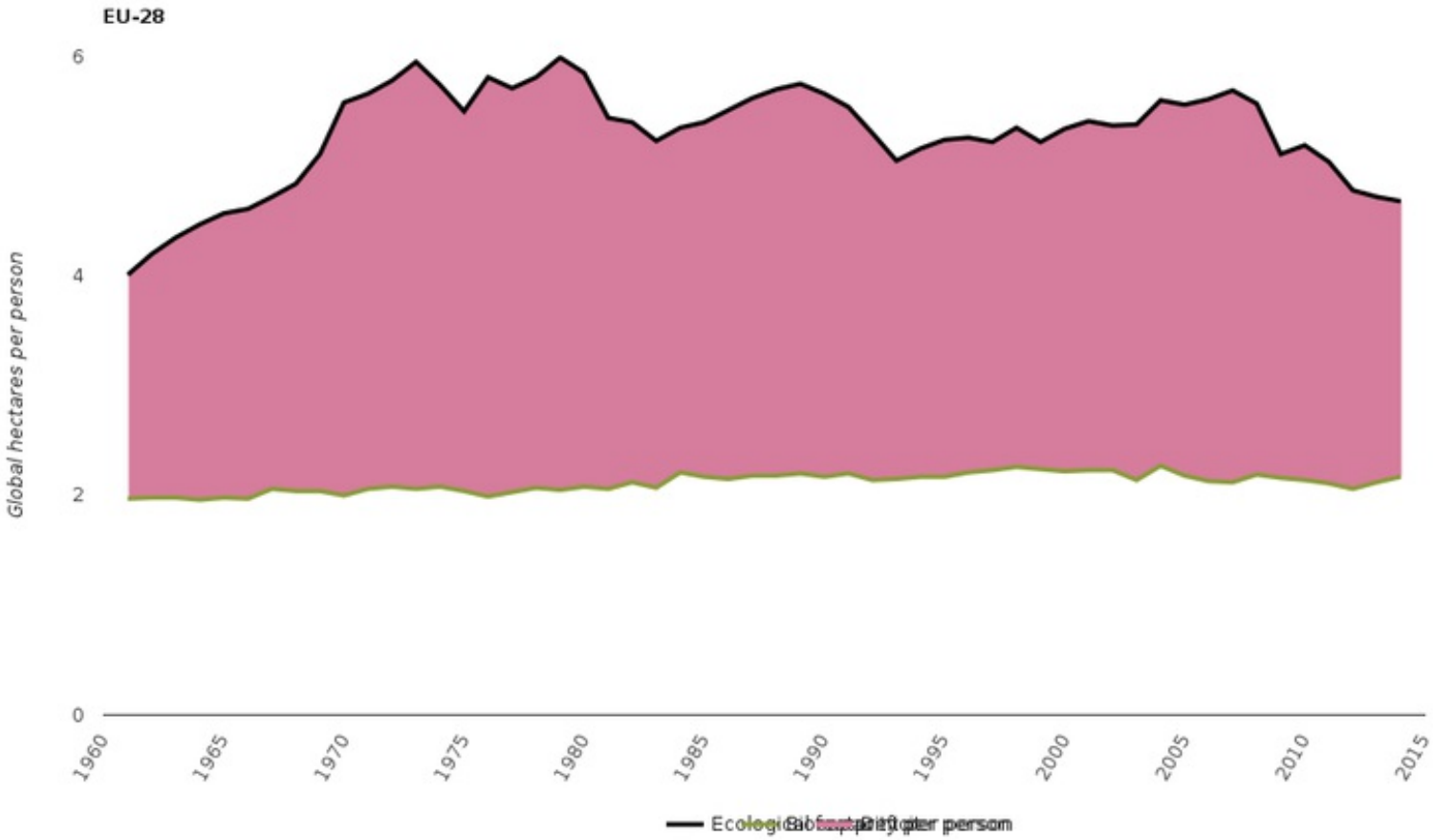
Ecological footprint of European countries



European Environment Agency

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Ecological footprint of European countries

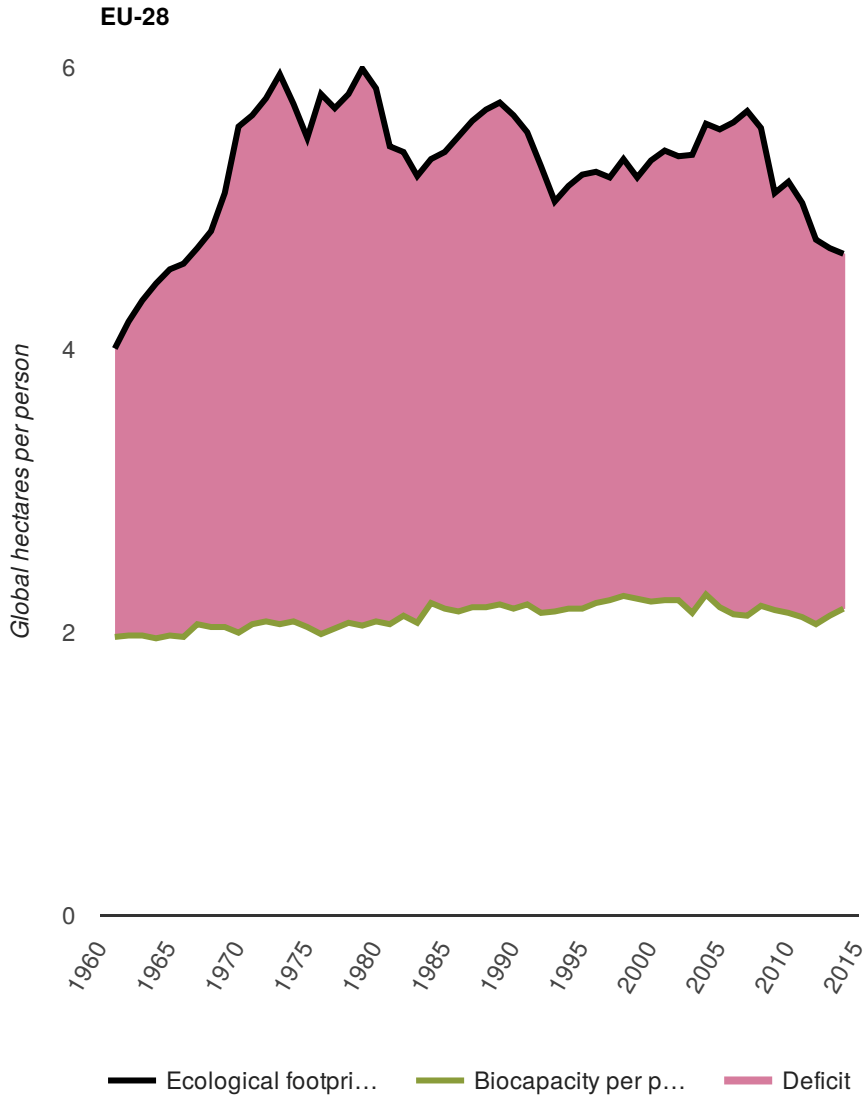
Key messages

The total ecological footprint of the EU-28 countries increased rapidly during the 1960s and 1970s, and has remained relatively constant since the 1980s. However, total biocapacity — the capacity of ecosystems to produce useful biological materials and absorb waste materials generated by humans, using current management schemes and extraction technologies — has changed very little since 1961. The picture is similar for the EEA-39 countries and the wider pan-European region.

The constantly increasing ecological footprint has resulted in an ever larger biocapacity deficit which may have negative consequences for the environment both within and outside Europe.

Are Europeans using more than their share of the world's resources?

Fig. 1: Ecological footprint, biocapacity and biocapacity deficit per person, 1961-2014



Note:
EU-28 countries are in a biocapacity deficit, meaning that the ecological footprint of the population exceeds the biocapacity of the area available to that population. From 1961 to 2014, the ecological footprint of the EU-28 increased from 4.0 to 4.7 gha per person, while the region's biocapacity rose from 2.0 to 2.2 gha per person. In the same period, the biocapacity per person worldwide dropped from 3.1 to 1.7 gha.

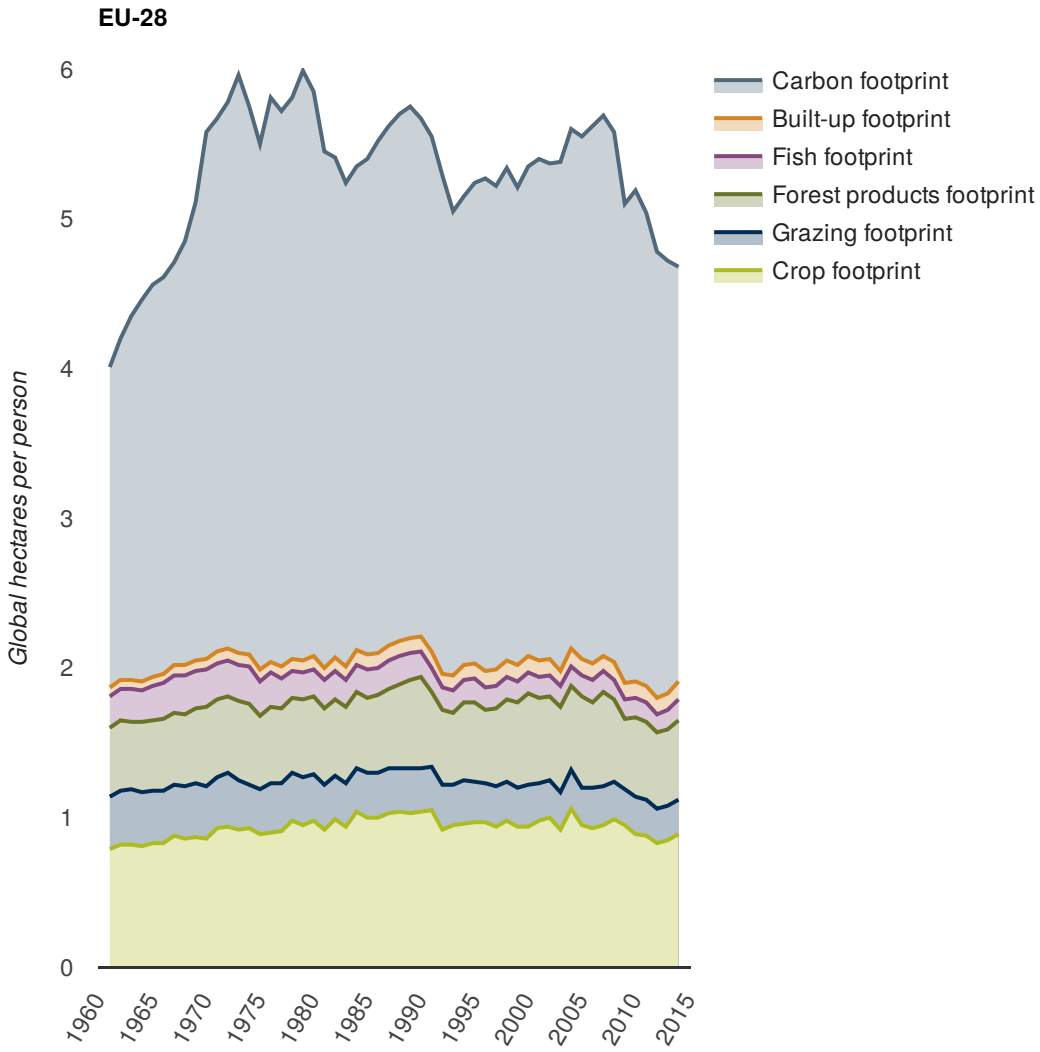
Explore chart interactively

European Environment Agency

Data sources:

- National Footprint Accounts 2018 Edition provided by **Global Footprint Network**

Fig. 2: Ecological footprint by land type, 1961-2014



Note:
The total ecological footprint of the EU-28 increased from 4.0 to 4.7 gha per person from 1961 to 2014.

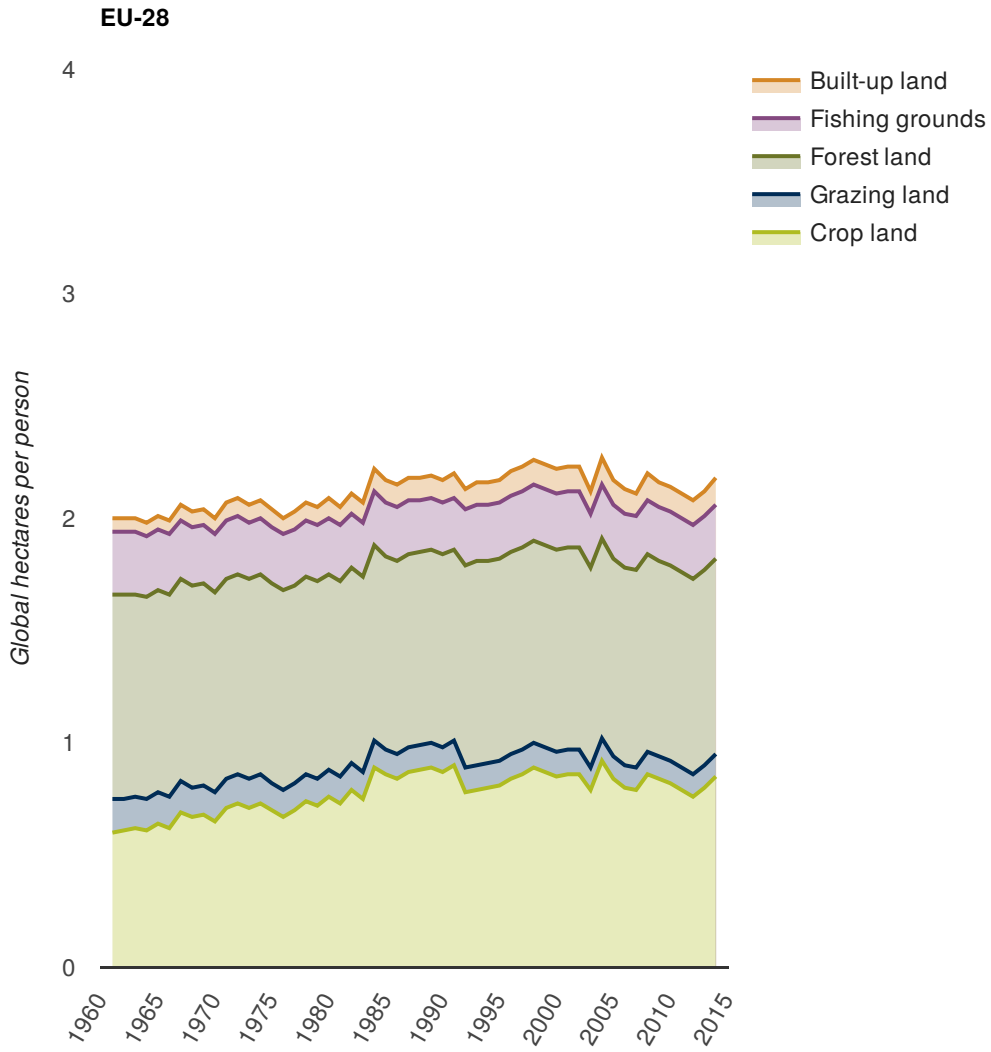
Explore chart interactively

European Environment Agency

Data sources:

- National Footprint Accounts 2018 Edition provided by **Global Footprint Network**

Fig. 3: Biocapacity by land type, 1961-2014



Note:
The total biocapacity of the EU-28 increased from 2.0 to 2.2 gha per person from 1961 to 2014. In the same period, the biocapacity per person worldwide dropped from 3.1 to 1.7 gha.

Explore chart interactively

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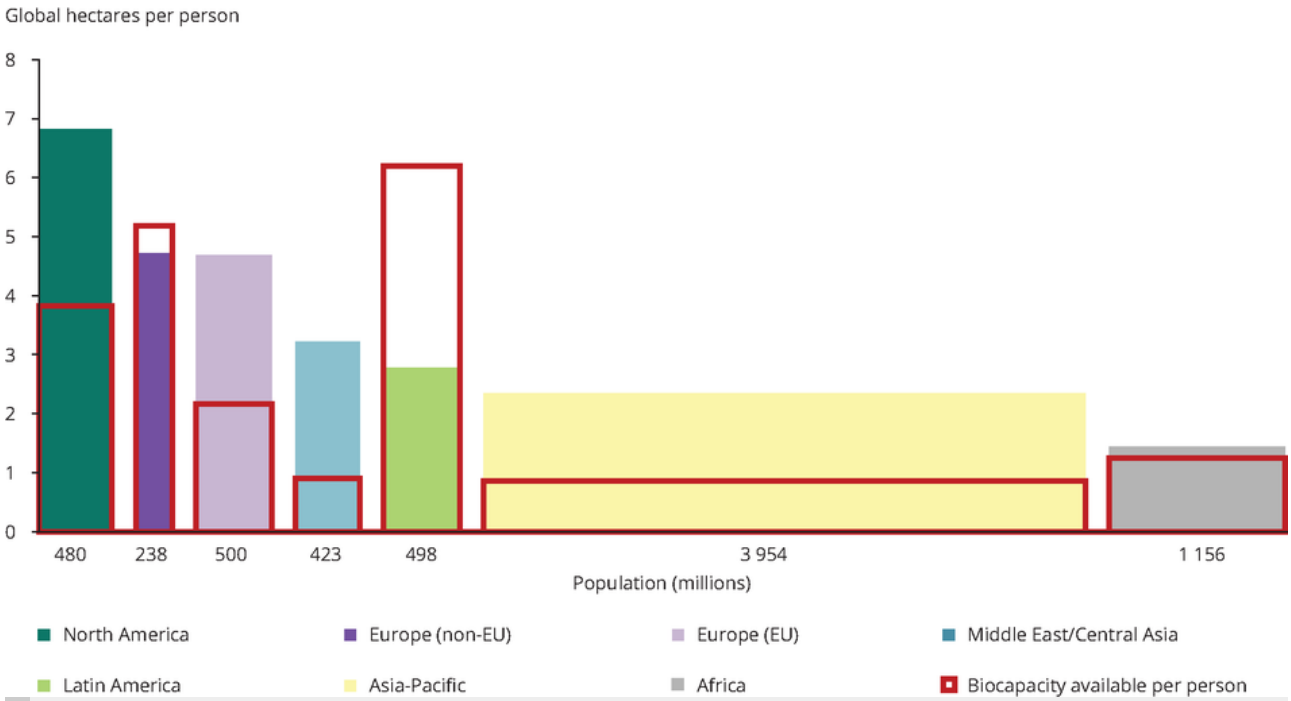
Data sources:

- National Footprint Accounts 2018 Edition provided by **Global Footprint Network**

Fig. 4: Ecological footprint variation per region in 2014



Note: Total ecological footprint is represented by the colored areas (as the product of per person footprint and population size); total biocapacity is represented by the areas within red lines. As of 2014, the EU-28 had approximately 500 million citizens, and a biocapacity of 2.2 global hectares per capita.

Data source:

- National Footprint Accounts 2018 Edition provided by **Global Footprint Network**

Europe's ecological deficit ([1]) is considerable: its total demand for ecological goods and services exceeds what its ecosystems can supply. The ecological footprint of the 28 EU Member States (EU-28) is more than double their biocapacity; the same is true for the EEA-39 (i.e. the EU-28 countries plus Albania, Bosnia and Herzegovina, Kosovo (under UN Security Council Resolution 1244/99), Iceland, Liechtenstein, North Macedonia, Norway, Serbia, Switzerland and Turkey). The pan-European ecological deficit per person is smaller than that of the EU-28 or EEA-39 regions, as shown in Fig. 1.

Nations can operate with an ecological deficit in three ways: (1) by over-exploiting their own stocks of ecological capital; (2) by importing products and thus using the biocapacity of other nations; or (3) by exploiting the global commons, such as by releasing carbon dioxide (CO_2) emissions from fossil fuel burning into the atmosphere. Some nations overdraw their own biocapacity by producing goods for export while simultaneously importing goods from elsewhere — which in itself will affect the biocapacity of the countries from which the imports come. On a global scale, all nations cannot be net importers, and nations that rely on competition for increasingly scarce imports will be increasingly at risk. Figures 2 and 3 demonstrate long-term changes in the ecological footprint and

biocapacity by land type.

While the ecological footprint does not measure biodiversity loss directly, it tracks global pressures on biodiversity and can be used to complement other measures of ecosystem-specific impacts on biodiversity (Galli et al., 2014). In a world that is already in overshoot, Europe's ecological deficit may have major global environmental implications, including the degradation of ecological assets, the depletion of natural reserves, biodiversity loss and ecosystem collapse.

Fig. 4 shows that Europe is not the only region where the ecological footprint exceeds biocapacity; North America and the Asia-Pacific and Middle East/Central Asia regions also have ecological deficits. On the other hand, Europe as a whole, not just the EU, has a biocapacity that is slightly larger than its ecological footprint. The same is also true for Latin America.

([1]) Ecological deficit or reserve refers to the difference between the biocapacity and the ecological footprint of a region or country. An ecological deficit occurs when the ecological footprint of a population exceeds the biocapacity of the area available to that population. Conversely, an ecological reserve exists when the biocapacity of a region exceeds its population's ecological footprint. At the global level, the ecological deficit is equivalent to 'global overshoot'.

Further information

Global Footprint Network: www.footprintnetwork.org

Indicator specification and metadata

Indicator definition

The ecological footprint of Europe is a proxy measure of the amount of biologically productive land and water areas that Europe requires to produce all the biological resources it consumes and to absorb the waste it generates, using prevailing technology and management strategies. These areas could be located anywhere in the world. This can be compared with the biocapacity of the planet or the biocapacity available within a given region. Both biocapacity and the ecological footprint are measured in global hectares (gha).

Units

Global hectares (gha) per person.

Rationale

Justification for indicator selection

Main advantages of the indicator

The methodology is well established: this indicator was developed and produced by the Global Footprint Network and has matured significantly over its 20 years of existence, with regard to both data sources and methodology.

It is of high policy relevance: it indicates the overall resource demand of European societies compared with resource availability in Europe and in the rest of the world.

Geographical and temporal coverage: the indicator has worldwide coverage and data are available over a long time-frame (1961-2014 and updated annually). The core data are national and allow for aggregations at various physical scales. The indicator can be disaggregated to provide information on specific resources or ecosystems.

The ecological footprint is a powerful tool for reaching and communicating with a wide range of audiences to promote an understanding of how people's activities have an impact on the environment and to support people in making choices that will reduce this impact.

Scientific references

- Ecological Footprint: Implications for biodiversity Galli A., Wackernagel M., Katsunori I., Lazarus E., 2014. Biological Conservation 173, 121-132.
- Biodiversity Loss and the Ecological Footprint of Trade. Lazarus, E., Lin, D., Martindill, J., Hardiman, J., Pitney, L. and Galli, A. (2015). Diversity, 7, 170-191.
- Exploring ecosystem services assessment through Ecological Footprint accounting Mancini, M. S., Galli, A., Coscieme, L., Niccolucci, V., Lin, D., Pulselli, M., Bastianoni, S. and Marchettini, N. (2018). Ecosystem Services, 30, 228-235.

Policy context and targets

Context description

This indicator provides a quantitative assessment of global and local overshoots, i.e. the extent to which humanity's footprint, or demand for ecosystem resources, exceeds biocapacity and the planet's ability to regenerate these resources. The global overshoot means that ecosystem stocks are being liquidated and untreated wastes are accumulating in the biosphere. While it is not known precisely how long various ecosystems can tolerate this growing ecological deficit, it is predicted that the increasing pressure will eventually contribute to ecosystem degradation or failure.

National ecological footprint accounting provides a number of key indicators such as the footprint of consumption, the footprint of production and the biocapacity of a nation. Hence, it can provide assessments of aspects such as (1) Europe's demands on land and sea areas within its own borders; (2) Europe's demands on the land and sea areas outside its borders; and (3) Europe's demand on specific ecosystem types. Although the aggregate consumption of material resources by European households is more than double the available biocapacity within Europe, Europe's domestic extraction of biological resources is still below Europe's total biocapacity and has remained at about the same level in recent years.

Relationship of the indicator to the focal area

The 'ecological footprint of European countries' (i.e. the consumption footprint) directly measures Europe's resource use compared with what is available globally. In other words, it shows to what extent the level of consumption is replicable on a global scale. It can also be used to measure local extraction rates. This means that ecological footprint accounting can provide information on global and local sustainability.

Targets

2020 EU biodiversity targets: Target 6

Related policy documents

- EU 2020 Biodiversity Strategy
  in the Communication: Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (COM(2011) 244) the European Commission has adopted a new strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020. There are six main targets, and 20 actions to help Europe reach its goal. The six targets cover: - Full implementation of EU nature legislation to protect biodiversity - Better protection for ecosystems, and more use of green infrastructure - More sustainable agriculture and forestry - Better management of fish stocks - Tighter controls on invasive alien species - A bigger EU contribution to averting global

biodiversity loss

Methodology

Methodology for indicator calculation

National Footprint Accounts (NFAs) provide the core data required for all Ecological Footprint analyses. The accounts measure the ecological resource use and resource capacity of nations over time. Based on approximately 15,000 data points per country per year, the accounts calculate the Footprints of more than 200 countries, territories, and regions from 1961 to the present.

National Footprint Account calculations are based on United Nations or UN-affiliated datasets, including those published by the Food and Agriculture Organization, United Nations Commodity Trade Statistics Database, and the UN Statistics Division, as well as the International Energy Agency. Supplementary data sources include studies in peer-reviewed science journals and thematic collections (books).

For general data and methodology see https://www.footprintnetwork.org/resources/data

A more detailed description of the methodology can be found in a paper by Borucke et al (2013).

The most recent description of the accounting methodology and results by Lin et al. (2018), based on the 2018 edition of the National Footprint Accounts, reviews the evolution of the National Footprint Accounts, describes and quantifies the effects of data and methodological improvements that have been implemented into the accounts since the 2012 edition, and reviews the latest global trends.

The template of the National Footprint Accounts, 2018 edition, is explained in the *Working guidebook to the National Footprint Accounts 2018*, available at https://www.footprintnetwork.org/content/uploads/2018/05/2018-National-Footprint-Accounts-Guidebook.pdf

Methodology for gap filling

Some minimal data cleaning excludes extreme outliers. In addition, if data points are missing between reported years, the gaps are filled by extrapolating from adjacent years.

Methodology references

- Accounting for demand and supply of the biosphere's regenerative capacity: The National Footprint Accounts' underlying methodology and framework Borucke, M., Moore, D., Cranston, G., Gracey, K., Iha, K., et al., 2013. Accounting for demand and supply of the biosphere's regenerative capacity: the National Footprint Accounts' underlying methodology and framework. Ecological Indicators 24, 518–533.
- Ecological Footprint accounting for countries: updates and results of the National Footprint Accounts, 2012-2018. Lin D., Hanscom L., Murthy A., Galli A., Evans M., Neill E., Mancini

M.S., Martindill J., Medouar F.-Z., Huang S., Wackernagel M. (2018). Resources, 7 (3), 58.

Uncertainties

Methodology uncertainty

The methodology of Ecological Footprint accounting is based on six assumptions:
1. Annual amounts of biological resources consumed and wastes generated by countries are tracked by national and international organisations.
2. The quantity of biological resources appropriated for human use is directly related to the amount of bioproductive land area necessary for their regeneration and for the assimilation of wastes.
3. By weighting each area in proportion to its inherent ability to regenerate biomass, the different areas can be expressed in terms of a standardised average productive hectare (a global hectare).
4. The overall demand in global hectares can be aggregated by adding all mutually exclusive resource-providing and waste-assimilating areas required to support the demand.
5. Aggregated human demand (Ecological Footprint) and nature's supply (biocapacity) can be directly compared to each other.
6. Area demand can exceed area supply.

The Ecological Footprint makes apparent the gap between human demand and regeneration. Likely, the accounts provide underestimates. On the demand side, UN data sets do not completely document all demands. On the biocapacity side, availability may be exaggerated since some overuses are not factored into the assessment due to lack of consistent data. Such aspects include soil erosion, groundwater depletion, and loss in forest productivity due to increased forest fires and pestilence.

Data sets uncertainty

Country assessments are based on UN statistics. They do not provide error margins.

Rationale uncertainty

Main limitations of the indicator

Several important aspects of sustainable use/management are not measured by the ecological footprint:

- Non-ecological aspects of sustainability: having a footprint smaller than the biosphere is a necessary minimum condition for a sustainable society, but it is not sufficient. For instance, the Ecological Footprint does not consider social well-being. In addition, on the resource side, even if the Ecological Footprint is within biocapacity, poor management can still lead to depletion. A footprint smaller than biocapacity is merely a necessary condition for making quality improvements replicable and scalable.
- Depletion of non-renewable resources: the footprint does not track the amount of non-renewable resource stocks, such as oil, natural gas, coal or metal deposits. The footprint

associated with these materials is based on the regenerative capacity used or compromised by their extraction and, in the case of fossil fuels, the area required to assimilate the wastes they generate.

- Inherently unsustainable activities: activities that are inherently unsustainable, such as the release of heavy metals, radioactive materials and persistent synthetic compounds (e.g. chlordane, polychlorinated biphenyls (PCBs), chlorofluorocarbons (CFCs), polyvinyl chloride (PVC), dioxins, etc.), do not enter directly into footprint calculations. These are activities that need to be phased out independently of their quantity (there is no biocapacity budget for using them). Where these substances cause a loss of biocapacity, however, their influence can be seen.
- Ecological degradation: the footprint does not directly measure ecological degradation, such as increased soil salinity from irrigation, which could affect future bioproductivity. However, if degradation leads to reductions in bioproductivity, then this loss is captured when measuring biocapacity in the future. Moreover, by looking at only the aggregate figure, 'under-exploitation' in one area (e.g. forests) can hide over-exploitation in another area (e.g. fisheries).
- Resilience of ecosystems: footprint accounts do not identify where and in what way the capacity of ecosystems are vulnerable or resilient. The footprint is merely an outcome measure documenting how much of the biosphere is being used compared with how productive it is.

Data sources

- Footprint data and results (dataset URL not directly available)

provided by **Global Footprint Network**

Metadata

Topics:

Biodiversity — Ecosystems
DPSIR: Pressure
Typology: Descriptive indicator (Type A - What is happening to the environment and to humans?)

Indicator codes

- SEBI 023

Dates

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Frequency of updates

Updates are scheduled every 2 years

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Katarzyna Biala

Related content

Used in publications

The European environment — state and outlook 2020 [https://www.eea.europa.eu/publications/soer-2020]

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