPE will increase in the coming years, as additional resources have been made available. The EU's 2021-2027 budget has earmarked additional funding for climate- and biodiversity-related activities [8]. Moreover, grants and loans for climate-related activities are available through the 2021-2026 EU Recovery and Resilience Facility (RRF) [8]. The RRF was created to mitigate the social and economic impacts of the COVID-19 pandemic and supports the EU's aim to achieve a twin digital and green transition.

To achieve EU's objectives on environmental protection, resource management and the circular economy by 2030 [9], the additional investments needed for the period 2021-2030 are estimated at approximately EUR 77 billion per year for environmental protection, as covered by EPE, and EUR 53 billion per year for resource management and the circular economy transition. It is uncertain if investments, for example in national EPE, EU funding and private circular economy financing, will increase at a fast enough rate to bridge the gap between current investment and total investment needed by 2030. For instance, environmental protection investments account for only a small share of total EPE, amounting to 20% in 2022, and increased from EUR 51 billion (2010 prices) in 2018 to EUR 56 billion (2010 prices) in 2022 (EEA's own calculations based on data from Eurostat [7]. InvestEU and sustainable finance actions are expected to trigger additional private capital flows in Member States for sustainable investment, which would help to fill the investment gap.

Figure 2. Expenditure on environmental protection by EU Member State, 2018 and 2020, (% of GDP)



Source: Eurostat.

Data used in the graph

Countries	2018	2020
EU-27	2.1	2.3
Belgium	3.4	3.5
Austria	3.4	3.4
Romania	3.5	3.3
Poland	1.9	2.8
Czechia	2.6	2.7
Italy	2.4	2.6
Slovenia	1.9	2.5
Germany	2.2	2.4
Estonia	2.4	2.3
Malta	1.8	2.3
Sweden	2	2.1
Bulgaria	1.8	2
France	1.9	2
Croatia	1.6	2
Netherlands	1.7	1.9
Slovakia	2.1	1.9
Spain	1.6	1.7
Portugal	1.5	1.7
Denmark	1.4	1.6
Hungary	1.5	1.6
Lithuania	1.7	1.5
Greece	1.3	1.3
Latvia	1.1	1.3
Luxembourg	1	1.3
Finland	1.2	1.2
Cyprus	1.2	1.1

Countries	2018	2020
Ireland	0.6	0.6

EPE increased from 2.1% to 2.3% of GDP between 2018 and 2020 at the EU level. EPE to GDP ratios varied greatly across the Member States. In Austria, Belgium and Romania EPE accounted for more than 3% of GDP, while in Ireland it accounted for less than 1%. In 21 of the 27 EU Member States, this share increased during the period 2018-2020, with the biggest increases in Poland (1 percentage point) and Malta (0.6 percentage points). In contrast, the share fell in the other EU Member States, with the biggest reductions in Lithuania and Cyprus.

Supporting information

Definition

'Environmental Protection Expenditure Accounts (EPEA) measure the economic resources devoted to prevention, reduction, and elimination of pollution and any other degradation of the environment. They cover the spending by resident units of a country (i.e. by its households, corporations and government) on environmental protection (EP) services, e.g. pollution abatement (air, water, soil and noise), waste and wastewater management, protection of biodiversity as well as related research and development, education and training activities' [7].

The scope of EPEA is defined according to the Classification of Environmental Protection Activities and Expenditure (CEPA 2000). CEPA 2000 is a recognised international standard included in the family of international economic and social classifications.

For further information, see Eurostat (2017).

Methodology

This indicator is directly based on data published by Eurostat and the underpinning methodology can be found in Eurostat [10][7]. EU-level data are based on Eurostat estimates.

The EUR values were deflated to 2010 prices using the Eurostat GDP deflator.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting one of the targets of the 8th EAP. It contributes mainly to monitoring progress in relation to aspects of the 8th EAP's aim to accelerate the green transition (Article 1) and Article 3(u), which requires 'mobilising resources and ensuring sufficient sustainable investments from public and private sources… consistent with the Union's sustainable finance policy agenda' [2]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the 'increase [in] spending by households, corporations and governments on preventing, reducing and eliminating pollution and other environmental degradation' [11].

Accuracy and uncertainties

Data sources and providers

- GDP and main components (output, expenditure and income) [NAMA_10_GDP__custom_6753046], Statistical Office of the European Union (Eurostat)
- National expenditure on environmental protection by institutional sector [ENV_AC_EPNEIS__custom_6972421], Statistical Office of the European Union (Eurostat)
- National expenditure on environmental protection by institutional sector [ENV_AC_EPNEIS__custom_6972306], Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Response

Topics

 # Sustainable finance

Tags

 # GDP # SUFI003 # climate # 8th EAP # Environmental protection expenditure # environment # expenditure # environmental protection investment # Sustainable finance

Temporal coverage

2018-2022

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

EPE is measured in billion euros (EUR) and as a share of GDP (%)

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal', COM (2019) 640 final of 11 December 2019.
↵
2. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union environment action programme to 2030, OJ L 114, 12.4.2022, p. 22-36.
a b
3. It does not capture expenditure on the production of renewable energies, energy efficiency in general or climate adaptation. However, it now includes expenditure on clean transport (vehicles and charging systems) as directly contributing to reducing air pollution. See CEPA and EPEA explanatory notes (Eurostat, 2020).
↵
4. https://ec.europa.eu/eurostat/documents/1798247/12177560/CEPA+and+CReMA+explanatory+notes+-+technical+note.pdf/b3517fb9-1cb3-7cd9-85bd-4e3a3807e28a?t=1609863934103
↵
5. Information on circular economy private investments in Member States is available in a data set published by Eurostat, under the circular economy indicators on competitiveness and innovation (see data set 'Private investment and gross value added related to circular economy sectors'
↵
6. https://ec.europa.eu/eurostat/web/products-datasets/-/cei_cie010
↵
7. Environmental protection expenditure accounts, 2023b, (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_protection_expenditure_accounts) accessed August 28, 2023.
a b c d
8. EC, 2021, *The EU's 2021-2027 long-term budget and NextGenerationEU — facts and figures*, Publications Office of the European Union, Luxembourg.
a b
9. EC, 2020, Commission staff working document 'Identifying Europe's recovery needs' accompanying the document Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'Europe's moment: repair and prepare for the next generation', SWD(2020) 98 final of 27 May 2020.
↵
10. Eurostat, 2023, 'National expenditure on environmental protection by institutional sector', *Eurostat Data Browser* (https://ec.europa.eu/eurostat/databrowser/view/env_ac_epneis/default/table?lang=en) accessed March 24, 2023.
↵

11. EC, 2022, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions ‘REPowerEU plan’, COM (2022) 230 final of 18 May 2022
↵

European Environment Agency

8th Environment Action Programme

Green bonds

8TH EAP HEADLINE INDICATOR, 2023

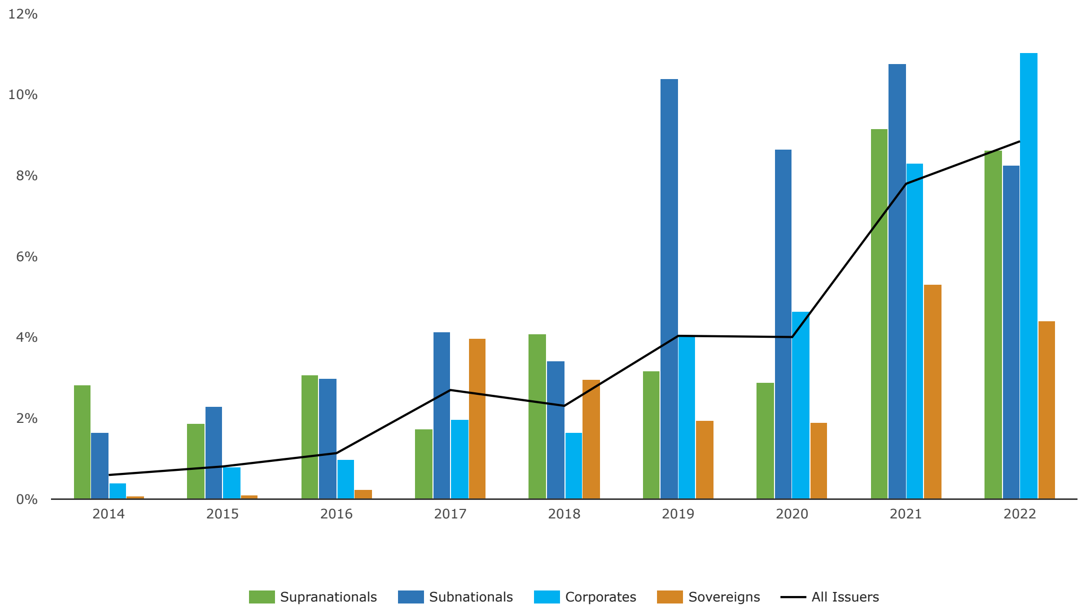
Green bonds

Published 28 Apr 2023

Analysis and data > Indicators > Green bonds

Bonds used to finance activities that address climate change and environmental issues — known as green bonds — provide a means to increase green investment. Green bonds accounted for only 0.6% of all bonds issued in the EU in 2014, rising to 8.9% in 2022. This increase reflects the financial sector's growing interest in offering products that support sustainability and the increasing demand among investors to finance environmentally sustainable projects. Various types of entities — government, corporate, supranational, and subnational entities — can issue green bonds, and issuance by all types has increased since 2014, although at different rates. Green bond issuance may increase further in the coming years, partly because of the ambitious environmental and climate goals of the European Green Deal.

Figure 1. Green bond issuance as a percentage of total bond issuance by all issuers and each type of bond issuer in the EU, 2014-2022



Source: Refinitiv EIKON/ESMA/EEA.

Data used in the graph

Year	Supranationals	Subnationals	Corporates	Sovereigns	All Issuers
2014	2.83	1.65	0.41	0.09	0.6
2015	1.86	2.29	0.79	0.12	0.81
2016	3.07	2.98	0.99	0.23	1.14
2017	1.73	4.14	1.98	3.98	2.7
2018	4.09	3.43	1.66	2.96	2.31
2019	3.17	10.39	4.07	1.94	4.04
2020	2.89	8.67	4.66	1.9	4.01
2021	9.16	10.76	8.31	5.32	7.8
2022	8.62	8.25	11.04	4.42	8.85

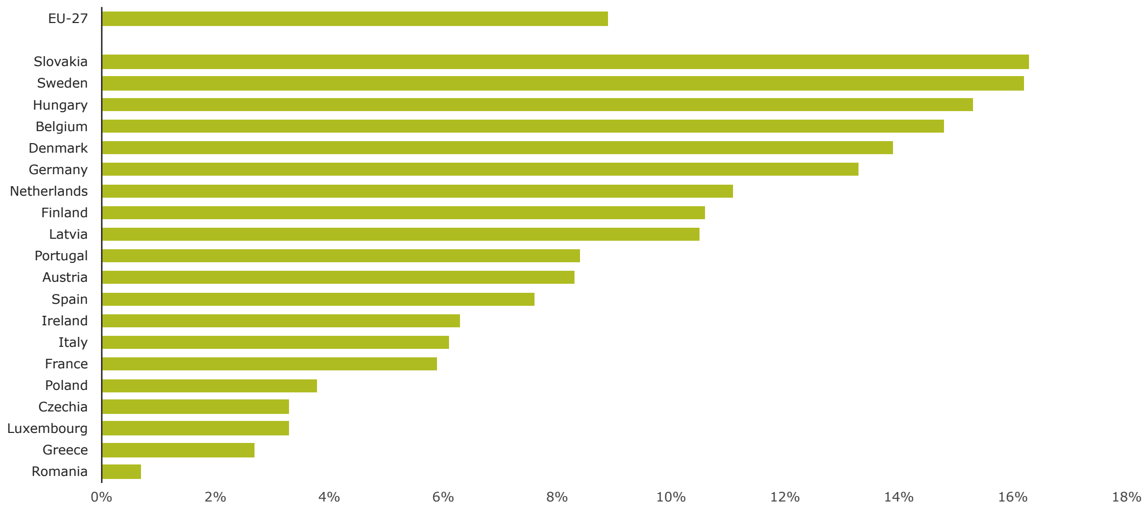
The European Green Deal [1] underlines the need to redirect capital flows to green investments. One way to do this is by issuing green bonds, which finance projects, assets or specific business activities that address environmental and climate change issues.

Green bond issuance increased significantly in the EU between 2014 and 2022, from 0.6% to 8.9% of total bonds issued. This indicates an increasing demand to finance sustainable investments, driven in part by the European Green Deal and the need to fund the transition to a low-carbon, green economy.

Green bonds can be issued by various types of entities, and the rates at which these entities have increased green bond issuance vary. In recent years, green bond issuance by corporate entities has increased rapidly, from 4.7% of total corporate bonds issued in 2020 to 8.3% in 2021 and 11.0% in 2022. Green bond issuance by supranational bodies (e.g. European Commission, European Investment Bank) has also increased substantially, reaching 9.2% in 2021, before declining slightly to 8.6% in 2022. Green bond issuance by municipalities and agencies, such as government-sponsored enterprises, increased particularly rapidly between 2018 and 2019 and has remained at a relatively high level since then. The issuance of green bonds by sovereign governments has increased less than issuance by other entities, to 5.3% in 2021 and falling to 4.4 % in 2022.

In the coming years, green bonds may account for an increasing percentage of total bonds issued, for several reasons. First, demand for green bonds will remain high, not least because of the ambitious environmental and climate objectives of the European Green Deal. Second, the European Commission intends to issue more green bonds to fund up to EUR 250 billion (or 30%) of its NextGenerationEU recovery plan [2][3]. The framework conditions for sustainable finance are also changing. For example, the EU action plan for financing sustainable growth [4], which includes the European green bond standard (EUGBS) [5] and the EU taxonomy for sustainable activities, aims to boost sustainable investment and thereby the issuance of green bonds.

Figure 2. Green bond issuance by corporate entities and sovereign governments, by Member State, 2022



Source: Refinitiv EIKON/ESMA/EEA.

Data used in the graph

Country	Pencentage
EU-27	8.9
Slovakia	16.3
Sweden	16.2
Hungary	15.3
Belgium	14.8
Denmark	13.9
Germany	13.3
Netherlands	11.1
Finland	10.6
Latvia	10.5
Portugal	8.4
Austria	8.3
Spain	7.6
Ireland	6.3
Italy	6.1
France	5.9
Poland	3.8
Czechia	3.3
Luxembourg	3.3
Greece	2.7
Romania	0.7

Green bond issuance as a share of total bond issuance varies across the EU Member States. In 2022, green bond shares were highest in Slovakia, Sweden, and Hungary, while seven Member States did not issue green bonds.

The speed at which national green bond markets develop and mature depends on many variables, including policy and regulatory factors, market conditions and financing trends. Further growth in green bond issuance across the EU faces a range of challenges, including underdeveloped national bond markets, insufficient pipelines of standardised green projects ready for green bond funding, a lack of commonly accepted green bond standards and definitions, and a general mismatch between small-scale projects and large-scale institutional investors [6]. Differences in financing norms and investment needs add to those challenges and lead to green bond markets of different seizes across the EU. The recently adopted uniform EUGBS [5] can help overcome some of these barriers and boost the share of green bonds in domestic (i.e. national) markets.

Supporting information

Definition

Bonds

Bonds are loans provided by an investor to a borrower that are widely used to fund activities. The borrower agrees to pay back the loan with interest at a specified future date. Bonds can be used to finance a wide range of projects, and the proceeds are not necessarily earmarked for any particular purpose.

Green bonds

Green bonds are types of bonds that are issued specifically to finance green projects, i.e. the proceeds from green bonds are earmarked for green projects. The use of proceeds is typically guided by a set of criteria or green bond frameworks.

Green bond frameworks and standards

Frameworks and standards, such as the recently adopted EUGBS, aim to provide a common language for the use of proceeds. This indicators only includes those green bonds that are either aligned with the four core components of the International Capital Market Association (ICMA) green bond principles or are certified by the Climate Bond Initiative (CBI), i.e. follow the climate bond standard or are CBI aligned (i.e. unlabelled (conventional) bonds issued by a CBI-aligned issuer or self-labelled green bonds that do not need to be aligned with ICMA principles or certified by the CBI).

Types of green bond issuers

Green bonds can be differentiated by the entity that issues them. For instance, corporate green bonds are issued by a corporate entity, such as a company or financial corporation. Sovereign green bonds are issued by a national government. Supranational green bonds are issued by an international body such as the EU, which started to issue green bonds in 2021 under the NextGenerationEU programme [7], or by international financial institutions (IFIs) such as the European Investment Bank, the lending arm of the EU. Data providers also differentiate green bonds issued by subnational entities such as municipalities or agencies from other types of green bond. Green bonds issued by agencies are usually securitised by a government-sponsored enterprise or a government department.

NextGenerationEU

The NextGenerationEU instrument was established to support the EU's recovery from the economic impacts of the COVID-19 pandemic. In the coming years, the European Commission intends to fund up to EUR 250 billion (or 30%) of its NextGenerationEU plan by issuing green bonds [3].

EU taxonomy for sustainable activities

The EU taxonomy for sustainable activities is a classification system that defines sustainable activities, e.g. activities for climate change mitigation and adaptation [8].

Methodology

This indicator is calculated based on data on the issuance of green bonds by companies, banks, governments, supranational bodies, and subnational bodies (municipalities and agencies) in the EU. It shows green bond issuance as a percentage of all bonds issued and by type of green bond issuer. Data on corporate and sovereign bonds were downloaded on 3 March 2023 by the European Securities and Markets Authority (ESMA), and data on bonds issued by supranational bodies, municipalities and agencies were downloaded by the EEA on 28 March 2023. Please note that the data for bonds issued by supranational bodies, municipalities and agencies tend to be less reliable than the data on bonds issued by corporate entities and sovereign governments. Moreover, as the groups of issuers were compiled by ESMA and Refinitive Eikon, minor double-counting at margins cannot be excluded, despite the utmost care.

Green bond indicators such as this may contain discrepancies, as they rely on data provided by various commercial data providers, which report on issuances at different dates and rely on different green bond standards or frameworks or make errors. Moreover, numbers from the same provider can vary depending on the date of data download and the currency exchange rate used.

It is important to note that the indicator does not provide information on the environmental impact or the sustainability of the projects financed by green bonds. In addition, the indicator does not capture the varying 'greenness' levels of the projects financed by different bonds or the contribution of financed projects to achieving the Paris Agreement goals, which are increasingly important factors for investors and regulators. Finally, fixed-income instruments cover only parts of the financial system and this green bond indicator therefore only partially reflects trends in financing green assets. Those trends might be different for different environmental objectives depending on the financial preferences and the 'investability' of the projects and activities funded.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting targets of the Eighth Environment Action Programme (8th EAP). It contributes mainly to monitoring in relation to aspects of 8th EAP Article 3(u), which requires 'mobilising resources and ensuring sufficient sustainable investments from public and private sources… consistent with the Union's sustainable finance policy agenda' [7]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the 'increase [in] the issuance of green bonds to boost public and private financing for green investments' [9].

Accuracy and uncertainties

Data sources and providers

- Refinitive Eikon (direct link to the datasets is not available), Refinitive
- ESMA (direct link to the datasets is not available), ESMA

Metadata

DPSIR

Response

Topics

Sustainable finance

Tags

green bond issuances # European Green Deal # SUFI004 # sustainable finance # 8th EAP

Temporal coverage

2014-2022

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

Green bond issuance is measured as a share (%) of total bond issuance.

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal', COM (2019) 640 final of 11 December 2019.
↲
2. EC, 2021, Communication from the Commission to the European Parliament, the Council, the European Central Bank, the European Economic and Social Committee, the Committee of the Regions 'The EU economy after COVID-19: implications for economic governance', COM (2021) 662 final of 19 October 2021.
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3. EC, 2023, 'NextGenerationEU green bonds', (https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/nextgenerationeu-green-bonds_en) accessed April 17, 2023.
a b
4. EC, 2018, Communication from the Commission to the European Parliament, the European Council, the European Central Bank, the European Economic and Social Committee and the Committee of the Regions 'Action plan: financing sustainable growth', COM (2018) 97 final of 8 March 2018.
↲
5. EC, 2021, Proposal for a regulation of the European Parliament and of the Council on European green bonds, COM (2021) 391 final of 6 July 2021.
a b
6. OECD, 2015, *Green bonds: mobilising the debt capital markets for a low-carbon transition*, Policy Perspectives, Organisation for Economic Co-operation and Development, Paris.
↲
7. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22–36.
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8. EU, 2020, Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, OJ L 198, 22.6.2020, p. 13-43.
↲
9. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme's 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.
↲

European Environment Agency

8th Environment Action Programme

Eco-innovation index

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

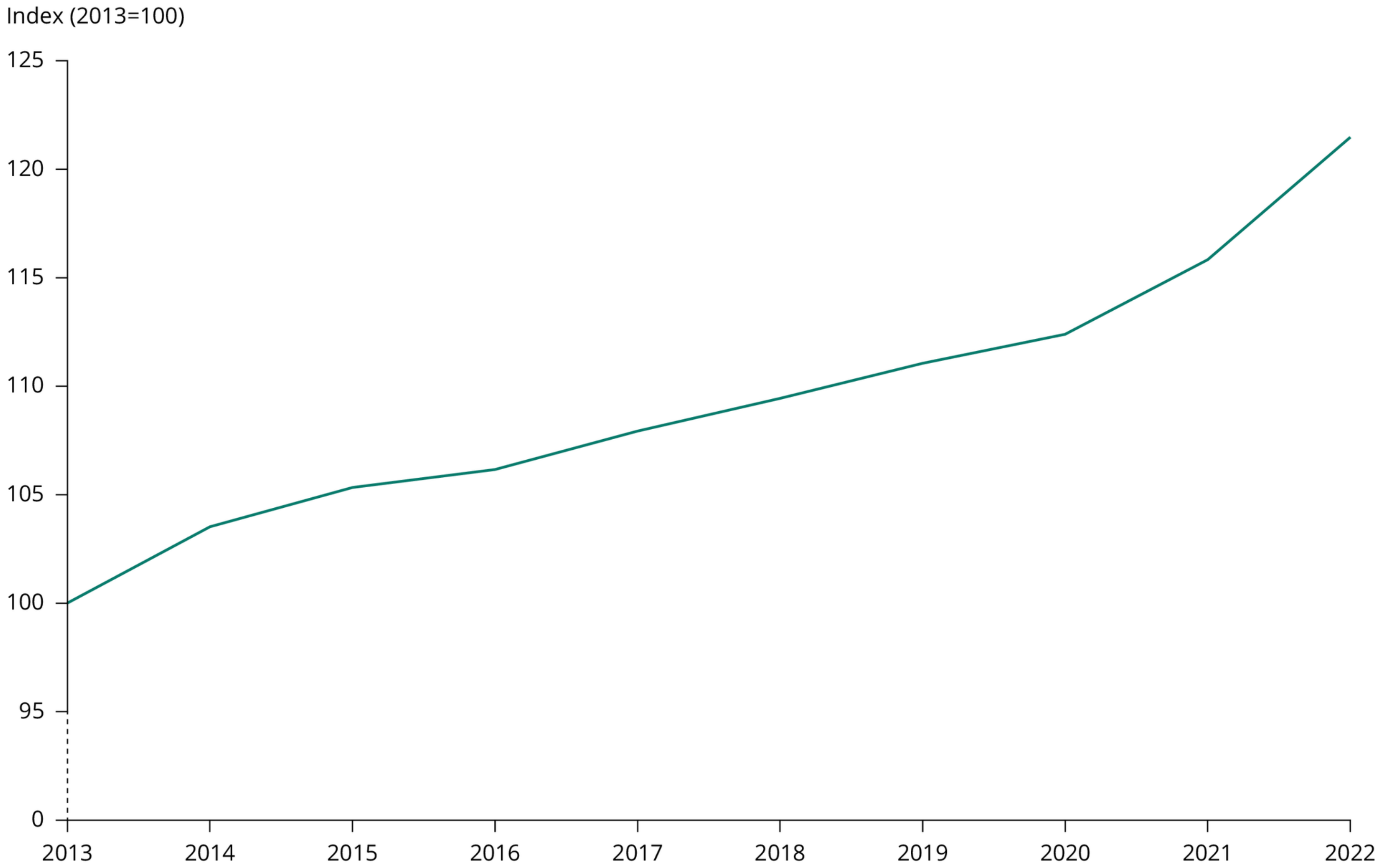
Eco-innovation index

Published 27 Apr 2023

Analysis and data > Indicators > Eco-innovation index

Eco-innovation is crucial for achieving the European Green Deal objective of transitioning to a carbon-neutral and sustainable economy. The European Commission's eco-innovation index shows that from 2013 to 2022 eco-innovation increased in the EU. This was mainly driven by improvements in resource efficiency. This steady increase in recent years is expected to continue, as the European Green Deal has set ambitious environment- and climate-related objectives, and its associated initiatives are very likely to create favourable conditions for more eco-innovation.

Figure 1. Eco-innovation index, EU-27, 2013-2022 (EU-27=100 in 2013)



Source: European Commission/Eco-Innovation Observatory.

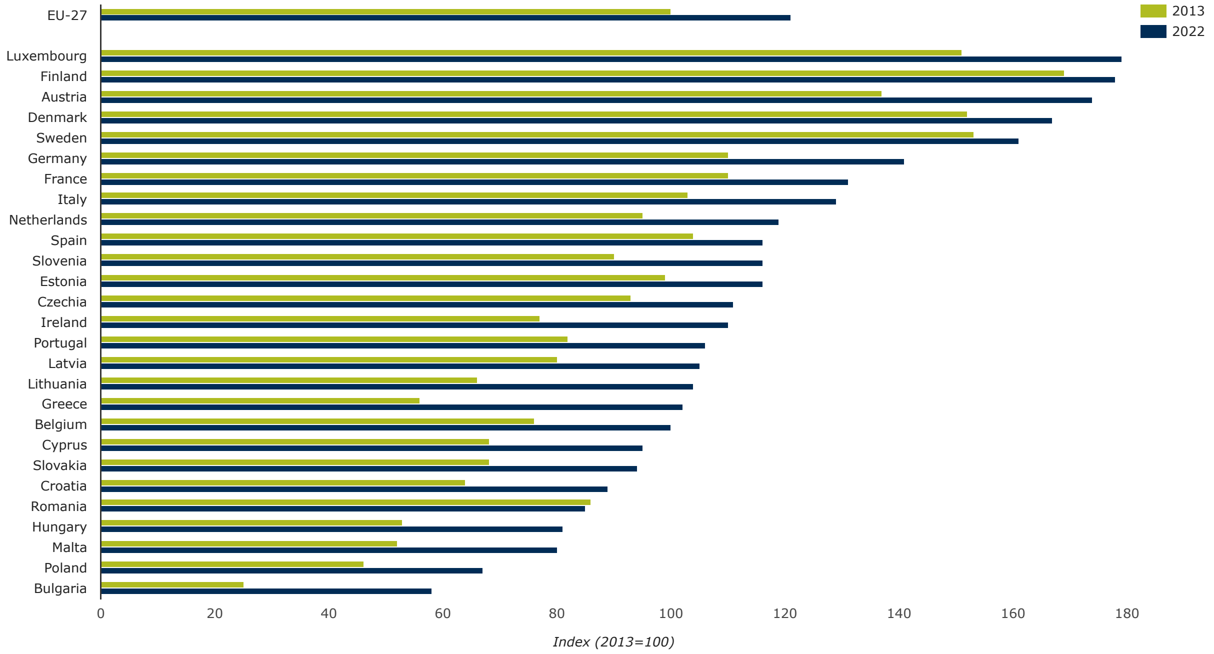
Eco-innovation refers to any innovation that reduces impacts on the environment, increases resilience to environmental pressures or uses natural resources more efficiently [1]. Eco-innovation is essential for achieving the objectives of the European Green Deal, such as the transition to a climate-neutral, circular economy [2].

The European Commission's eco-innovation index [4][3]is a composite indicator based on five dimensions: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency outcomes and socio-economic outcomes. Performance in each of these dimensions is measured using relevant indicators, which are published by, for instance, Eurostat, the EEA and the Organisation for Economic Co-operation and Development (OECD).

The EU's performance between 2013 and 2021 was positive, as shown by the steady increasing trend in the eco-innovation index score [5]. Increases were seen in all five dimensions [6]. Most of the increase was due to improvements in the resource efficiency outcomes dimension, particularly in greenhouse gas (GHG) emission productivity (i.e. decreases in GHG emissions generated per unit of gross domestic product (GDP)). However, the greatest improvement was seen in the number of eco-innovation publications, which is included in the eco-innovation outputs dimension [6].

The steady increase in the eco-innovation index score between 2013 and 2021 is expected to continue in the future. This is because the improvements in resource efficiency and other contributing indicators are likely to persist due to the highly ambitious environment- and climate-related objectives of the European Green Deal and its associated initiatives [7].

Figure 2. Eco-innovation index by EU Member State, 2013-2022 (relative to EU-27=100 in 2013)



Source: European Commission/Eco-Innovation Observatory.

Data used in the graph

Countries	2013	2022
Luxembourg	151	179
Finland	169	178
Austria	137	174
Denmark	152	167
Sweden	153	161
Germany	110	141
France	110	131
Italy	103	129
Netherlands	95	119
Spain	104	116
Slovenia	90	116
Estonia	99	116
Czechia	93	111
Ireland	77	110
Portugal	82	106
Latvia	80	105
Lithuania	66	104
Greece	56	102
Belgium	76	100
Cyprus	68	95
Slovakia	68	94
Croatia	64	89
Romania	86	85
Hungary	53	81

Countries	2013	2022
Malta	52	80
Poland	46	67
Bulgaria	25	58

In terms of the eco-innovation performance of the individual EU Member States in 2013 and 2022 [8], the Nordic countries, Luxembourg and Austria were the best performers. Except for Finland, all of these countries performed well in resource efficiency outcomes. Luxembourg, Finland and Austria scored particularly highly on socio-economic outcomes [6].

Index scores improved between 2013 and 2022 for all EU Member States except Romania. Moreover, 18 EU Member States achieved increases of above the EU-27 average, with Greece achieving the largest increase, followed by Lithuania, Austria, Ireland, Bulgaria and Germany. The main reason for Greece's improved performance was increases in government environmental and energy research and development (R&D) appropriations and outlays. Improvements in various resource efficiency-related indicators [6] account for the relatively large increases in Lithuania, Austria, Ireland, Bulgaria and Germany.

Supporting information

Definition

'Eco-innovation is any innovation that make progress towards a more green and sustainable economy by reducing environmental pressures, increasing resilience or using natural resources more efficiently' [9].

The eco-innovation index is based on the eco-innovation scoreboard, which has 12 indicators in five thematic areas:

1 'Eco-innovation inputs, which includes financial and human capital investment in eco-innovative activities;

2 Eco-innovation activities, which defines the extent to which companies in a given country are active in eco-innovation;

3 Eco-innovation outputs, which measures the output of eco-innovation activities concerning the number of patents and academic literature;

4 Resource efficiency outcomes, which pinpoint a country's efficiency of resources and GHG emission intensity; and

5 Socio-economic outcomes, which aims to measure the positive societal as well as economic outcomes of eco-innovation' [6].

Methodology

Eco-innovation index scores are currently calculated on the basis of 12 indicators belonging to the following five thematic areas:

1 Eco-innovation inputs: governments' environmental and energy R&D appropriations and outlays (governments' environmental and energy R&D appropriations and outlays as a proportion of GDP); total R&D personnel and researchers (total R&D personnel and researchers as a proportion of total employment).

2 Eco-innovation activities: number of ISO 14001 certificates (number of ISO 14001 certificates/population in millions).

3 Eco-innovation outputs: eco-innovation-related patents (number of patent applications filed under the Patent Cooperation Treaty (PCT) in the fields of environment-related technologies, climate change adaptation technologies and sustainable ocean economy inventions/population in millions); eco-innovation-related academic publications (number of publications with any the following list of English keywords in the title and/or abstract: eco-innovation, energy efficient/efficiency, material efficient/efficiency, resource efficient/efficiency, energy productivity, material productivity, resource productivity/population in millions);

4 Resource efficiency outcomes: material productivity (GDP/domestic material consumption (DMC)); water productivity (GDP/total fresh water abstraction); energy productivity (GDP/gross available energy for a given year); GHG emission productivity (GDP/GHGs (CO_2, N_2O in CO_2 equivalent, CH_4 in CO_2 equivalent, hydrofluorocarbons (HFCs) in CO_2 equivalent, perfluorocarbons (PFCs) in CO_2 equivalent, SF_6 in CO_2 equivalent, NF_3 in CO_2 equivalent)).

5 Socio-economic outcomes: exports of environmental goods and service sector (export of goods and services in the field of environmental protection and resource management activities/total exports); employment in environmental protection and resource management activities (employment in environmental protection and resource management activities/total employment); value added in environmental protection and resource management activities (value added in the environmental goods and service sector/GDP).

Policy/environmental relevance

The Eighth Environment Action Programme (8th EAP) should, among other things, accelerate the transition to a green economy in the context of a well-being economy through, inter alia, 'continuous… innovation' (EU, 2022). This indicator is a headline indicator for monitoring progress towards meeting one of the 8th EAP and contributes mainly to monitoring progress in relation to aspects of Article 3(w), which requires 'strengthening the environmental knowledge base… and its uptake…, including through… innovation' (EU, 2022). The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the increase in 'eco-innovation as a driver for the green transition' [10].

Accuracy and uncertainties

Data sources and providers

- Ecoinnovation index, European Commission

Metadata

DPSIR

Response

Topics

 # Sustainability solutions

Tags

 # impacts **# 8th EAP** **# Transition** **# Eco-innovation** **# environment** **# resource efficiency** **# SUSO001** **# environmental pressures**

Temporal coverage

2013-2022

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

This is a composite indicator and therefore no units are used.

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

1. EC, 2011, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions ‘Innovation for a sustainable future — the eco-innovation action plan (Eco-AP)’, COM(2011) 899 final of 15 December 2011.
↲

2. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions ‘The European Green Deal’, COM (2019) 640 final of 11 December 2019.
↲

3. For a discussion of these areas, see Al-Ajlani et al. (2022).
↲

4. EC, 2022, 'Eco-innovation at the heart of European policies', *European Commission, Directorate-General for Environment* (https://green-business.ec.europa.eu/eco-innovation_en) accessed March 27, 2023.
↲

5. The report Eco-innovation index 2022 — policy brief (Al-Ajlani et al., 2022) shows performance up to 2021. Furthermore, the indicators used in the analysis may be lagging 1 or 2 years behind the eco-innovation index reference years. For more information, see Al-Ajlani et al. (2022).
↲

6. Al-Ajlani, H., Cvijanović, V., Es-Sadki, N. and Müller, N., 2022, *EU eco-innovation index 2022 — policy brief*, European Commission.
a b c d e

7. Mohamedaly, Al-Ajlani, H., Kuuliala, V., McKinnon, D. and Johansen, M., 2022, *Eco-innovation for circular industrial transformation — a report on the best practices, drivers, and challenges in key sectors*, European Commission.
↲

8. The progress made by EU Member States over time is presented relative to an eco-innovation score for the EU-27 in 2013 of 100.
   ↲
9. EC, 2022, *Eco-index 2022 — indicators and methodology*, European Commission.
   ↲
10. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme’s 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.
    ↲

European Environment Agency

8th Environment Action Programme

Land take: net land take in cities and commuting zones in Europe

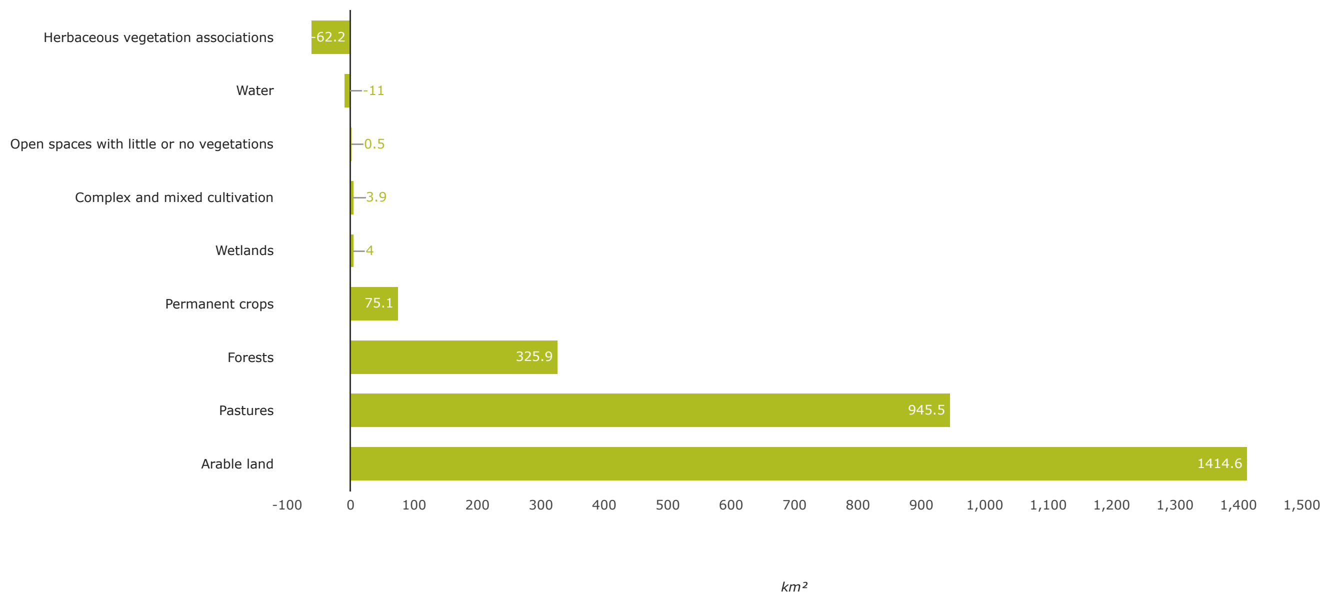
8TH EAP HEADLINE INDICATOR, 2023

Net land take in cities and commuting zones in Europe

Published 23 Mar 2023

Land conversion to artificial surfaces impairs the ecological functions of land and makes ecosystems less resilient. In Europe, this conversion takes place primarily in cities and commuting zones. Between 2012 and 2018, the net land take in the EU in these zones was 450 km^2 annually. The land that was taken was mostly croplands and pastures, followed by forests. For the EU to reach its aim of 'no-net-land take by 2050' there needs to be significant reductions in the net land take over the years and this seems, at present, uncertain and challenging. It is unclear how the main drivers of land take will change and whether reconverting artificial surfaces to land will increase sufficiently in the future while current projections indicate a likely expansion of built up areas in the coming years.

Figure 1. Net land take in cities and commuting zones by land cover category, 2012-2018, EU-27



Source: EEA/Copernicus Land Monitoring Service.

Data used in the graph

Land cover category	Net land take (km2)	Net land take (km2)_Text
Arable land	1414.6	1414.6
Pastures	945.5	945.5
Forests	325.9	325.9
Permanent crops	75.1	75.1
Wetlands	4	4
Complex and mixed cultivation	3.9	3.9
Open spaces with little or no vegetations	0.5	0.5
Water	-11	-11
Herbaceous vegetation associations	-62.2	-62.2

Land take entails the conversion of land to artificial surfaces, which impairs the valuable ecological functions of lands. This leads to less resilient ecosystems, decreased potential for carbon storage and biodiversity maintenance, increased surface run-off during floods and increased effects of heatwaves in cities. It also results in reduced quality of life via the diminished ecological land functions as well as via the direct loss of natural areas for relaxation, regeneration and outdoor activities.

The EU's biodiversity strategy for 2030 [1] addresses land take as one of the major threats to biodiversity, whereas the soil strategy for 2030 [2] sets the aim of 'no net land take by 2050'. The European Commission proposed a nature restoration law [3], which includes, among others: no net loss of green urban spaces by 2030, a 5% increase by 2050, a minimum of 10% tree canopy cover in every European city, town and suburb, and net gain of green space that is integrated to buildings and infrastructure.

Land take mostly (but not exclusively) occurs in cities and their commuting zones — these are also known as functional urban areas (FUAs). Over the 2012-2018 period, the majority (78%) of the net land take happened in commuting zones. The net land take in FUAs during 2012-2018 amounted to 2,696km^2 or 450km^2 annually.

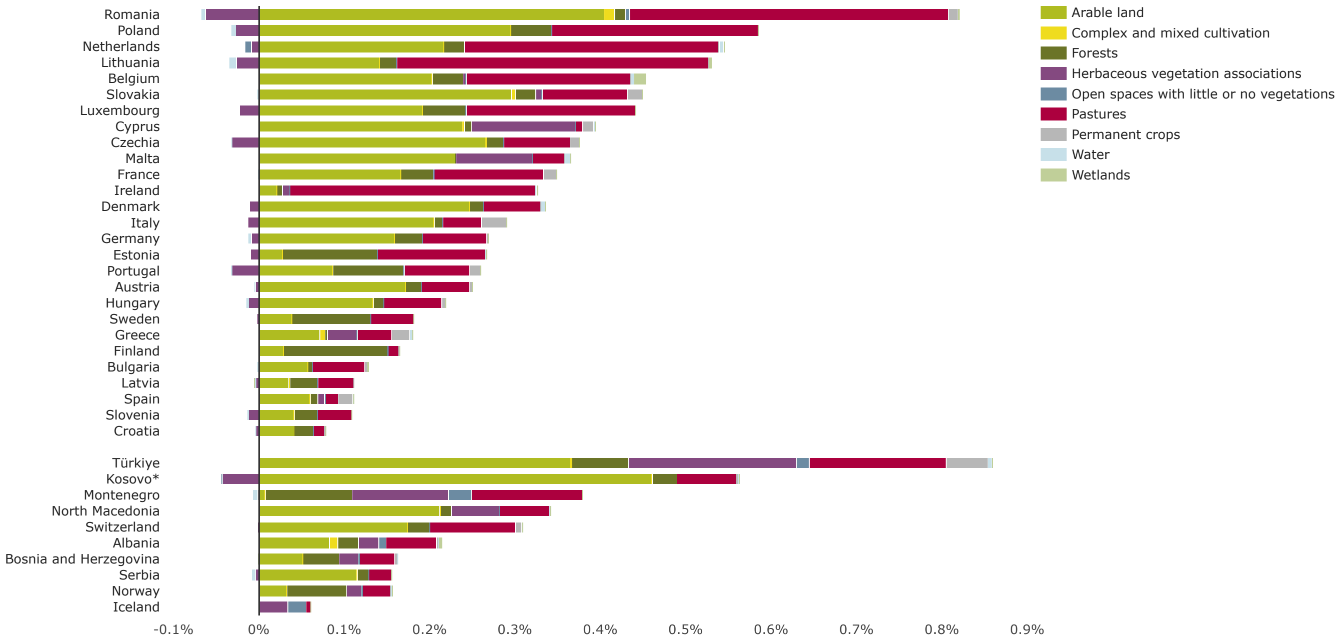
Most land take in FUAs took place in arable lands — a loss of 1,415km² or 47% of all land take. Loss in arable land can impact food security, carbon sequestration and the maintaining of biodiversity. The second largest land take took place in pastures — a loss of 945km² or 36% of all land take. Pastures are among Europe's most important biodiversity hotspots[4] and carbon sinks[5], so being under such pressure is a cause for concern. The area of forests loss (326km^2) was about one quarter of the area of arable lands lost. Forests present significant carbon stocks accumulated through growth of trees and an increase in soil carbon, and are important for habitat provision, flood protection and climate regulation. For the same reasons, although wetlands represent a very small area of FUA territory (2.5%) any loss — and there has been a total loss of 6km^2 in 2012-2018 — is cause for concern.

Assuming a linear evolution in land take, for the EU to meet its aim of reducing its net land take to zero by 2050 would require that from 2019 onwards the EU reduces its net land take by 14km^2 annually. This would mean that by 2030 the EU needs to reduce annual net land take to 282km^2.

Major drivers of land take include population growth, the need for transport infrastructure, cultural preferences and economic growth[6]. It is unclear how these drivers will evolve in the coming years and therefore it is uncertain whether the EU would be reducing its net land take by 2030 sufficiently to stay on track with meeting its 2050 no net land take goal. The recently adopted (2021) Soil Strategy for 2030 sets a series of actions and their implementation could contribute to reducing land take. However, according to a European Commission study[7]built-up areas are likely to expand by more than 3%, reaching 7% of the EU territory by 2030.

Discouraging diffuse urban expansion while promoting compact city planning and the re-naturalisation of land instead would be an important means to reduce the land take rate in the future and reach the 2050 no net land take goal[6].

Figure 2. Net land take by land cover and country, 2012-2018, EEA-38 (in % of the total FUA surface in the country)



Source: EEA/Copernicus Land Monitoring Service.

Data used in the graph

Countries	Arable land	Complex and mixed cultivation	Forests	Herbaceous vegetation associations	Open spaces with little or no vegetations	Pastures	Permanent crops	Wate
Romania	0.404	0.013	0.013	-0.062	0.004	0.373	0.012	-0.005
Poland	0.296	0	0.047	-0.027	0	0.242	0.001	-0.006
Netherlands	0.217	0	0.023	-0.009	-0.007	0.298	0.001	0.005
Lithuania	0.142	0	0.02	-0.026	0	0.365	0	-0.009
Belgium	0.203	0	0.036	0.004	0	0.193	0	0.004
Slovakia	0.296	0.004	0.024	0.008	0	0.1	0.018	-0.002
Luxembourg	0.191	0	0.052	-0.022	0	0.198	0.001	0
Cyprus	0.238	0.003	0.008	0.121	0	0.009	0.013	0.002
Czechia	0.265	0.002	0.02	-0.031	0	0.077	0.011	-0.001
Malta	0.23	0	0	0.091	0	0.037	0	0.008
France	0.166	0	0.038	0.002	0	0.127	0.016	-0.001
Ireland	0.022	0	0.006	0.008	0	0.288	0	0.001
Denmark	0.247	0	0.016	-0.011	0	0.068	0	0.005
Italy	0.206	0	0.01	-0.013	0	0.044	0.031	0
Germany	0.159	0	0.032	-0.009	0	0.076	0.002	-0.003
Estonia	0.028	0	0.111	-0.01	0	0.127	0	0
Portugal	0.086	0	0.083	-0.031	0.001	0.077	0.013	-0.002
Austria	0.171	0	0.019	-0.004	0	0.057	0.003	-0.001
Hungary	0.134	0	0.012	-0.012	0	0.068	0.005	-0.003
Sweden	0.039	0	0.093	-0.002	0	0.049	0	0.001
Greece	0.072	0.006	0.002	0.035	0	0.04	0.021	0.004
Finland	0.029	0	0.122	0.001	0	0.012	0	0.001
Bulgaria	0.058	0	0.005	0	0	0.061	0.003	-0.002
Latvia	0.035	0.001	0.033	-0.003	0	0.042	0	-0.002
Spain	0.06	0	0.009	0.008	0.001	0.015	0.017	0.001
Slovenia	0.041	0	0.028	-0.012	0	0.04	0	-0.002
Croatia	0.041	0.001	0.022	-0.003	0	0.012	0.003	-0.001

Countries	Arable land	Complex and mixed cultivation	Forests	Herbaceous vegetation associations	Open spaces with little or no vegetations	Pastures	Permanent crops	Wate
Türkiye	0.364	0.003	0.066	0.197	0.015	0.16	0.049	0.005
Kosovo*	0.461	0	0.029	-0.043	-0.001	0.069	0.002	0.002
Montenegro	0.008	0	0.101	0.113	0.027	0.13	-0.001	-0.007
North Macedonia	0.212	0.001	0.013	0.056	0	0.058	0.001	0
Switzerland	0.174	0	0.027	-0.001	0	0.099	0.008	0.001
Albania	0.083	0.01	0.023	0.024	0.009	0.059	0.002	0.001
Bosnia and Herzegovina	0.051	0.001	0.042	0.022	0.002	0.041	0.004	0
Serbia	0.114	0.001	0.014	-0.004	0	0.026	0	-0.005
Norway	0.033	0	0.07	0.017	0.002	0.032	0	0.002
Iceland	0	0	0	0.034	0.021	0.007	0	0

None of the EU countries have re-naturalised more land than that converted to urban areas (Figure 2). There are positive signs in a few countries, however: in Czechia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal and Romania, the re-naturalisation of former urbanised areas appears.

At the national level, compared to their 2012 FUA area, net land take in the EU was highest in FUAs in Romania, Poland and the Netherlands (an increase of between 0.5% and 1%). Croatia, Latvia, Slovenia and Spain increased their urbanised areas the least (below 0.1% increase in FUAs).

EU net land take in arable lands was highest in Denmark, Austria and Italy (>65% of all land take), followed by Czechia, Germany, Hungary, Malta, and Slovakia (around 60% of all land take) (Figure 2).

In most countries, land take did not impact forests, except for Estonia, Finland and Sweden (circa 40% of land take), however this accounted for less than 50km^2 of forest loss. In Ireland and Lithuania, more than 70% of all land take impacted pastures, although in absolute terms, the impacted areas were smaller than 50km^2.

Land take in pastures were highest in Ireland, Lithuania, the Netherlands and Romania, where artificial surfaces increased by circa 0.5% of the FUA area. Wetland loss due to land take was very little as a percentage of the FUA territory. The highest value was observed in Belgium, with 1.6km^2 of net wetland loss.

Supporting information

Definition

The land take indicator addresses the change in the areas of agricultural, forest and other semi-natural land taken for urban and other artificial land development. Land take includes areas sealed by construction and urban infrastructure, urban green areas, and sport and leisure facilities.

The main drivers of land take are grouped as processes resulting in the extension of:

• housing, services and recreation;

• industrial and commercial sites;

• transport networks and infrastructure;

• mines, quarries and waste dump sites;

• construction sites.

Note: the land take changes relate to the extension of urban areas and may also include parcels that were not sealed (e.g. urban green areas, and sport and leisure facilities). This is, in particular, the case for discontinuous urban fabric, which is considered as a whole. Similarly, monitoring the indicator with satellite images leads to the exclusion of some linear transport infrastructure, which are too narrow to be observed directly.

Methodology

Methodology for indicator calculation

The indicator is currently calculated from the Urban Atlas dataset of the Copernicus Land Monitoring Service for the years 2012 and 2018. Changes from agriculture, forest and semi-natural/natural land, wetlands or water to urban areas are grouped and expressed in km^2 of converted area.

Net land take is calculated taking into account the 'reverse land take process', i.e. when urban areas are converted to semi-natural land. This can happen as, for example, land cover changes from a mineral extraction site to forest. Net land take is hence the result of land take minus reverse land take, expressed in km^2 area.

Methodology for gap filling

Not applicable.

Policy/environmental relevance

Justification for indicator selection

Land is a finite resource and the way it is used is one of the principal drivers of environmental change and has a significant impact on quality of life and ecosystems. In Europe, the proportion of total land use occupied by production (agriculture, forestry, etc.) is one of the highest on the planet and conflicting land use demands require decisions to be made that involve hard trade-offs. Land use in Europe is driven by a number of factors, such as the increasing demand for living space per person, and the link between economic activity, increased mobility and the growth of transport infrastructure, which usually result in land take. Urbanisation rates vary substantially, with coastal and mountain areas being among the most affected regions in Europe as a result of the increasing demand for recreation and leisure.

Land take occurs mostly in peri-urban areas, where the demand for new infrastructure is high and soil quality, for historical reasons of human settlement, is good. The increase in the area of artificial surfaces often impairs or disrupts valuable ecological functions of soils, such as biomass provision, soil biodiversity and soil carbon pool, or water infiltration potential causing flooding. This has negative impacts on climate change, as it decreases the potential for carbon storage and sequestration, and increases surface run-off during flood [8][9]. Land occupied by artificial surfaces and dense infrastructure connects human settlements and fragments landscapes. It is also a significant source of water, soil and air pollution. In addition, lower population densities — a result of urban sprawl — require more energy for transport and heating or cooling. The consequences of urban lifestyles, such as air pollution, noise, greenhouse gas emissions and impacts on ecosystem services, are felt within urban areas and in regions far beyond them.

Policy context and targets

Context description

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring aspects of the 8th EAP Article 2.1. that requires that 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters and other environmental risks. The Union sets the pace for ensuring the prosperity of present and future generations globally, guided by intergenerational responsibility'[10]. The European Commission 8th EAP monitoring Communication specifies that this indicator should monitor whether the EU is on track to meet the 'no land take by 2050' target[11].

In May 2020, the European Commission adopted a biodiversity strategy to 2030, related to protecting and restoring nature. The strategy states that the 'biodiversity crisis and the climate crisis are intrinsically linked. Climate change accelerates the destruction of the natural world through droughts, flooding and wildfires, while the loss and unsustainable use of nature are in turn key drivers of climate change'. Therefore, both the EU biodiversity strategy and the soil strategy for 2030 include the no net land take target by 2050. The soil strategy also addresses land recycling and promotes the circular use of land over greenfield development to limit the acute pressure from soil sealing and land take. The soil strategy further suggests that member states include 'land take hierarchy' in their urban greening plans to 'give priority to reusing and recycling land and to quality urban soils at national, regional and local level, through appropriate regulatory initiatives and by phasing out financial incentives that would go against this hierarchy, such as local fiscal benefits for converting agricultural or natural land into built environment.' In June 2022, the European Commission adopted the proposal for a nature restoration law that aims to put all natural and seminatural ecosystems on the path to recovery by 2030. The proposed law includes specific targets on green urban spaces and peatlands.

'No net land take' is also addressed in the land degradation neutrality (LDN) target of the United Nations Convention to Combat Desertification (UNCCD), which aims to maintain the amount and quality of land resources. LDN is promoted by target 15.3 of the UN Sustainable Development Goals (SDGs), which, by 2030, strives to combat desertification and to restore degraded land and soil. Land and soil are also linked to goals that address poverty reduction (SDG 1), health and well-being through reduced pollution (SDG 3), access to clean water and sanitation (SDG 6), the environmental impact of urban sprawl (SDG 11) and climate change (SDG 13). The EU biodiversity strategy to 2020 [12] calls for the restoration of at least 15% of degraded ecosystems in the EU and the expansion of the use of green infrastructure, e.g. to help overcome land fragmentation.

Policy decisions that shape land use need to consider trade-offs among many sectoral interests, including industry, transport, energy, mining, agriculture and forestry. These trade-offs are eventually implemented through spatial planning and land management in the Member States. Although the subsidiarity principle assigns land and urban planning responsibilities to the national and regional government levels, most EU policies have a direct or indirect effect on urban development. In particular, the effective implementation of the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) Directives[13][14] has shown that they can improve the consideration of environmental aspects in planning projects, plans and programmes, contribute to more systematic and transparent planning, and improve participation and consultation. The far-reaching consequences of EU and other policies for spatial impacts are, however, only partially perceived and understood. Tackling these challenges needs the completion of a comprehensive knowledge base and better awareness of the complexity of the problems. Initiatives aimed at achieving such an integrated approach, as requested in the Community strategic guidelines on cohesion 2007-2013[15] imply compliance with the precautionary principle, the efficient use of natural resources and the minimisation of waste and pollution, and must be vigorously pursued and, in particular, implemented.

Targets

While many EU and national policies address land and soil to some extent, legally binding targets, incentives and measures are largely missing at the EU level. Nevertheless, the 8th Environmental Action Program and the soil and biodiversity strategies to 2030 all address and aim at no-net land take by 2030.

The European Commission adopted the proposal for a nature restoration law and intends to adopt the proposal for a soil health law in 2023, including related targets on healthy soil.

Accuracy and uncertainties

Methodology uncertainty

The methodology is straightforward as it is based on calculating observed area changes as long as the definition of land take is followed.

Data set uncertainty

Even though the Urban Atlas dataset represents every $10m^2$ grid cell in Functional Urban Areas, very large-scale sealed surfaces or land use processes converting semi-natural land to artificial surfaces will be underestimated. These processes are not captured by the dataset and hence the absolute land take value could be higher. There is however no indication on an EU level as to the degree of this underestimation.

Rationale uncertainty

Newly urbanised areas (land uptake) may also comprise non-artificial surfaces (private gardens or public green areas). Thus, they may vary in environmental condition and provision of habitats or ecosystem services.

Data sources and providers

- Copernicus Land Monitoring Service - Urban Atlas, European Environment Agency (EEA)

Metadata

DPSIR

Pressure

Topics

Land use

Tags

Communting zones # 8th EAP # LSI001 # Artifical surfaces # Fnctional urban areas

Temporal coverage

2012-2018

Geographic coverage

Albania
Austria
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Kosovo (UNSCR 1244/99)
Latvia
Lithuania
Luxembourg
Malta
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Türkiye

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Life on land

Unit of measure

km² and percentage

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

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European Environment Agency

8th Environment Action Programme

Water scarcity conditions in Europe
(Water exploitation index plus)

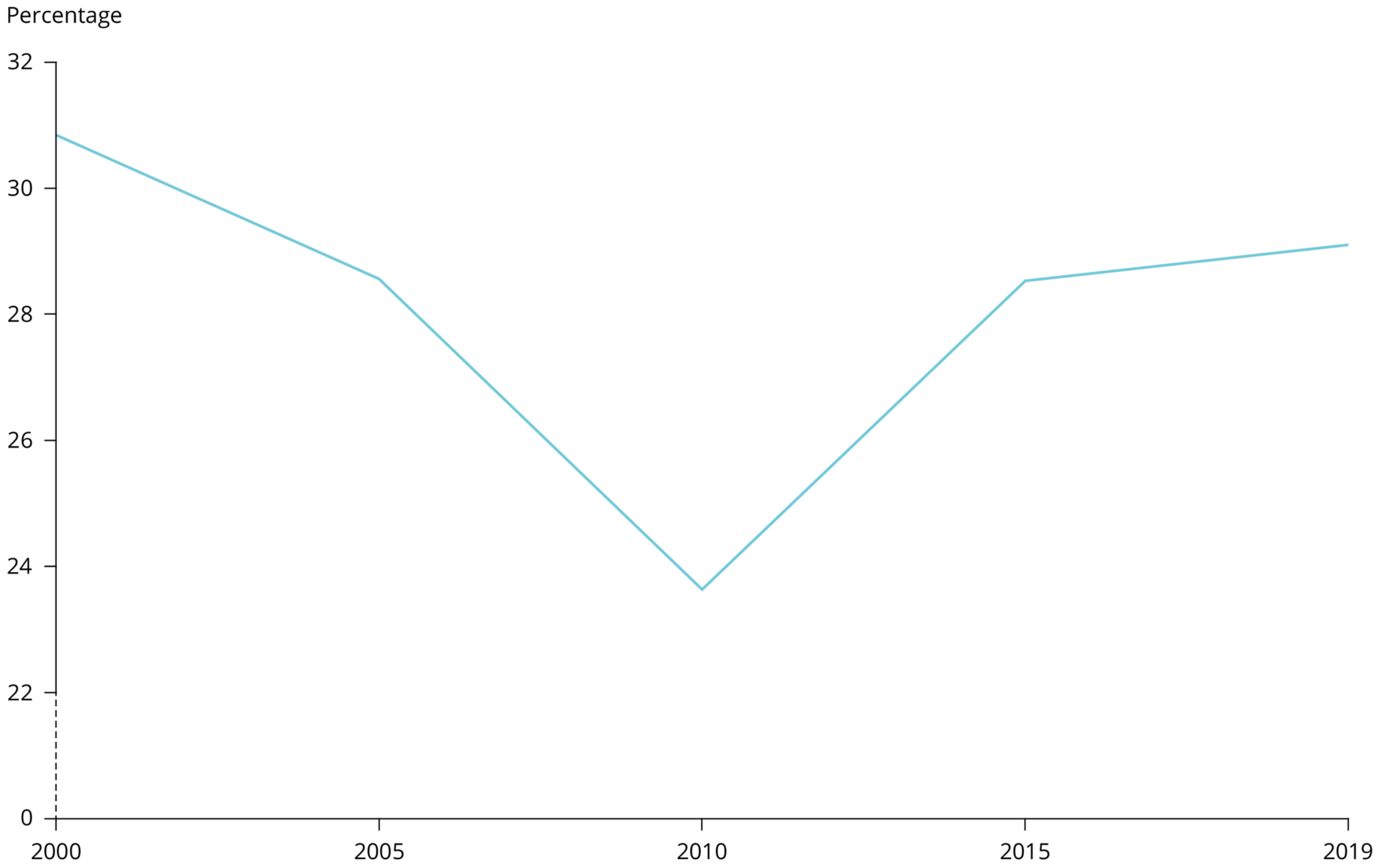
8TH EAP HEADLINE INDICATOR, 2023

Water scarcity conditions in Europe (Water exploitation index plus)

Published 13 Jan 2023

Water scarcity affected 29% of the EU territory during at least one season in 2019. Despite water abstraction declining by 15% in the EU between 2000 and 2019, there has been no overall reduction in the area affected by water scarcity conditions. In fact, since 2010 there has been a worsening of the situation. This, compounded with the fact that climate change is expected to further increase the frequency, intensity and impacts of drought events, makes it somewhat unlikely that water scarcity will reduce by 2030. Additional effort is needed to ensure sustainable water use

Figure 1. Area affected during at least one quarter of the year by water scarcity conditions in the EU, measured by the water exploitation index plus



.**Source:** EEA/Eurostat/OECD/Joint Research Centre/Ecrins

Freshwater resources are essential for human health, nature and the functioning of economies and societies. However, across the EU, these resources are threatened by multiple pressures. To address this, the Water Framework Directive requires Member States to promote the sustainable use of water resources and to protect the available water resources [1].

Water scarcity is determined primarily by (1) water demand and consumption, which largely depend on population and type of socio-economic activities; (2) climatic conditions, which control water availability and seasonality of supply; and (3) landscape and geological characteristics of the basins. Assessing water scarcity conditions across Europe at river basin level and by season is more informative, compared to aggregated annual estimates at European or even country level, which masks the extent or intensity of the problem for certain areas or seasons. The water exploitation index plus (WEI+) does that by measuring water consumption as a percentage of the renewable freshwater resources available at river sub-basin level and by each of the four quarters of the year (3 consecutive months). WEI+ values above 20% indicate that water resources are under stress and therefore water scarcity conditions prevail; values above 40% indicate that stress is severe and freshwater use is unsustainable [2][3].

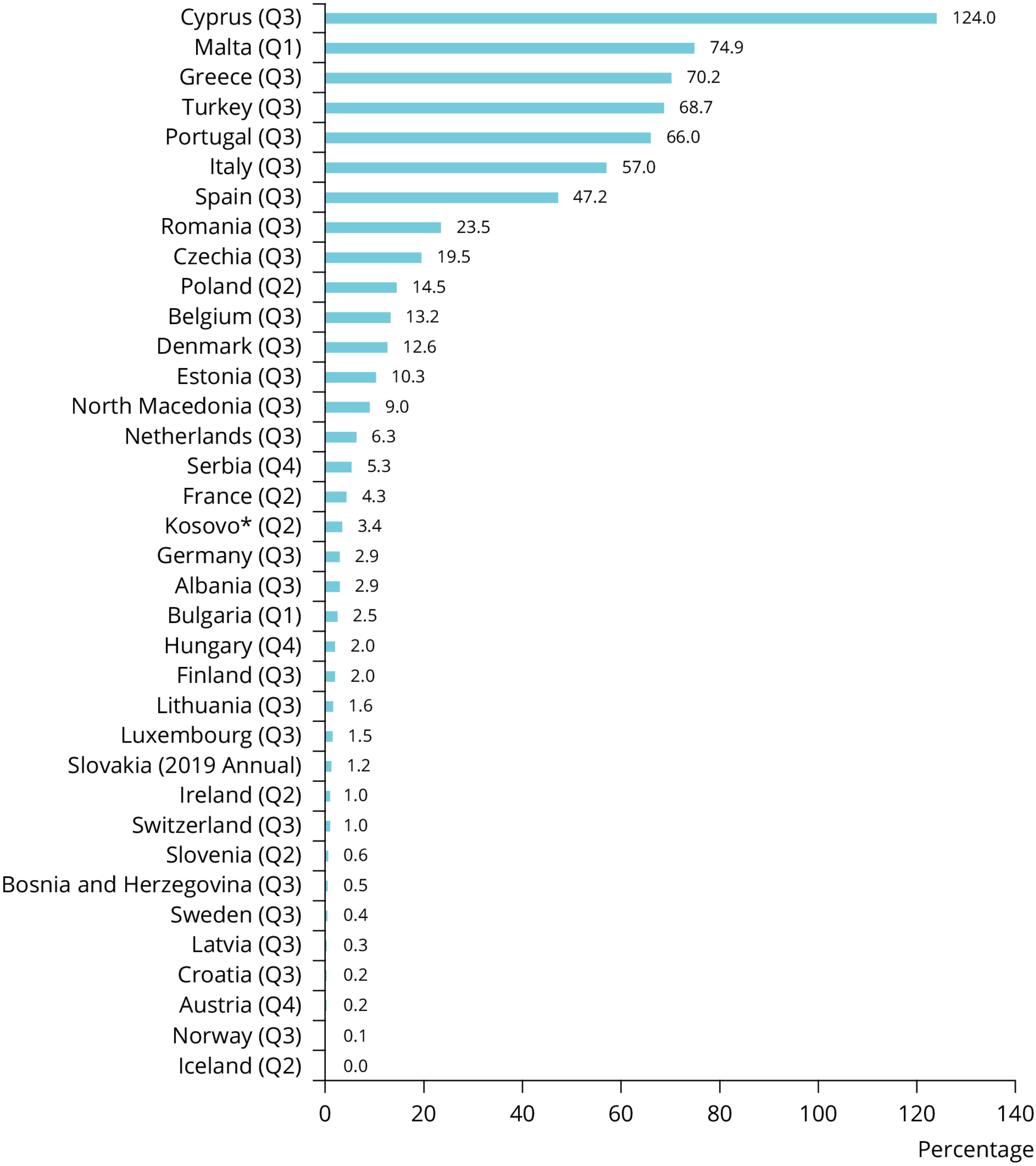
Figure 1 shows the percentage of the EU territory that has been affected in at least one of the four quarters of the year by WEI+ values of above 20% per year. It shows that 29% of the EU-27 territory, excluding Italy, was affected by water scarcity conditions in 2019. Despite total water abstraction declining by about 15% in the EU between 2000 and 2019, the area affected by water scarcity conditions was relatively stable over the period, albeit there has been an increase since 2010.

In general, water scarcity is more common in southern Europe, where approximately 30 % of its population living in areas with permanent water stress and up to 70 % of its population living in areas with seasonal water stress during summer[4]. Water abstractions for agriculture, public water supply and tourism are the most significant pressures on freshwater [5]

However, water scarcity is not limited to southern Europe. It extends to river basins across the EU, particularly in western Europe, where water scarcity is caused primarily by high population density in urban areas, combined with high levels of abstraction for public water supply, energy and industry[5]. During the last decade, drought events have also become more frequent and severe in these areas, with impacts on seasonal water availability[6].

Climate change threatens to reduce further the availability of freshwater resources mostly in southern, western and eastern Europe and to exacerbate the natural fluctuations in seasonal water availability. As a result, it is expected that the frequency, intensity and impacts of drought events will be increasing[7]. Based on this and the fact that the overall past trend does not show any improvement — rather a deterioration since 2010 — it seems unlikely that water scarcity will reduce by 2030 (Figure 1).

Figure 2. Worst seasonal water scarcity conditions for European countries in 2019, measured by the water exploitation index plus (WEI+)



Source: EEA/Eurostat/OECD/Joint Research Centre.

In 2019, Cyprus, Malta, Greece, Portugal, Italy and Spain faced the most significant water scarcity conditions in the EU-27 on the seasonal scale (seasonal WEI+ >40%). Malta is experiencing the permanent water scarcity conditions partly due to its natural hydro-climatic conditions. Romania displays water scarcity challenges as well (seasonal WEI+ >20%) (Figure 2). Among the non-EU European countries for which data are available, Turkey is the most severely challenged.

In general, water scarcity conditions intensify between July and September in the majority of countries. This is a combination of dry weather, reduced flows and increased abstractions for irrigated agriculture, tourism and recreational activities, and other socio-economic activities during that period of the year.

Certain river sub-basins, which were affected by seasonal water scarcity in 2019, are located in Belgium, Bulgaria, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Malta, Poland, Portugal, Romania, Sweden, Spain and Romania (seasonal WEI+ >20%; see further River sub-basin seasonal WEI+ results).

Supporting information

Definition

The WEI+ provides a measure of total water consumption as a percentage of the renewable freshwater resources available for a given territory and period. The WEI+ is an advanced geo-referenced version of the WEI. It quantifies how much water is abstracted monthly or seasonally and how much water is returned before or after use to the environment via river basins (e.g. leakages, discharges by economic sectors). The difference between water abstractions and water returns is regarded as 'water consumption'.

Methodology

In 2011, a technical working group, developed under the Water Framework Directive Common Implementation Strategy, proposed the implementation of a regional 'WEI+'. This differed from the previous approach, as the WEI+ was able to depict more seasonal and regional aspects of water stress conditions across Europe (see the EEA's updated conceptual model of WEI+ computation). This proposal was approved by the Water Directors in 2012 as one of the awareness-raising indicators[8].

The regional WEI+ is calculated according to the following formula:

WEI+=(abstractions-returns)/renewable freshwater resources.

Renewable freshwater resources are calculated as 'ExIn+P-Eta±ΔS' for natural and semi-natural areas, and as 'outflow+(abstraction-return)±ΔS' for densely populated areas

where:

ExIn=external inflow

P=precipitation

Eta=actual evapotranspiration

ΔS=change in storage (lakes and reservoirs)

Outflow=outflow to downstream/sea.

It is assumed that there are no pristine or semi-natural river basin districts or sub-basins in Europe. Therefore, the formula 'outflow+(abstraction-return)±ΔS' is used to estimate renewable water resources.

Climate data and streamflow data have been integrated from Waterbase — Water Quantity database and the Joint Research Centre (JRC) Lisflood model[9]. The JRC Lisflood data cover hydro-climatic variables for Europe in a homogeneous way for the years 2000-2019 on a monthly scale.

Once the data series are complete, the flow linearisation calculation is implemented, followed by a water asset accounts calculation, which is done to fill the gaps in the data for the parameters requested for the estimation of renewable water resources. The computations are implemented at different scales independently, from sub-basin scale to river basin scale or to country level.

Overall, annually reported data are available for water abstraction by source (surface water and groundwater) and water abstraction by sector with temporal and spatial gaps. Gap-filling methods are applied to obtain harmonised time series.

No sufficient data are available at the European scale on 'return'. To fill gaps in data on return, urban wastewater treatment plant data, the European Pollutant Release and Transfer Register (E-PRTR) database[10], JRC data on the crop coefficient of water consumption and satellite-observed phenology data have been used as proxies to quantify water demand and water use by different economic sectors. Eurostat tourism data[11] and data on industry in production have been used to estimate the actual water abstraction and return on a monthly scale. Where available, Waterbase — Water Quantity database[12] and Eurostat data[13] on water availability and water use have also been used at aggregated scales for further validation purposes.

Once water asset accounts have been implemented according to the United Nations System of Environmental-Economic Accounting for Water[14], the necessary parameters for calculating water use and renewable freshwater resources are harvested.

Following this, bar and pie charts are produced, together with static and dynamic maps.

Methodology for gap filling

For each parameter of water abstraction, return and renewable freshwater resources, primarily data from the Waterbase — Water Quantity database have been used[12]. Eurostat, OECD and Aquastat (FAO) databases have also been used to fill the gaps in the data sets. Furthermore, the statistical office websites[13] of all European countries have each been visited several times to get the most up-to-date data from these national open sources. Despite this, some gaps still needed to be filled by applying certain statistical or geospatial methodologies (see EEA (undated), Table 1 - Reference data sources for gap filling and modulation coefficients).

Lisflood data from the JRC have been used to gap fill the streamflow data set (see EEA (undated), Table 1 - Reference data sources for gap filling and modulation coefficients). The spatial reference data for the WEI+ are the European Catchments and Rivers Network System (Ecrins) data (250-m vector resolution). Ecrins is a vector spatial data set, while Lisflood data are in 5-km raster format. To fill the gaps in the streamflow data, centroids of the Lisflood raster have been identified as fictitious (virtual) stations. The topological definition of the drainage network in Ecrins has been used to match the most relevant and nearest fictitious Lisflood stations with EEA-Eionet stations and the Ecrins river network. After this, the locations of stations between Eionet and Lisflood stations were compared and overlapping stations were selected for gap filling. For the remaining stations, the following criteria were adhered to: fictitious stations had to be located within the same catchment as the Eionet station and have the same main river segment; in addition, both stations had to show a strong correlation.

A substantial amount of gap filling has been performed on the data on water abstraction for irrigation. First, a mean factor between utilised agricultural areas and irrigated areas has been used to fill the gaps in the data on irrigated areas. Then, a multiannual mean factor of water density (m^3/ha) in irrigated areas per country has been used to fill the gaps in the data on water abstraction for irrigation.

The gaps in the data on water abstraction for manufacturing and construction have been filled using Eurostat data on production in industry (Eurostat [sts_inpr_a]) and the E-PRTR database, with the methodologies in the best available techniques reference document (BREF) being used to convert the production level into the volume of water.

Uncertainties

Methodology uncertainty

Reported data on water abstraction and water use do not have sufficient spatial or temporal coverage. Therefore, estimates based on country coefficients are required to assess water use. First, water abstraction values are calculated and, second, these values are compared with the production level in industry and in relation to tourist movements to approximate actual water use for a given time resolution. This approach cannot be used to assess the variations (i.e. the resource efficiency) in water use within the time series.

Spatial data on lakes and reservoirs are incomplete. However, as reference volumes for reservoirs, lakes and groundwater aquifers are not available, the water balance can be quantified as only a relative change, and not the actual volume of water. This masks the actual volume of water stored in, and abstracted from, reservoirs. Thus, the impact of the residence time, between water storage and use, in reservoirs is unknown.

The sectoral use of water does not always reflect the relative importance of the sectors to the economy of a given country. It is, rather, an indicator that describes which sectors environmental measures should focus on in order to enhance the protection of the environment. A number of iterative computations based on identified proxies are applied to different data sets, i.e. urban wastewater treatment plant data, E-PRTR data, JRC data on the crop coefficient of water consumption and satellite-observed phenology data have been used as proxies to quantify water demand and water use by different economic sectors. This creates a high level of uncertainty in the quantification of water return from economic sectors, thus also leading to uncertainty with regard to the 'water use' component.

The calculation of the EU percentage area affected by water scarcity includes the whole of the sub-river basins, which are shared with non-EU neighbouring countries as it has not been possible to distinguish the data between EU and non-EU countries in such locations. Nevertheless, most of the sub-basins identified as having water scarcity fall in EU territory.

ISPRA, in collaboration with Istat, provided provisional annual WEI+ values for Italy for the years 2015-2019 by following the WEI+ formula that is also implemented by the EEA. In the annual WEI+ computation for Italy (2015-2019), the term ΔS (change in water storage) is considered to be negligible by these institutions, and it has therefore been set equal to zero by ISPRA. In the seasonal WEI+ estimation, provided by Italy for 2019, the term ΔS (change in water storage) has been considered instead. The datasets used for WEI+ evaluation are not homogeneous in terms of sources over the entire time-period. Therefore, there is no use in assessing trends, as they would not be statistically significant.

Policy/environmental relevance

Justification for indicator selection

The WEI+ is a water scarcity indicator that provides information on the level of pressure exerted by human activities on the natural water resources of a territory. This helps to identify the areas that are prone to water stress problems [8]. The WEI+ values on the country and annual scales are provided in line with the directions of UN SDG indicator 6.4.2 ('Level of water stress'), which is used to track progress towards target 6.4, addressing water scarcity and resource efficiency[15] (however, ecological flows are not yet included in the WEI+). Furthermore, computing and assessing the WEI+ at finer spatial scale (e.g. river basin districts) and finer temporal scale (e.g. seasonal), compared to the country-scale annual averages, helps to improve the monitoring and assessment of water scarcity issues occurring regionally/locally and seasonally. Finally, computation and assessment of the WEI+ at the European level, would hide the large regional and local differences that exist across the continent. Therefore, it would be misleading. Instead, the computation and assessment of the proportional area being affected by water scarcity conditions (either seasonally or throughout an entire year) better capture the significance of water scarcity conditions on the continental scale.

Policy context and targets

Context description

The WEI is part of the set of water indicators published by several international organisations, such as the Food and Agricultural Organization of the United Nations (FAO), the Organisation for Economic Co-operation and Development (OECD), Eurostat and the Mediterranean Blue Plan. An indicator similar to WEI is also used to measure progress towards UN SDG target 6.4.2 at the global level[15]. Therefore, the WEI is an internationally accepted indicator for assessing the pressure of the economy on water resources, i.e. water scarcity.

This indicator is a headline indicator for monitoring progress towards the 8th Environment Action Programme (8th EAP). It contributes mainly to monitoring aspects of the 8th EAP Article 2.1. that requires that 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters and other environmental risks. The Union sets the pace for ensuring the prosperity of present and future generations globally, guided by intergenerational responsibility'[16]. The European Commission 8th EAP monitoring communication specifies that this indicator should monitor whether there is a reduction in water scarcity[17].

The new Water Reuse Regulation[18], which entered into force in 2020, explicitly addresses water stress and water scarcity, respectively, and includes provisions for improving resource efficiency in the context of managing water resources.

Targets

There are no specific quantitative targets directly related to this indicator. However, the Water Framework Directive (Directive 2000/60/EC)[19] requires Member States to promote the sustainable use of water resources based on the long-term protection of available water resources, and to ensure a balance between abstraction and the recharge of groundwater, with the aim of achieving good groundwater status and good ecological status or potential for surface waters.

Regarding WEI+ thresholds, it is important that agreement is reached on how to delineate non-stressed and stressed areas. Raskin et al. (1997)[2] suggested that a WEI value of more than 20% should be used to indicate water scarcity, whereas a value of more than 40% would indicate severe water scarcity. These thresholds are commonly used in scientific studies[20]. Smakhtin et al. (2004)[21] suggested that a 60% reduction in annual total run-off would cause environmental water stress. The FAO uses a water abstraction value of above 25% to indicate water stress and of above 75% to indicate serious water scarcity[22]. Since no formally agreed thresholds are available for assessing water stress conditions across Europe, in the current assessment, the 20% WEI+ threshold is considered to distinguish stressed from non-stressed areas, while a value of 40% is used as the highest threshold for mapping purposes. The previous thresholds were proposed by Raskin at al. (1997) [2]originally for the WEI.

Accuracy and uncertainties

Methodology uncertainty

Reported data on water abstraction and water use do not have sufficient spatial or temporal coverage. Therefore, estimates based on country coefficients are required to assess water use. First, water abstraction values are calculated and, second, these values are compared with the production level in industry and in relation to tourist movements to approximate actual water use for a given time resolution. This approach cannot be used to assess the variations (i.e. the resource efficiency) in water use within the time series.

Spatial data on lakes and reservoirs are incomplete. However, as reference volumes for reservoirs, lakes and groundwater aquifers are not available, the water balance can be quantified as only a relative change, and not the actual volume of water. This masks the actual volume of water stored in, and abstracted from, reservoirs. Thus, the impact of the residence time, between water storage and use, in reservoirs is unknown.

The sectoral use of water does not always reflect the relative importance of the sectors to the economy of a given country. It is, rather, an indicator that describes which sectors environmental measures should focus on in order to enhance the protection of the environment. A number of iterative computations based on identified proxies are applied to different data sets, i.e. urban wastewater treatment plant data, E-PRTR data, JRC data on the crop coefficient of water consumption and satellite-observed phenology data have been used as proxies to quantify water demand and water use by different economic sectors. This creates a high level of uncertainty in the quantification of water return from economic sectors, thus also leading to uncertainty with regard to the ‘water use’ component.

The calculation of the EU percentage area affected by water scarcity includes the whole of the sub-river basins, which are shared with non-EU neighbouring countries as it has not been possible to distinguish the data between EU and non-EU countries in such locations. Nevertheless, most of the sub-basins identified as having water scarcity fall in EU territory.

ISPRA, in collaboration with Istat, provided provisional annual WEI+ values for Italy for the years 2015-2019 by following the WEI+ formula that is also implemented by the EEA. In the annual WEI+ computation for Italy (2015-2019), the term ΔS (change in water storage) is considered to be negligible by these institutions, and it has therefore been set equal to zero by ISPRA. In the seasonal WEI+ estimation, provided by Italy for 2019, the term ΔS (change in water storage) has been considered instead. The datasets used for WEI+ evaluation are not homogeneous in terms of sources over the entire time-period. Therefore, there is no use in assessing trends, as they would not be statistically significant.

Data set uncertainty

Data are very sparse for some parameters of the WEI+. For instance, current streamflow data reported by the EEA member countries to the WISE SoE — Water Quantity database[12] do not have sufficient temporal or spatial coverage to provide a strong enough basis for estimating renewable water resources for all of Europe. Such data are not available elsewhere at the European level. Therefore, JRC Lisflood data are used intensively as surrogates[23], 'Availability on streamflow data').

Data on water abstraction by economic sector have better spatial and temporal coverage. However, the representativeness of data for some sectors is also poor, such as the data on water abstraction for mining. In addition to the WISE SoE — Water Quantity database, intensive efforts to compile data from open data sources such as Eurostat, OECD, Aquastat (FAO) and national statistical offices have also been made (see EEA (undated), 'Share of surrogate data versus reported data on water abstraction by all economic sectors (total volume)').

Quantifying water exchanges between the environment and the economy is, conceptually, very complex. A complete quantification of the water flows from the environment to the economy and, at a later stage, back to the environment, requires detailed data collection and processing, which have not been done at the European level. Thus, reported data have to be used in combination with modelling to obtain data that can be used to quantify such water exchanges, with the purpose of developing a good approximation of 'ground truth'. However, the most challenging issue is related to water abstraction and water use data, as the water flow within the economy is quite difficult to monitor and assess given the current lack of data availability. Therefore, several interpolation, aggregation or disaggregation procedures have to be implemented at finer scales, with both reported and modelled data. The main consequences of data set uncertainty are that the water accounts and WEI+ results have been implemented in the EEA member and western Balkan countries. However, regional data availability was an issue for some river basins (e.g. in Italian and Turkish river basins), which had to be removed from the assessment.

Rationale uncertainty

Because of the aggregation procedure used, slight differences exist between sub-basin and country levels for total renewable water resources and water use.

Data sources and providers

- Groundwater depletion - Lisflood- EPIC model, Joint Research Centre (JRC)
- Population on 1 January by age and sex (DEMO_PJAN), Statistical Office of the European Union (Eurostat)

- Freshwater abstractions (OECD), Organisation for Economic Co-operation and Development (OECD)
- Annual freshwater abstraction by source and sector [env_wat_abs], Statistical Office of the European Union (Eurostat)
- Waterbase - Water Quantity, European Environment Agency (EEA)
- European catchments and Rivers network system (Ecrins), European Environment Agency (EEA)

Metadata

DPSIR

Pressure

Topics

 # Water **# Climate change adaptation** **# Extreme weather**

Tags

 # Surface water **# 8th EAP** **# Water abstraction** **# Groundwater** **# WAT001**

Temporal coverage

2000-2019

Geographic coverage

Albania	Austria
Belgium	Bosnia and Herzegovina
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Kosovo (UNSCR 1244/99)	Latvia
Lithuania	Luxembourg
Malta	Netherlands
North Macedonia	Norway
Poland	Portugal

Romania	Serbia
Slovakia	Slovenia
Spain	Sweden
Switzerland	Turkey

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Clean water and sanitation

Unit of measure

WEI+ values are given as percentages, i.e. water use as a percentage of renewable water resources.

Frequency of dissemination

Every 2 years

Contact

info@eea.europa.eu

References and footnotes

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↵

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23. EEA, undated, 'Conceptual model of the WEI+ computation', (https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/resolveuid/b820b42dc3e8406a9bc9372ae3eee08b).
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European Environment Agency

8th Environment Action Programme

Consumption footprint (based on life cycle assessment)

8TH EAP HEADLINE INDICATOR, 2023

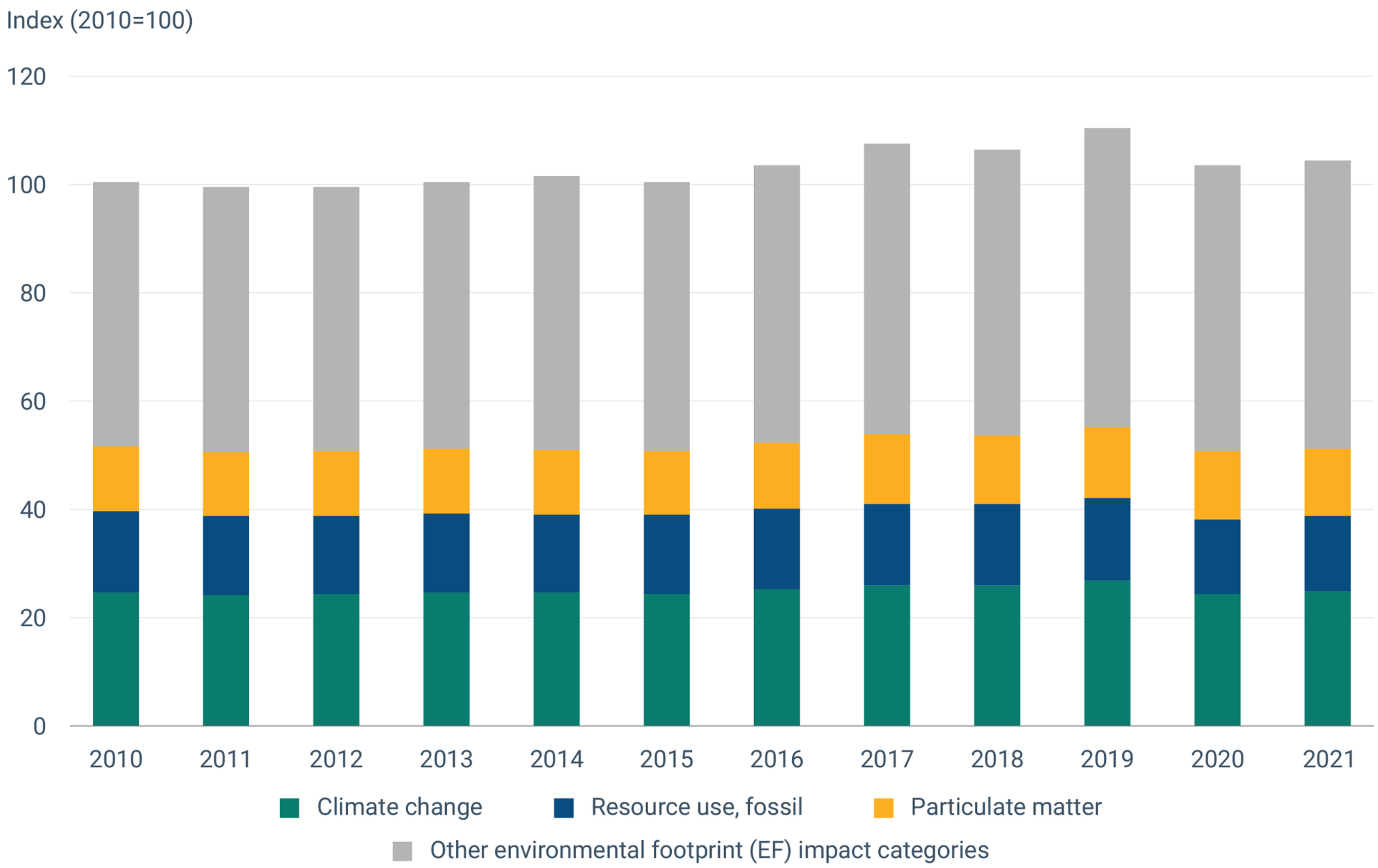
European Environment Agency

Consumption footprint (based on life cycle assessment)

Published 14 Sept 2023

The Eighth Environment Action Programme calls for the EU to significantly reduce its consumption footprint by 2030, i.e. the environmental and climate impacts of its consumption, irrespective of whether products consumed are produced in or outside the EU. From 2010 to 2021, the consumption footprint increased, albeit only slightly, by around 4%. Projections indicate that it will increase further by 2030, triggered by economic growth and current consumption patterns and therefore that the EU is rather unlikely to meet its aim by 2030. Switching to less environmentally harmful products and curbing increasing consumption levels would be necessary to keep the impacts of EU consumption within planetary boundaries.

Figure 1. EU consumption footprint, in a single indexed score (2010=100), broken down into the most significant contributing impact categories of the Environmental Footprint (EF) method, from 2010 to 2021



Source: Joint Research Centre.

The EU's Eighth Environment Action Programme (8th EAP) calls for a significant reduction in the Union's consumption footprint, to bring it within planetary boundaries as soon as possible. To fulfil this ambition, the EU must accelerate its transition towards adopting a regenerative growth model, to give back to the planet more than it takes, as outlined in the EU's 2020 circular economy action plan [1]. The consumption footprint represents the environmental and climate impacts of the consumption of goods and services [2] by EU citizens, irrespective of whether these goods and services are produced within or outside the EU.

Different approaches can be used to calculate a consumption footprint. The methodology used for this indicator [2] is based on life cycle assessment (LCA): LCA data for a basket of representative products are used to calculate environmental impacts and these are then scaled up to represent impacts from entire EU consumption, based on consumption statistics. The indicator uses the European Commission's environmental footprint method to assess environmental impacts in 16 different categories, including climate change and resource depletion, which can be aggregated to give a single score, based on a normalisation and weighting system.

In the period 2010-2021, the EU's consumption footprint increased slightly, by almost 4%. In the same period, gross domestic product (GDP) increased by almost 8%. This indicates that the impacts of the EU's consumption are growing at a slower pace than its economy, suggesting a decoupling of the consumption footprint from economic growth [4][3]. However, the consumption footprint and GDP still appear to be somewhat correlated (e.g. they both declined in 2020 during the economic slowdown caused by pandemic-related measures). This means that reducing the impacts of EU consumption in a growing economy will be challenging.

In 2021, the consumption of food contributed the most (48%) to the total environmental impact of consumption in the EU, followed by housing (19%) and mobility (15%). The types of environmental impact that make the largest contributions to the consumption footprint are those related to climate change (24%), the use of fossil resources (14%) and the release of particulate matter (12%) [4].

Overall, the environmental impacts of EU citizens' consumption is considered high. Scientific evidence increasingly suggests that, based on current consumption footprint levels, the EU exceeds its fair share of planetary boundaries for five environmental impact categories, including particulate matter, climate change and resource use (EC, 2023; Sanye Mengual and Sala, 2023) [5].

Based on current consumption patterns and expected economic growth, the EU's consumption footprint is projected to increase further by 2030 [6]. Therefore, the EU is rather unlikely to meet its aim of significantly reducing this footprint by 2030.

The EU could reduce its consumption footprint by (1) reducing the overall amount of goods and services consumed, (2) shifting to the consumption of goods with a lower environmental impact or (3) a combination of the above. In this regard, it is worth noting that, in general, service consumption has less of an impact on the environment than the consumption of goods. Adopting circular business models based on, for example, sharing or product-as-a-service schemes would help the EU to move in this direction.

Figure 2. Level of consumption footprint (points per capita) for EU countries in 2021 compared to 2010

Source: Joint Research Centre.

In 2021, Denmark had the highest consumption footprint of the 27 EU Member States and Slovakia had the lowest, with a score less than half that of Denmark.

Between 2010 and 2021, 13 Member States showed increases in their consumption footprints, while 14 showed decreases. These changes were relatively small in most countries, however. The largest increases, of more than 15%, were registered for Croatia, Bulgaria, Poland, Lithuania and Romania. On the other hand, significant decreases, of more than 10%, were registered for Ireland, Slovenia and Luxembourg, indicating that reducing a national consumption footprint in a growing economy is possible.

Supporting information

Definition

The EU consumption footprint indicator represents a summary of the environmental and climate impacts associated with the EU's consumption of goods and services, regardless of where in the world these goods and services are produced. The indicator is based on consumption statistics and process-based life cycle assessment (LCA) structured in a basket of representative product of main areas of consumption. The assessment includes the 16 impact categories of the European Commission's environmental footprint method [7], which are aggregated into a single weighted score.

Methodology

Different methodological approaches can be taken to calculating consumption footprints. The two most widely used are the 'top-down' and the 'bottom-up' approaches. The former derives environmental impacts of EU consumption from the observed environmental impacts of economic production, using macro-economic (input-output) modelling. The latter is based on combining macro-scale consumption statistics and LCA data to construct the consumption footprint by focusing on a basket of representative products for a number of consumption areas.

The footprint presented in this indicator is based on the latter methodological approach, as this has been developed by the European Commission's Joint Research Centre. The methodology documents available through the Consumption Footprint Platform explain the precise method and calculations used to derive this consumption footprint [4].

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting targets of the 8th EAP. It contributes mainly to monitoring progress in relation to aspects of 8th EAP Article 3(s), which requires the following: 'significantly decreasing the Union's material and consumption footprints to bring them into planetary boundaries as soon as possible, including through the introduction of Union 2030 reduction targets, as appropriate' [8]. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should be used to monitor the EU's progress towards achieving the target to 'significantly decrease the EU's consumption footprint, i.e. the environmental impact of consumption' [9].

Accuracy and uncertainties

Data sources and providers

- Consumption Footprint, Joint Research Centre (JRC)

Metadata

DPSIR

Impact

Topics

Sustainability solutions

Tags

WST010 # 8th EAP # service consumption # Sustainability # consumption footprint # EU consumtion

Temporal coverage

2010-2021

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia

Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Performance indicator (Type B - Does it matter?)

UN SDGs

Responsible consumption and production

Unit of measure

Figure 1: The EU consumption footprint is shown as a single indexed score (2010=100) and is broken down according to the impact categories of the environmental footprint (EF) method that make the most significant contribution to the consumption footprint — 'climate change', 'resource use, fossil' and 'particulate matter' — and other EF impact categories

Figure 2: Points per capita

Extra figure: Number of times the planetary boundaries are transgressed

Frequency of dissemination

Once a year

Contact

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References and footnotes

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↵
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5. The EU's consumption footprint is transgressing the planetary boundaries for the environmental footprint categories of particulate matter, freshwater ecotoxicity, climate change and resource use (for both fossil and mineral and metal resources) (EC, 2023; Sanye Mengual and Sala, 2023).

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8. EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a general Union environment action programme to 2030, OJ L 114, 12.4.2022, p. 22-36.

9. EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: measuring progress towards the attainment of the programme's 2030 and 2050 priority objectives, COM (2022) 357 final of 26 July 2022.

European Environment Agency

8th Environment Action Programme

Gross value added of the environmental goods and services sector

8TH EAP HEADLINE INDICATOR, 2023

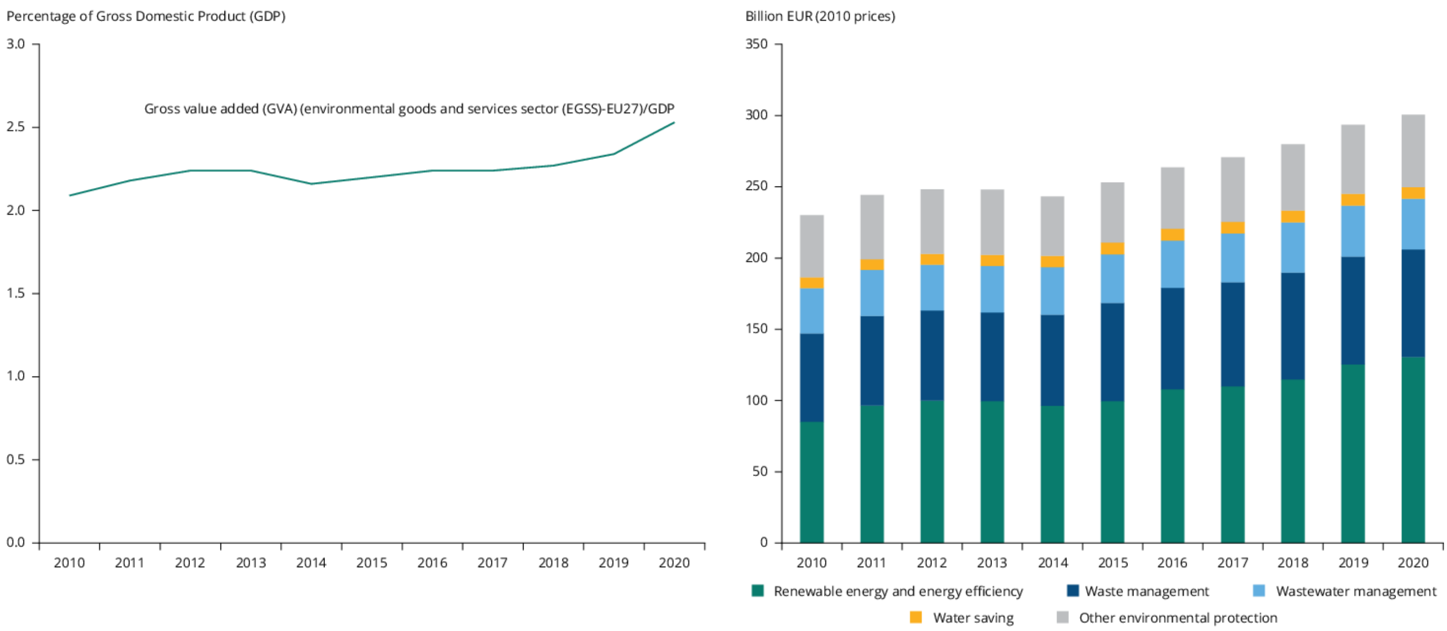
European Environment Agency

Gross value added of the environmental goods and services sector

Published 28 Apr 2023

The contribution of the environmental goods and services sector (environmental or green economy) to the overall economy in the EU in terms of value added increased from 2.1% in 2010 to 2.5% in 2020, when it reached just over EUR 300 billion (2010 prices). This rise was mainly caused by significant increases in environmental economy activities related to renewable energy sources and energy efficiency and waste management. The EU aims to achieve a green transition and a carbon-neutral economy by 2050. This will require further significant increases in environmental economy activities. It is therefore expected that the EU's environmental economy will account for an increasing share of the whole economy in the coming years.

Figure 1. Gross value added of the EU's environmental goods and services sector by domain, 2010-2020



Source: Eurostat.

The European Green Deal [1] and the Eighth Environment Action Programme (8th EAP) [2] aim to accelerate the green transition of the EU's economy. The EU's environmental goods and services sector, also known as the green economy, produces goods and provides services that are used in environmental protection and resource management.

The contribution of the environmental economy to the overall economy (i.e. to gross domestic product (GDP)) in the EU increased from 2.1% in 2010 to 2.5% in 2020. Over this period, the environmental economy increased by 2.7% annually, on average, while EU GDP increased by only 0.8%.

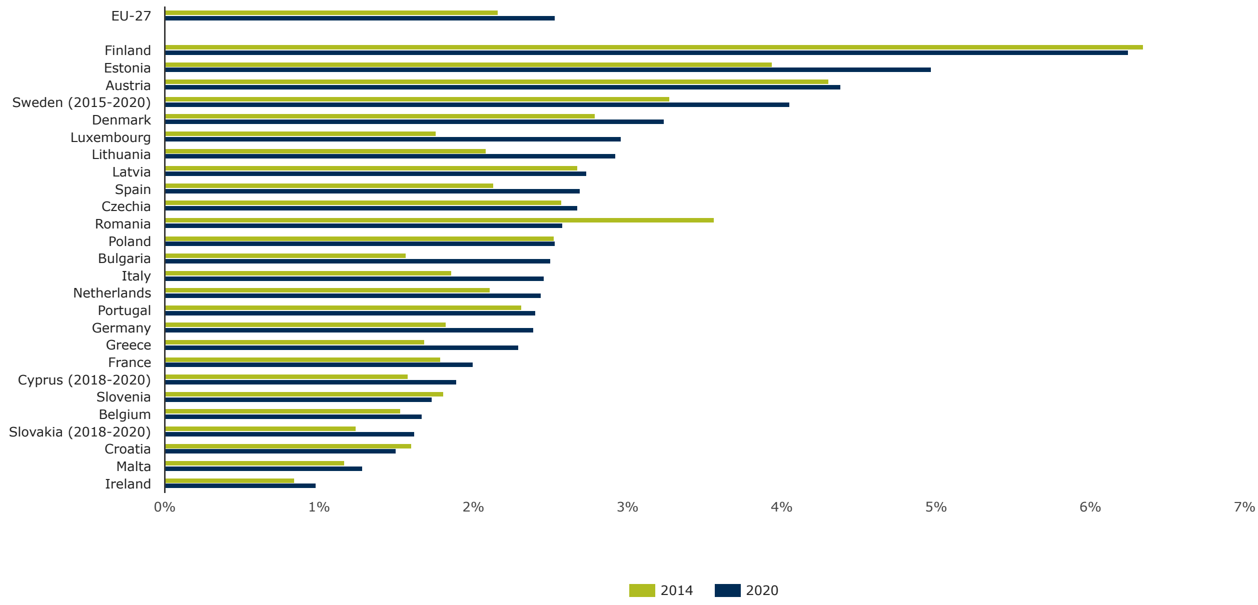
In terms of gross value added (GVA), all of the main domains of the green economy increased in the period 2010-2020. However, most growth was due to increases in the GVA of renewable energy and energy efficiency activities, followed by waste management activities. In 2020, green economy activities contributed a gross value added of EUR 301 billion (2010 prices) to the EU-27 economy.

The European Green Deal increases the ambition of EU environment and climate policy, to support the transition to a carbon-neutral, circular, green economy by 2050. As a result, it is expected that the contribution of the green economy to EU GDP will increase further in the coming years. For example, the application of circular economy principles across the EU economy is expected to increase EU GDP by an additional 0.5% by 2030 [3]. Similarly, significant additional economic activity will be required to implement the 'Fit for 55' package [4], which aims to increase output from renewable energy sources, such as solar energy or offshore wind sources, and improve energy efficiency.

Additional resources have been made available to support the expansion of the EU's environmental economy. The EU's 2021-2027 budget has earmarked additional funding for climate- and biodiversity-related activities [5]. Moreover, grants and loans are available through the 2021-2026 EU Recovery and Resilience Facility (RRF) [5]for climate-related activities and through the 2022-2027 REPowerEU plan [6] for activities related to renewable energy and energy efficiency. The RRF was created to mitigate the social and economic impacts of the COVID-19 pandemic, while the REPowerEU plan was devised to rapidly reduce the EU's dependence on Russian fossil fuels following Russia's invasion of Ukraine and to fast forward the clean energy transition.

Environmental economy activities are also expected to become more important at the global level. A recent report estimates that the global market volume for environmental technology and resource efficiency activities will increase by 7.3% per year until 2030 [7]. The increasing opportunities for the environmental economy, particularly for economic sectors that contribute to achieving net-zero emissions, are also highlighted in the International Energy Agency reports 'World energy outlook 2022' [8] and 'Energy technology perspectives 2023' [9].

Figure 2. Gross value added of the environmental goods and services sector by EU Member States, 2014 and 2020



Source: Eurostat.

Data used in the graph

Countries	2014	2020
EU-27	2.16	2.53
Finland	6.34	6.24
Estonia	3.94	4.97
Austria	4.3	4.38
Sweden (2015-2020)	3.27	4.05
Denmark	2.79	3.24
Luxembourg	1.76	2.96
Lithuania	2.08	2.92
Latvia	2.68	2.73
Spain	2.13	2.69
Czechia	2.57	2.68
Romania	3.56	2.58
Poland	2.52	2.53
Bulgaria	1.56	2.5
Italy	1.86	2.46
Netherlands	2.11	2.44
Portugal	2.31	2.4
Germany	1.82	2.39
Greece	1.68	2.29
France	1.79	2
Cyprus (2018-2020)	1.58	1.89
Slovenia	1.81	1.73

Countries	2014	2020
Belgium	1.53	1.67
Slovakia (2018-2020)	1.24	1.62
Croatia	1.6	1.5
Malta	1.16	1.28
Ireland	0.84	0.98

Shares of the environmental economy in the total economy increased in 19 of the EU Member States between 2014 and 2020, with the biggest increases reported for Luxembourg and Estonia. In contrast, shares dropped during this period in four EU Member States: Croatia, Romania, Slovenia and Finland. Shares varied considerably across Member States in 2020, from about 1% in Ireland to more than 4% in Finland, Estonia, Austria and Sweden.

Supporting information

Definition

The indicator 'Gross value added of the environmental goods and services sector' monitors the gross value added of the economic activities of the EU's environmental (or green) economy. The indicator builds on Eurostat statistics on employment and growth in the EU's environmental economy, as they are defined in the European environmental goods and services sector accounts. 'The environmental economy encompasses activities and products that serve either of two purposes: "environmental protection" — that is, preventing, reducing and eliminating pollution or any other degradation of the environment, or "resource management" — that is, preserving natural resources and safeguarding them against depletion'[10].

For further information, see Eurostat (2016).

Methodology

This indicator is directly based on data published by Eurostat, and the underpinning methodology can be found in Eurostat (2023). EU-level data are based on Eurostat estimates. A detailed discussion of statistics on the environmental goods and services sector can be found in Eurostat (2016).

The data were deflated to 2010 prices by using the GDP deflator.

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting targets of the 8th EAP. It contributes mainly to monitoring progress in relation to aspects of Article 2.1, which requires that, 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters and other environmental risks. The Union sets the pace for ensuring the prosperity of present and future generations globally, guided by intergenerational responsibility' [11]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should monitor the 'increase ofthe shares of the green economy... in the whole economy' [2].

Accuracy and uncertainties

Data sources and providers

- Production, value added and exports in the environmental goods and services sector [ENV_AC_EGSS2__custom_3494226], Statistical Office of the European Union (Eurostat)
- GDP and main components (output, expenditure and income) [NAMA_10_GDP__custom_3489075], Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Response

Topics

Sustainability solutions

Tags

GDP # Gross value added # green economy # 8th EAP # GVA # goods and services # environment # European Green Deal # environmental economy # SUSO003 # green transition

Temporal coverage

2010-2020

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

The gross value added of the environmental goods and services sector is measured in billion euros (EUR) and as a share (%) of total economy GDP.

Frequency of dissemination

Once a year

Contact

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References and footnotes

1. EC, 2019, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions 'The European Green Deal', COM (2019) 640 final of 11 December 2019.
↵
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European Environment Agency

8th Environment Action Programme

Employment in the environmental goods and services sector

8TH EAP HEADLINE INDICATOR, 2023

European Environment Agency

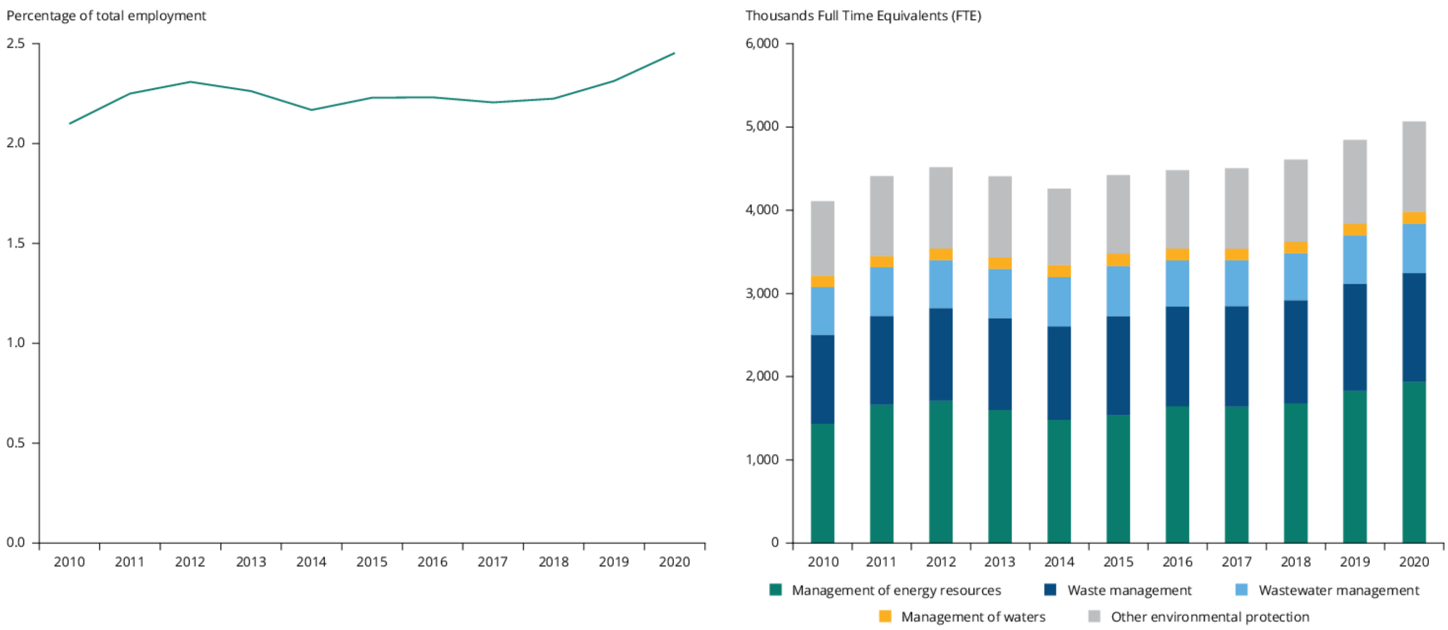
Employment in the environmental goods and services sector

Published 28 Apr 2023

Analysis and data > Indicators > Employment in the environmental goo...

Employment in the EU's environmental goods and services sector grew at a faster rate than the EU's overall rate of employment in the last decade. It increased from 2.1% of total employment in 2010 to 2.5% in 2020, with the number of full-time equivalent employees in this sector reaching 5.1 million. This was mainly the result of the creation of jobs related to renewable energy, energy efficiency and waste management. The EU aims to accelerate the green transition of its economy and also become carbon neutral by 2050. This is expected to boost job creation in the EU's green economy in the coming years and therefore further increase the share of green employment in the EU economy as a whole.

Figure 1. Employment in the EU's environmental goods and services sector by domain, 2010-2020



Source: Eurostat.

The European Green Deal [1] and the Eighth Environment Action Programme (8th EAP) [2] aim to accelerate the green transition of the EU's economy. The EU's environmental goods and services sector, also known as the environmental or green economy, produces goods and provides services that are used for environmental protection and resource management activities.

Employment in the EU's green economy as a share of employment in the EU's whole economy increased by 0.4 percentage points (or 956,000 full-time equivalents (FTEs)) from 2010 to 2020. This represents an increase of 23%, compared with an increase of only 5% in employment in the EU's economy as a whole in the same period. This shows that pursuing environmental objectives has the potential to create jobs in the EU.

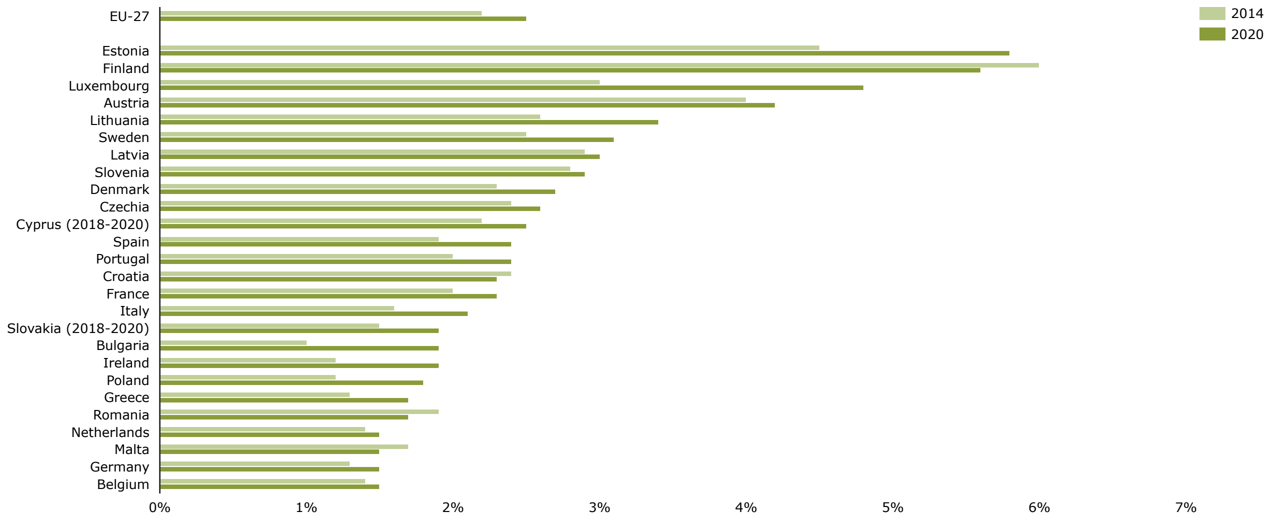
By 2020, the environmental goods and services sector employed 5.1 million people (in FTEs) in the EU, accounting for about 2.5% of total EU employment. The increase in green employment between 2010 and 2020 was driven largely by an increase of 503,000 FTEs in the number of jobs related to the management of energy resources [3], for instance jobs related to:

- producing renewable energy
- manufacturing equipment needed to generate renewable energy, such as wind turbines and photovoltaic cells
- manufacturing energy-efficient equipment
- research and development (R&D) activities
- installation, consultancy and management services.

The second largest contributor to the increase in green employment was waste management, with the number of jobs in this domain increasing by 238,000 FTEs over the period. Employment in the wastewater management domain declined, however, while the numbers of jobs remained more or less stable in the environmental protection domain and slightly increased in the management of waters domain.

Steps taken to support the green transition will create more green employment in the EU by 2030, mainly through applying circular economy principles [4] and moving towards a low-carbon economy [5][6][7]. It is therefore expected that, through policies, measures and investments, green employment will account for a higher share of total employment in the EU by 2030.

Figure 2. Employment in the environmental goods and services sector by EU Member States, 2014 and 2020



Source: Eurostat.

Data used in the graph

Countries	2014	2020
EU-27	2.2	2.5
Estonia	4.5	5.8
Finland	6	5.6
Luxembourg	3	4.8
Austria	4	4.2
Lithuania	2.6	3.4
Sweden	2.5	3.1
Latvia	2.9	3
Slovenia	2.8	2.9
Denmark	2.3	2.7
Czechia	2.4	2.6
Cyprus (2018-2020)	2.2	2.5
Spain	1.9	2.4
Portugal	2	2.4
Croatia	2.4	2.3
France	2	2.3
Italy	1.6	2.1
Slovakia (2018-2020)	1.5	1.9
Bulgaria	1	1.9
Ireland	1.2	1.9
Poland	1.2	1.8
Greece	1.3	1.7
Romania	1.9	1.7

Countries	2014	2020
Netherlands	1.4	1.5
Malta	1.7	1.5
Germany	1.3	1.5
Belgium	1.4	1.5

Shares of green employment in total employment increased in all EU Member States between 2014 and 2020 except in Finland and Romania, where shares dropped by 3% and 15%, respectively. The largest increases in percentage terms were reported for Bulgaria (98%), Luxembourg (87%) and Ireland (79%).

The domains that account for most employment in the environmental economy differ between EU Member States. For example, employment in resource management activities (i.e. management of energy and of water resources) made up more than half of total environmental employment in Estonia, Finland, Luxembourg and Sweden in 2020. In contrast, employment in environmental protection activities (e.g. waste and wastewater management activities) accounted for most environmental employment in Belgium and Croatia (78% in both countries) and in Malta (73%) [8].

Shares of green employment in total employment were highest in Estonia and Finland, with green jobs making up more than 5% of all jobs in these countries in 2020, although the share in Finland had dropped slightly since 2014. Moreover, a share of just below 5% was reported for Luxembourg. The lowest shares, of less of 1.5%, were reported for the Netherlands, Malta, Germany and Belgium.

Supporting information

Definition

The indicator 'Employment in the environmental goods and service sector' monitors employment in the EU's environmental (or green) economy. The indicator builds on Eurostat statistics on employment and growth in the EU's environmental economy, as they are defined in the European environmental goods and service sector (EGSS) accounts. 'The environmental economy encompasses activities and products that serve either of two purposes: "environmental protection" — that is, preventing, reducing and eliminating pollution or any other degradation of the environment, or "resource management" — that is, preserving natural resources and safeguarding them against depletion' [8].

For further information, see Eurostat (2016).

Methodology

This indicator is directly based on data published by Eurostat, and the underpinning methodology can be found in Eurostat [8]. EU-level data are based on Eurostat estimates. A detailed discussion of statistics on the environmental goods and services sector can be found in Eurostat (2016).

Policy/environmental relevance

This indicator is a headline indicator for monitoring progress towards meeting targets of the 8th EAP. It contributes mainly to monitoring progress in relation to aspects of Article 2.1, which requires that, 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced. A healthy environment underpins the well-being of all people and is an environment in which biodiversity is conserved, ecosystems thrive, and nature is protected and restored, leading to increased resilience to climate change, weather- and climate-related disasters and other environmental risks. The Union sets the pace for ensuring the prosperity of present and future generations globally, guided by intergenerational responsibility' [2]. The European Commission communication on the 8th EAP monitoring framework specifies that this indicator should monitor the 'increase ofthe shares… of green employment in the whole economy' [9].

Accuracy and uncertainties

Data sources and providers

- Employment in the environmental goods and services sector [ENV_AC_EGSS1__custom_3494147], Statistical Office of the European Union (Eurostat)
- Employment by A*10 industry breakdowns [NAMA_10_A10_E__custom_4173709], Statistical Office of the European Union (Eurostat)

Metadata

DPSIR

Response

Topics

Sustainability solutions

Tags

green economy # 8th EAP # environmental goods # environmental economy # SUSO002 # Employment

Temporal coverage

2010-2020

Geographic coverage

Austria	Belgium
Bulgaria	Croatia
Cyprus	Czechia
Denmark	Estonia
Finland	France
Germany	Greece
Hungary	Ireland
Italy	Latvia
Lithuania	Luxembourg
Malta	Netherlands
Poland	Portugal
Romania	Slovakia
Slovenia	Spain
Sweden	

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Sustainable cities and communities

Unit of measure

Employment in the environmental goods and services sector is measured in thousands of full-time equivalents (total hours worked divided by the average annual hours worked in a full-time job) and as a share (%) of total employment.

Frequency of dissemination

Once a year

Contact

info@eea.europa.eu

References and footnotes

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↵

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European Environment Agency

8th Environment Action Programme

Environmental inequalities: income-related environmental inequalities associated with air pollution in Europe

8TH EAP HEADLINE INDICATOR, 2023

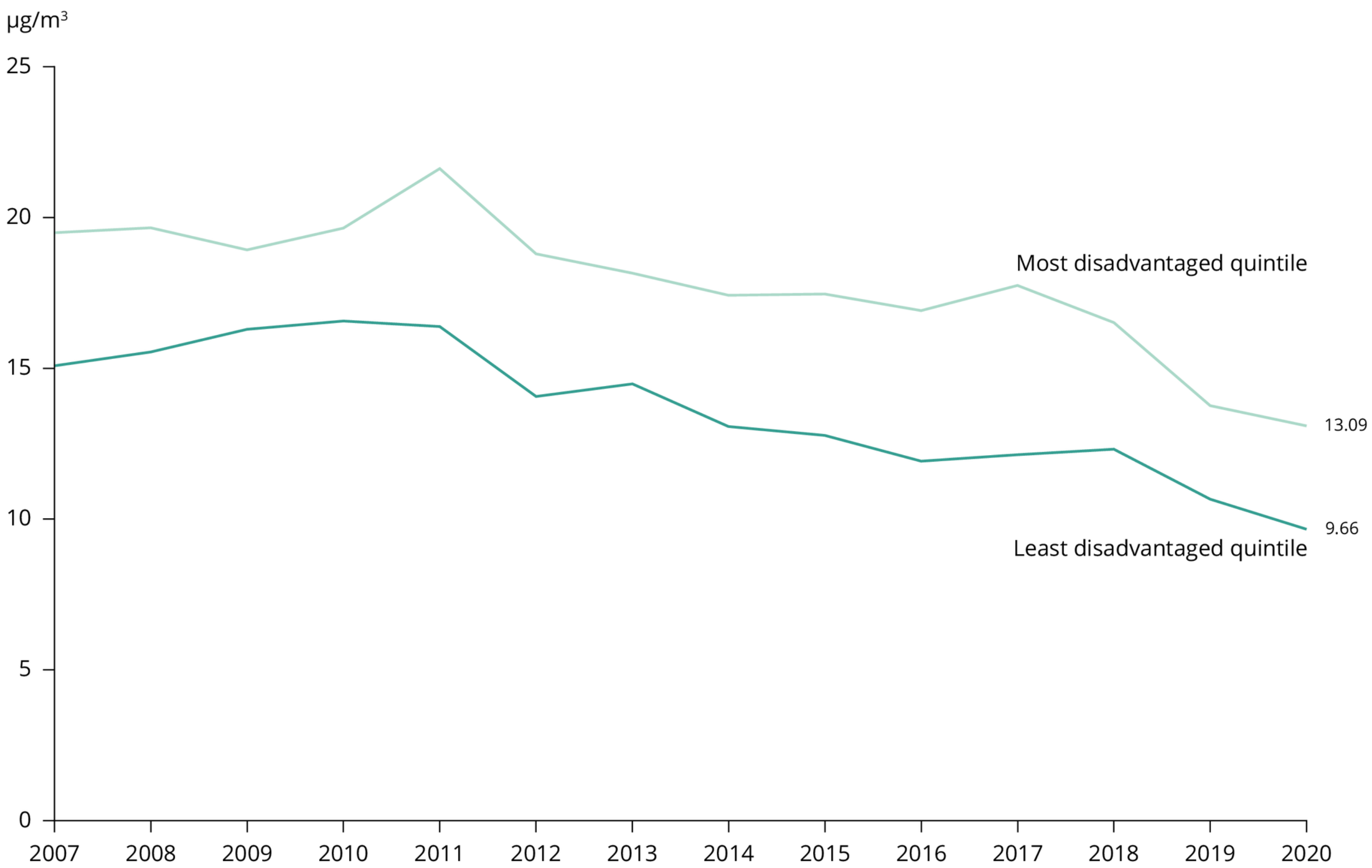
European Environment Agency

Income-related environmental inequalities associated with air pollution in Europe

Published 28 Apr 2023

Air pollution poses the greatest environmental risk to health in Europe. Fine particulate matter ($PM_{2.5}$) causes more premature deaths in Europe than any other ambient air pollutant. Despite improving trends in air pollution for both the richest and poorest regions of the EU during 2007-2020, inequalities remained with levels of $PM_{2.5}$ concentrations consistently higher by around one third in the poorest regions. This lack of progress in reducing air pollution exposure disparities seems to indicate that we are not progressing in reducing these important environmental inequalities.

Figure 1. Population-weighted concentrations (micrograms per cubic meter) of fine particulate matter ($PM_{2.5}$) in the richest and poorest NUTS3 regions in the EU-27, 2007-2020



Source: EEA/Eurostat.

Air pollution poses the greatest environmental risk to health in Europe [1]. Fine particulate matter with a diameter of 2.5µm or less ($PM_{2.5}$) is the ambient air pollutant associated with the highest number of premature deaths [1], with no thresholds below which exposure is considered safe in terms of the impacts on health [2]. $PM_{2.5}$ exposure also demonstrates to be a reliable indicator of risk associated with air pollution in general and in different environments [3]. Monitoring $PM_{2.5}$ levels is therefore useful for exploring income-related inequalities in the distribution of health impacts of air pollution and more broadly of environmental risks.

This indicator explores these inequalities by comparing the exposure to air pollution by fine particulate matter experienced by the population living in the poorest regions of the EU with that in the richest regions. The analysis uses population-weighted concentrations of $PM_{2.5}$ in the 20% NUTS3 regions (i.e. in small regions like a prefecture) of the EU with the least per capita income (in terms of purchasing power) and in the 20% NUTS3 regions with the highest per capita income. Exposure at NUTS3 is an imperfect proxy for actual inequalities in air pollution exposure. Most likely, within a city the inequalities can be much higher than between NUTS3 regions, depending on the local situation (proximity to main roads, industry, etc.). However, while we have data on exposure to fine particles at a very fine scale (down to a 1 by 1km cell grid), we do not have Europe-wide data on GDP at a level smaller than NUTS3. Therefore, NUTS3 is the smallest scale at which we can calculate the indicator as currently defined.

Between 2007 and 2020, air quality, measured as population-weighted concentrations of $PM_{2.5}$, improved in both the least disadvantaged (i.e. richest) and the most disadvantaged (i.e. poorest) quintiles of the EU-27's NUTS3 regions (figure 1). However, regions in the richest quintile had lower $PM_{2.5}$ levels to begin with (around 15µg/m^3 in 2007) than those in the poorest quintile (19.5µg/m^3 in 2007).

In an environmentally equal Europe, poverty and pollution would not be correlated. $PM_{2.5}$ concentrations have decreased at relatively similar rates in regions in the richest quintile (3.15% average year-to-year decrease between 2007 and 2020) and in the poorest quintile (2.77% average year-to-year decrease in the same period), with no statistically significant difference in the trends. However, despite improving trends in air pollution in both the richest and the poorest regions over the 2007-2020 period, inequalities remained with levels of $PM_{2.5}$ being consistently higher by around one third in the poorest regions (figure 2).

The indicator, defined as the ratio of population weighted concentration of $PM_{2.5}$ in EU NUTS3 regions in the most and in the least deprived quintiles remained relatively stable from 2007 to 2020 (see supporting information) and well above 1.0. This indicates that so far there has been no progress with reducing environmental inequalities in the EU, at least when it comes to air pollution.

Figure 2. Ratio of population-weighted concentrations of $PM_{2.5}$ in EU NUTS3 regions in the most deprived quintile relative to those in the least deprived quintile, 2007-2020

Source: EEA/Eurostat.

Some of the most highly polluted NUTS3 regions spatially coincide with the poorest regions in the eastern part of Europe, although there are pockets of highly polluted NUTS3 regions elsewhere in Europe with both high and low purchasing power per capita. However, almost no NUTS3 regions in the quintile with the highest purchasing power per capita are in the quintile with the most pollution.

In terms of what the future trend could be for this indicator, the absence of disaggregated projections at the NUTS3 level for both $PM_{2.5}$ concentrations and purchasing power makes evidence-based predictions challenging. While there are national level projections in $PM_{2.5}$ emissions and concentrations (i.e. including cross-border transfers) by country stemming from the third clean air outlook, these cannot be readily used to derive NUTS3-level extrapolations, nor would it be reasonable to assume that NUTS3 GDP levels will remain constant. Thus, no reasonable prediction can be given for this indicator based on existing evidence. The past trend indicates, however, that so far there has been no real progress in reducing the environmental inequalities associated with air pollution. On that basis it therefore seems unlikely that the EU will make significant progress in reducing environmental inequalities, at least those related to air pollution.

Supporting information

Definition

This indicator monitors concentrations of $PM_{2.5}$ in the richest and poorest NUTS3 regions of the EU-27. More specifically it measures the ratio ofpopulation-weighted $PM_{2.5}$ concentrations of the most disadvantaged quintile compared to the ones of the least disadvantaged quintile (based on GDP per capita at purchasing power standard) at NUTS3-region level. Population-weighting is a statistical technique that assigns greater weight to the air pollution experienced where most people live. GDP: Gross Domestic Product, a basic measure of the overall size of a country's or region's economy. Per capita (Latin: "per head") indicates the average per person in a group, in this case the population of a given NUTS3 region. NUTS3 is the smallest subdivision of the NUTS classification (Nomenclature of territorial units for statistics), a hierarchical system for dividing up the economic territory of the EU. PPS: purchasing power standard, an artificial currency unit with which theoretically, one could buy the same amount of goods and services in each country. PPS is a more accurate way to compare wealth per capita than raw GDP because it reduces the effect of price differences. $PM_{2.5}$, particulate matter with a diameter of 2.5µm or less.

The definitions of GDP, per capita and PPS come from the Eurostat glossary (https://ec.europa.eu/eurostat/statistics-explained)

Methodology

The indicator is formally defined as '$PM_{2.5}$ exposure ratio between most disadvantaged and least disadvantaged quintile (GDP per capita at purchasing power standard) at NUTS3 region level'.

The indicator is calculated via the formula:

Exposure ratio = Pop. weighted PM2.5 exposure (µg/m^3) MDQ/Pop.weighted PM2.5 exposure (µg/m^3) LDQ

Where:

'Pop. weighted $PM_{2.5}$ exposure (µg/m^3) MDQ' is the annual average population-weighted concentration of $PM_{2.5}$ in ambient air measured in micrograms per cubic meter of the most deprived (i.e. poorest) quintile of NUTS3 regions, measured based on GDP per inhabitant at purchasing power standard in euros.

'Pop. weighted $PM_{2.5}$ exposure (µg/m^3) LDQ' is the annual average population-weighted concentration of $PM_{2.5}$ in ambient air measured in micrograms per cubic meter of the least deprived (i.e. richest) quintile of NUTS3 regions, measured based on GDP per inhabitant at purchasing power standard in euros.

Because the numberator and denominator of this indicator are in the same units, the resulting ratio has no units. Both parts of this ratio are easily measurable and based on readily available data. In an environmentally equal Europe, in terms of $PM_{2.5}$, this ratio would be close to 1. If the poorer regions were more polluted than the richer regions, the ratio would be greater than 1; a ratio of lower than 1 would indicate the opposite.

Policy/environmental relevance

This indicator will provide an objective and comparable estimate over time of the inequalities in $PM_{2.5}$ exposure (and thus of associated health risks) between the poorest and the richest regions in Europe.

This indicator is a proxy headline indicator on environmental inequalities for monitoring progress towards the 8th Environment Action Programme (8th EAP), (EU, 2022). It contributes mainly to monitoring aspects of the 8th EAP Article 2.1 that requires 'by 2050 at the latest, people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced… .'. It further contributes to monitoring aspects of the Article 3.f which requires 'ensuring that social inequalities resulting from climate- and environmental-related impacts and policies are minimised and that measures taken to protect the environment and climate are carried out in a socially fair and inclusive way'. The European Commission Communication on the 8th EAP monitoring framework specifies that this indicator should monitor whether the EU 'reduces environmental inequalities and ensures a fair transition', (EC, 2022).

EU, 2022, Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJL 114, 12.4.2022, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022D0591 accessed October 24, 2022

EC, 2022, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the monitoring framework for the 8th Environment Action Programme: Measuring progress towards the attainment of the Programme's 2030 and 2050 priority objectives, COM/2022/357 final, EUR-Lex - 52022DC0357 - EN - EUR-Lex (europa.eu), accessed October 24, 2022

Accuracy and uncertainties

GDP per capita at NUTS3 level is an imperfect measure of economic deprivation, but it is a fair proxy that is published regularly and is easy to understand for most audiences. The assessment of population weighted concentrations also has uncertainties inherent to the estimation, though those are known and limited. The trend analyses for this indicator is performed via linear regression and a T test for the significance of slope value. The indicator showed from 2007 to 2020 a small but statistically significant ($p<0.05$) upward linear slope of 0.02. However, with such a small value and a standard error of around 0.01, this trend cannot be assessed as significantly different from stable.

Data sources and providers

- Gross domestic product (GDP) at current market prices by NUTS 3 regions (nama_10r_3gdp), Statistical Office of the European Union (Eurostat)
- Air Quality Health Risk Assessments, European Environment Agency (EEA)

Metadata

DPSIR

State

Topics

Air pollution   # Environmental inequalities   # Environmental health impacts

Tags

8th EAP # income # AIR009 # inequalities # air pollution

Temporal coverage

2007-2020

Geographic coverage

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Typology

Descriptive indicator (Type A - What is happening to the environment and to humans?)

UN SDGs

Good health and well-being

Unit of measure

The population-weighted concentrations of $PM_{2.5}$

is measured in micrograms per cubic meter and the ratio of population-weighted concentrations of $PM_{2.5}$ has no units, it is expressed as ratio.

Frequency of dissemination

Once a year

Contact

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References and footnotes

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European Environment Agency