



Beyond GDP

Measuring progress, wealth and wellbeing

Ecological Footprint

Short description

The ecological footprint measures how much nature we use compared to how much we have. This accounting approach tracks how much biologically productive land and water area an individual, population or activity uses to produce all the resources it consumes, to house all its infrastructure, and to absorb its waste given prevailing technology and resource management practices. Global Footprint Network calculates the ecological footprint of countries on an annual basis and presents the results on an open data platform. The results shed light on the ecological performances of nations and regions.

Methodology: Ecological footprint accounts adds up all the competing demands for biologically productive space, including the space needed to sequester carbon emissions from fossil fuel. This human demand is compared to how much biologically productive space is available. Footprints can be calculated for products, individuals, cities, regions, countries or the world.

Prepared by:

Mathis Wackernagel, David Lin, Laurel Hanscom
Global Footprint Network

<http://www.footprintnetwork.org/>

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Introduction

One fundamental requirement for sustainability is to demand less from the planet than the planet's ecosystems can renew. Ecological footprint accounting focuses on this very requirement. It tracks human demand on ecosystems in comparison to what ecosystems can renew. When demand exceeds renewal, ecological overshoot occurs. It leads to degradation of natural capital, which in turn may cause a decrease in economic and social welfare.

What is the Ecological Footprint?

The Ecological footprint is a measure of how much [biologically productive land and water area](#) an individual, population or activity uses to produce all the resources it consumes, to house all its infrastructure, and to absorb its waste¹ given prevailing technology and resource management practices.

People obtain resources from forests, cropland, fisheries, and grazing land. They also use these areas for accommodating roads, houses and energy infrastructure. Waste absorption also utilizes area-based ecosystem services, for example to assimilate carbon dioxide emissions from fossil fuel burning or cement production. The Ecological footprint adds up the areas required to produce resources or assimilate waste to the extent that they are mutually exclusive. The sum of these areas then measures the total human demand on nature. In other words, ecological footprint analysis builds on "mass flow balance," where each flow is translated into the ecologically productive areas necessary to support them.

Ecosystems have a limited ability to supply us with natural resources. This is based on factors such as water availability, climate, soil fertility, solar energy, technology and management practices. This capacity to renew, driven by photosynthesis, is called biocapacity.

When a population's ecological footprint exceeds the biocapacity of its territory, it runs a biocapacity deficit. This deficit is balanced either through the use of biocapacity from elsewhere, or local overuse, called 'ecological overshoot'. At the global level, deficit and overshoot are identical since there is no interplanetary trade allowing for biocapacity use from elsewhere.

Ecological footprint accounting can be applied at all scales, from the global down to the product level. Overshoot measured at the global scale is an indicator of unsustainability.

¹ Due to data constraints in UN statistics, the national footprint accounts (called "National Footprint and Biocapacity Accounts") only include carbon dioxide emissions from fossil fuel use and cement in the waste equation. But in local assessments with more complete data sets, other waste streams have been included such as nitrogen absorption.

[Global Footprint Network](#) calculates the ecological footprint of **countries** on an annual basis. All the results are presented on an open data platform at data.footprint-network.org.

Results from these national footprint accounts show that humanity's resource demands and carbon dioxide emissions began to exceed the regenerative capacity of the planet to meet these demands in the 1970s. According to Global Footprint Network estimates for 2019,² humanity exceeds the planet's ability to provide biological resources by over 75 percent.

In 2016, the latest year based on a full data set from the United Nations, the world average biocapacity was 1.6 global hectares³ per person. In contrast, the world average ecological footprint was 2.7 global hectares per person.⁴

Wild species need access to biocapacity as well. Otherwise species abundance and biodiversity inevitably decline. It is a political choice to decide how much of the earth's biocapacity – 1.6 global hectares per person – should be dedicated to biodiversity preservation. Professor E.O. Wilson from Harvard University and others advocate leaving half of the planet's capacity wild in order to protect up to 85% of existing biodiversity.⁵

Ecological footprint and biocapacity vary widely among countries. For instance, the average footprint of EU-28 countries in 2016 was 4.6 global hectares per person, compared to an average biocapacity of 2.1 global hectares per person.⁶

National ecological footprint accounts inform analysts about local or regional ecological performance.

Two recent open access papers explain the national footprint methodology ("[Ecological Footprint Accounting for Countries: Updates and Results of the National Footprint Accounts, 2012–2018](#)") and its relevance to development strategy ("[Defying the Footprint Oracle: Implications of Country Resource Trends](#)").

² UN data comes with a time lag. Hence the 2018 edition of the National Footprint Accounts only stretches to 2014. The 2019 edition, launched in April 2019, reaches till 2016. Data points beyond 2016 are estimated through national data, where available, and extrapolations. The 2020 edition is scheduled to be launched before June 5, 2020.

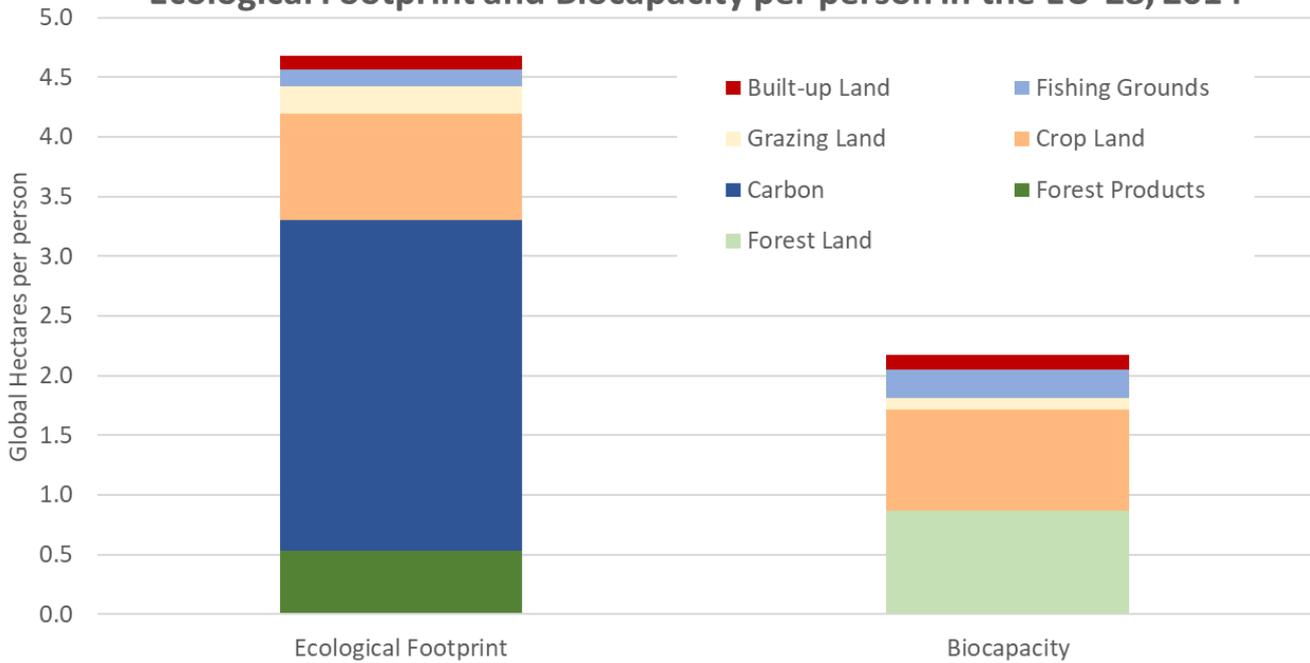
³ A global hectare is a biologically productive hectare with world average productivity.

⁴ Two Footprint demands compete for forest biocapacity: a) the Carbon Footprint, which requires forest area to sequester atmospheric carbon dioxide emissions, and b) the Forest Product Footprint, which includes human demands for timber and firewood.

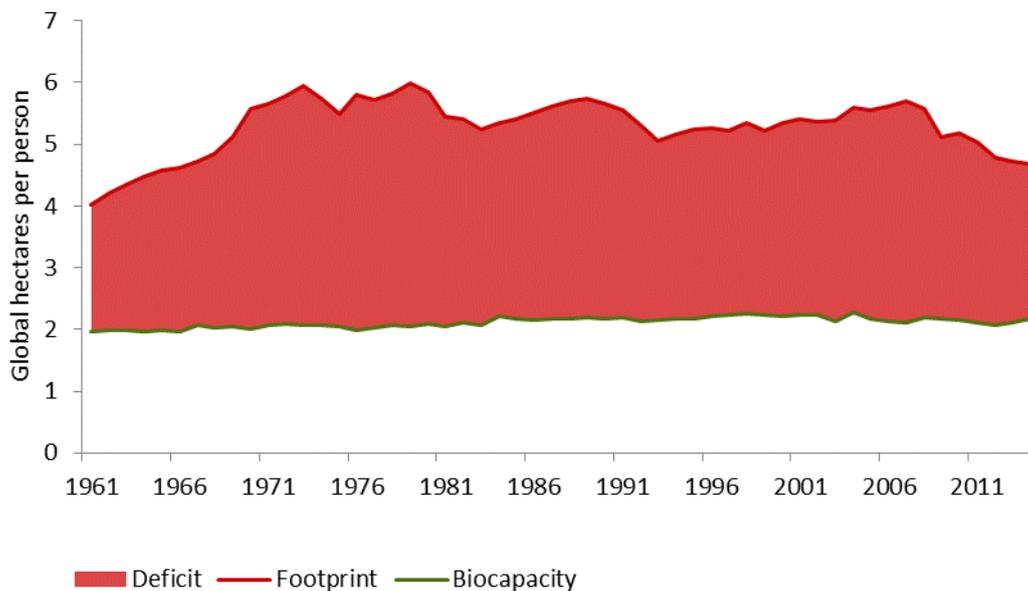
⁵ Wilson, E.O. (2016), *Half-Earth: Our Planet's Fight for Life*, Liveright Publishing Corporation, New York.

⁶ Data for Latvia, Lithuania, Estonia, Croatia, and Slovenia is only available post-1992. Czechoslovakia is included until 1993 and then tracked as the Czech Republic and Slovakia. Also see the [EEA website](#).

Ecological Footprint and Biocapacity per person in the EU-28, 2014



EU-28 per person Footprint, Biocapacity and Deficit



For the EU-28, for instance, the human demand from consumption (ecological footprint of consumption) is about twice of what European ecosystems can renew (biocapacity). Updated numbers are available on [the EEA website](#). This means that more than half of the ecosystem area on which Europeans depend is outside of Europe. Europeans have about twice the ecological footprint of what is available per person worldwide (and this available biocapacity also needs to support wild species that are

competing with people for food and space). This has been confirmed by several ecological footprint assessments commissioned by the European Environment Agency, the European Commission and WWF International. All of the EU members have per person footprints that are above the amount of biocapacity available per person worldwide. And all but six—Bulgaria, Estonia, Finland, Latvia, Romania, and Sweden—are running a national ecological deficit by using more than what is available within their national boundaries.

The ecological footprint of Europe has decreased 18% since its peak in 2007. Much of this reduction is driven by the contraction of national consumption after the financial crisis, rather than by forward-looking policy (see figure above).

As emphasized in [many footprint publications](#), the ecological footprint measures merely one critical aspect of sustainability: the availability of, and the human demand on, Earth's regenerative capacity. Other measures are needed to complement this indicator to assess social well-being, depletion of non-renewable resources, the degradation of ecosystems, or inherently unsustainable activities such as the release of persistent pollutants.

History of the concept and plans ahead

The original ecological footprint concept resulted from a collaboration between Dr Mathis Wackernagel and Dr William Rees at the University of British Columbia in Vancouver, Canada in the early 1990s. The publication of their book '[Our Ecological Footprint: Reducing Human Impact on the Earth](#)' in 1995 made the concept more widely accessible. A new introduction, '[Ecological Footprint: Managing Our Biocapacity Budget](#)', was published in 2019.

[Global Footprint Network](#) was founded in 2003 with the goal of changing how the world manages its natural resources and responds to climate change. Since 2003 it has engaged with more than 50 nations, 30 cities, and 70 global partners to deliver scientific insights that have driven high-impact policy and investment decisions. Its mission is to create a future where all can thrive within our planet's limits. This includes advancing the scientific rigor and practical application of the ecological footprint, and making the ecological footprint as prominent a metric as the Gross Domestic Product (GDP). The ecological footprint is now in wide use by governments, communities, and businesses to set targets and monitor their ecological performance.

Global Footprint Network has teamed up with [York University in Toronto](#) to build an [independent academic organization](#) ([Footprint Data Foundation](#)) just to produce the National Footprint and Biocapacity Accounts. The intention is to have it championed by [select national governments](#). The focus of this collaboration is to publish yearly updates and improve national footprint accounts. The goal is to extend the reach of the assessment, strengthen the robustness and utility of the database, make it more

accessible, relevant and engaging, and train more researchers, policy analysts and decision makers. This global collaboration will help make footprint accounting a decisive foundation for public and private decision-making.

The adoption of the ecological footprint as a trusted sustainability metric depends upon the scientific integrity of the methodology, consistent and rigorous application of the methodology across analyses, and on results being reported in a straightforward and non-misleading manner. To meet these goals, Global Footprint Network and its partners have created both Ecological Footprint Standards (<http://www.foot-printstandards.org>, launched in 2006 and updated in 2009) and a consensus-based committee process to improve and develop the [Ecological Footprint methodology](#), a processes that will be strengthened through this new academic network.

Examples of applications

The footprint metrics is getting increasingly popular: A simple Google search yields millions of websites discussing the ecological footprint. Efforts to advance this way of measuring human demand on the planet has also been recognized through prizes and awards. For instance, Global Footprint Network or its leadership have been recipients of the 2018 [World Sustainability Award](#), the 2015 [IAIA Global Environment Award](#), the 2012 [Blue Planet Prize](#), the 2012 [Binding-Prize](#) for Nature Conservation, the 2012 [Kenneth E. Boulding Memorial Award](#), the 2007 [Skoll Award for Social Entrepreneurship](#), and the 2011 [Zayed International Prize for the Environment](#) in recognition of the most innovative and effective approaches to resolving critical social issues and promoting the central role of sustainability in maintaining healthy economies.

A number of government and international organizations have employed the ecological footprint. Examples include:

- Scotland's Environmental Protection Agency has organized its regulatory framework under the umbrella of "[One Planet Prosperity](#)".
- [Calgary](#), the largest city in Alberta, Canada, was the first city to develop specific ecological footprint reduction targets.
- [Switzerland](#) has regularly reported on its ecological footprint and had a referendum in 2016 on whether or not it should plan to live within the means of one planet by 2050.
- [Vancouver](#) has engaged its residents with the ecological footprint as part of a wider city-greening initiative.
- [China](#) is advancing Ecological Civilization and harbours an active academic footprint community.
- The [finance world](#) has started to use ecological footprint to evaluate financial risks. Global Footprint Network collaborated with the UN Environment Programme Finance Initiative and seven major financial institutions to explore

ways to incorporate ecological footprint and biocapacity trends into international credit ratings for sovereign bonds.

- [Human development](#) and resource security are tightly linked, something also recognized in the [SDGs](#).
- The Mediterranean Region is a microcosm of the sustainable development world: Global Footprint Network helped Montenegro and Slovenia adopt the ecological footprint as a national sustainability metric. www.footprintnetwork.org/med.
- The World Business Council for Sustainable Development (www.wbcsd.org) used the HDI-Footprint framework extensively for its Vision 2050, and so did UNEP for its Green Economy initiative.
- WWF International (www.panda.org), as one of its two institutional meta-goals, has committed to help humanity reduce its footprint to below available biocapacity by 2050. One initiative to achieve this, in collaboration with Bioregional (www.bioregional.org), is the One Planet Living initiative.

An ecological footprint calculator at www.footprintcalculator.org serves over 3 million users per year to estimate their footprint. The calculator is widely used in schools and college classes to introduce students to the concept of sustainability.

[Earth Overshoot Day](#), the day in the year by when humanity has used as much from nature as the planet can regenerate in the entire year, has become an annual media event. In 2019, it fell on July 29th and the campaign reached over 4 billion documented media impressions in 120 countries.

Useful links

data.footprintnetwork.org (open data platform providing visuals and results for all countries)

www.footprintnetwork.org (overall introduction to ecological footprint accounting)

www.eea.europa.eu/data-and-maps/indicators/ecological-footprint-of-european-countries-2/assessment (Ecological footprint of European countries)

www.overshootday.org (Earth Overshoot Day site)

www.footprintcalculator.org (for personal footprint)

www.footprintstandards.org (Standards on ecological footprint accounting)

www.footprintfinance.org (Application to financial risks)

www.chinafootprint.org (Application for China)