



ECOLOGICAL DEBT RISK – HAVE WE ALREADY SPENT OUR RESOURCES FOR 2025?

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Abstract: Of all the material resources on Earth, the potential for biological regeneration is the most limited. For this reason, it is essential to map all of our demands against biocapacity. Adopting this biological viewpoint makes it evident which strategies are likely to succeed and which are bound to fail. Each year, the Global Footprint Network announces the day the world enters ecological debt, which is an estimate of the point in the year at which we have globally consumed more resources than the Earth can renew in one year. Calculations typically say that global ecological debt day is mid-summer. The ecological debt day of specific countries shows a slightly different assessment, which raises the question of when the global ecological debt day would occur if the world spent on average the same as that particular country. The calculation is done per capita, so countries whose per capita consumption is relatively low have no ecological debt at all. Serbia, which already entered the ecological debt in the middle of spring 2025, consumes resources faster than the world average and somewhat slower than the European Union.

Keywords: Global Footprint Network, ecological debt, resources, biocapacity.

1. INTRODUCTION

Biocapacity is the most valuable asset. Of all the material resources on Earth, the potential for biological regeneration is the most limited. For this reason, it is essential to map all of our demands against biocapacity (Global Footprint Network, 2025). Our times are unique. Most of us consider our massive reliance on fossil fuels to be normal. It is quite abnormal. Eighty percent of all fossil fuels burned in human history occurred in the previous fifty years. A sustainable approach is better for the economy and mankind, beginning with those who make decisions. Without this perspective, we place our companies, communities, and nations in increasingly unavoidable pitfalls (Wackernagel & Beyers, 2019).

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In 1995, there was only a basic and approximate estimate of humanity in Canada. Around 1997, more methodical national calculations began to be conducted. In 2003, the Global Footprint Network (GFN) was launched, providing time series dating back to 1961 and yearly updates for almost every nation on Earth. Additionally, unsustainable trends – from utilizing 1.3 Earths in 1995 to using 1.75 Earths today – have persisted almost unchecked. The majority of policymakers continue to overlook or prefer to ignore the fact that humanity, and every country that possesses resources, is endangering its capacity to function in the absence of resource security. Therefore, the task of figuring out how to make the necessity of resource security more apparent to a variety of audiences was set (Wackernagel & Beyer, 2019).

This paper analyzes the entry into ecological debt based on the 2025 edition of National Footprint and Biocapacity Accounts (NFBAs), which provide the core data required for all ecological footprint and biocapacity analysis.

2. LITERATURE REVIEW

The productivity of the earth's biological resources, such as lands used for farming, grazing, forestry, and fishing, is known as biocapacity. These spaces can also absorb waste, such as carbon emissions from burning fossil fuels (Global Footprint Network, 2025). However, as the demand for power rises, more available resources must be used.

The ecological footprint quantifies the ecological resources – which correspond to those discussed while establishing biocapacity – necessary to generate the natural resources that a particular population can consume. Therefore, ecological footprint is a demand concept, whereas biocapacity is a supply concept (Sravan & Mishra, 2024).

Numerous research studies have demonstrated that energy production negatively affects the ecological footprint and, in turn, biocapacity (Logan et al., 2021; Ristić et al., 2019). Although the pollutants and increased resource use from industrial power may directly contribute to the biocapacity deficit, this is not to argue that the other sectors that use electricity are completely unaffected. Domestic electricity use is probably going to increase as urbanization increases. The demand for energy in the commercial sector is fueled by the digitalization of enterprises and the growth and diversity of commercial activity. This ultimately accelerates the population's ecological footprint, perhaps surpassing biocapacity and resulting in a deficit.

The significance of sustainable consumption has increased as a result of these worries. The definition of sustainable consumption is “the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations” (Roy, 2021). The foundation of sustainable consumption is a shift in people's habits and lifestyles. According to Dermody et al. (2018), realizing sustainable consumption may result from emerging economies' shift toward global economic development. However, it has been noted that electricity use negatively affects biocapacity by increasing emissions (Feng et al., 2023). Fossil fuels and other resources used to produce power are not the only sources of this growth in emissions. Inappropriate use of electricity is another factor. Therefore, it is essential to consider how to use such electricity efficiently. However, understanding the consequences of a biocapacity shortfall requires more due to the possibility of either national or worldwide biocapacity being exhausted (Gabbi et al., 2021).

The Global Footprint Network (GFN) announces the day the world enters ecological debt yearly. The GFN calculates the time of year when global resource consumption exceeds what the planet can restore in a single year. We know that excessive energy and material consumption in high-income countries contributes to the ecological collapse of the world.

The concept of ecological debt emerged in the early 1990s as a result of social movements spurred by an increasing awareness of environmental issues (Jernelöv, 1992). The ecological footprint and biophysical capacity statistics allow us to determine a country's ecological surplus or deficit (Loh, 2000). Ecological debt and environmental justice have long been associated. When employed as a vehicle to promote a reconsideration of political-economic ties, ecological debt offers a number of advantageous characteristics that can further the worldwide struggle for environmental and social justice (Warlenius et al., 2015).

3. DATA AND METHODOLOGY

Originally based in the United States, Belgium, and Switzerland, the *Global Footprint Network (GFN)* is an independent think tank that was established in 2003 as a non-profit charity organization in each of those three nations. Oakland, California, is home to the organization's headquarters. More than 70 partner organizations are part of the network. Its goal is to create and disseminate instruments for promoting sustainability, such as the ecological footprint and biocapacity, which quantify our resource consumption and availability. GFN aims to put ecological boundaries at the forefront of decision-making. It unites economics, policy, and science to transform global resource management and build a sustainable future in which all people can live comfortably on Earth (Global Footprint Network, 2025).

The *National Footprint and Biocapacity Accounts (NFBAs)*, which offer the fundamental information needed for all ecological footprint and biocapacity analyses, are generated annually by GFN. York University's Ecological Footprint Initiative for the Footprint Data Foundation (FoDaFo), founded in 2019, is currently in charge of maintaining them (FoDaFo, 2025). The NFBAs track a country's ecological resource capacity and utilization over time and compute the footprints of over 200 nations, territories, and areas from 1961 to the present, using about 15,000 data points per nation-year. On Earth day (April 22, 2025), the 2025 edition was introduced. More than a dozen nations have used these statistics to shape their policies.

The *Ecological Footprint (EF)* is calculated by measuring the amount of biologically productive land required to meet all humankind's conflicting demands. These needs include areas for growing food, producing fiber, regenerating timber, absorbing carbon dioxide emissions from burning fossil fuels, and making room for constructed infrastructure. Imports are added to a nation's national production, and exports are subtracted to determine its consumption. EF is calculated using the following formula (Global Footprint Network, 2025):

$$EF_C = EF_P + (EF_I - EF_E) \quad (1)$$

where:

- EF_C – ecological footprint of consumption
- EF_P – ecological footprint of production
- EF_I – ecological footprint of imports
- EF_E – ecological footprint of exports

Earth Overshoot Day (EOD), formerly known as Ecological Debt Day, is the day on which human activity has depleted nature's annual budget. Society continues to function in ecological overshoot throughout the remainder of the year by depleting local resource reserves and raising atmospheric carbon dioxide levels.

The date on which the planet's annual biocapacity budget would run out if everyone on Earth lived at the same level of consumption as the citizens of that specific nation is known as *Country Overshoot Day (COD)*. Using the most recent information from the most recent edition of the NFBAs, CODs are released every year in December for the previous year.

According to Global Footprint Network (2025), the day when a country's natural resources are exhausted is calculated by multiplying the number of days in the current calendar year by the difference between the global hectare per capita and the country's biocapacity. Biocapacity is the ability of ecosystems to produce biological material used by humans and to absorb waste materials produced by humans according to a country's current management, while the global hectare defines a country's productivity per capita.

4. RESULTS AND DISSCUSION

December 19, 1987, was the first Earth Overshoot Day (EOD) (Figure 1). In 2014, EOD was August 19; 2015, August 13 (Roppolo, 2014); and 2016, August 8 (Mosbergen, 2016). EOD landed on August 2, 2017, and August 22, 2020. In 2024, EOD fell on August 1.

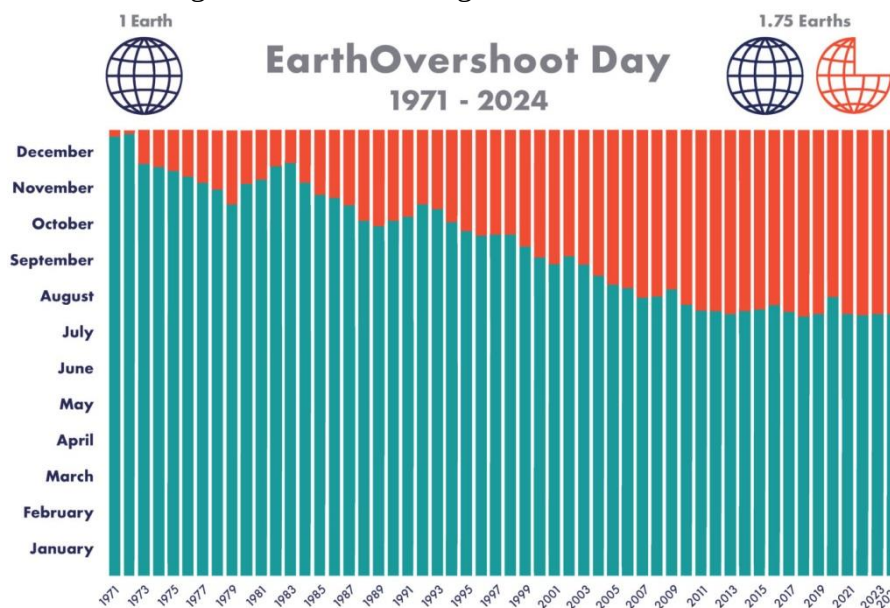


Figure 1. Earth Overshoot Days 1971-2024 (Earth Overshoot Day, 2025)

According to Global Footprint Network (2025) calculations, humanity has already used up all of the planet's renewable resources in one year. As a result, humanity is living "on credit," and 1.75 Earths would be needed to meet everyone's demands.

It is incorrect to infer past EODs based solely on reports from prior years. For example, comparing the date of EOD 2007 as it was determined and publicized at the time with the EOD 2024 would be pointless because the results have been slightly shifted by new findings, such as lower net carbon sequestration by forests, and improved historical data. EOD can be moved by a significant number of days with a change of just a few percent.

4.1. Ecological Footprint

The global ecological footprint analysis provide insight into a country's ecological impact. If a country's ecological footprint is less than its biocapacity, it is considered an ecological reserve. If not, it is functioning with an ecological deficit, as indicated by the proportion of the ecological footprint above the biocapacity. The majority of nations and the entire world are currently experiencing ecological deficits. More than 85% of people on the planet now reside in countries with a global ecological overshoot or deficit.

Table 1 shows Serbia and the countries in the region's ecological footprint for 2025, according to the size of the ecological deficit in relation to the best and worst-ranked countries in the world.

Table 1. Ecological footprint by country 2025 (Open Data Platform, 2025; World Population Review, 2025)

Country	Total ecological footprint (HA)	Ecological footprint per person (HA)	Total biocapacity (HA)	Biocapacity per person (HA/capita)	Ecological reserve or deficit
French Guiana	521K	1.8	26.1M	91.8	4,900%
Suriname	2M	3.4	46.2M	77	2,160%
Guyana	3.6M	4.6	57.1M	71.4	1,460%
Croatia	15.7M	3.8	10.3M	2.5	-53%
Montenegro	2.8M	4.5	1.8M	2.8	-59%
Albania	6M	2.1	3.2M	1.1	-87%
Serbia	26.7M	3.6	14.2M	1.9	-88%
N. Macedonia	6.3M	3	3.2M	1.5	-97%
B&H	14M	4.2	6.8M	2	-100%
Slovenia	11M	5.2	5.2M	2.4	-110%
Singapore	39.9M	6.8	640K	0.1	-6,100%
Nauru	754K	62.1	1.6K	0.1	-46,000%

Serbia faces an ecological deficit (-88%) and an ecological footprint of 26.7M HA, almost double the total biocapacity. Of the countries in the region, it is only in a better position than N. Macedonia, B&H, and Slovenia.

The five countries with the highest ecological footprint (in hectares) are China (5.1B), the USA (2.6B), India (1.5B), Russia (848M), and Brazil (551M). Brazil (219%) and Russia (30%) have ecological reserves, while the rest have ecological deficits: China (-340%), India (-200%), and the USA (-110%).

The incomes and unbalanced resource consumption of China's population are increasing with the country's economy's continued rapid expansion. The ecological footprint of the average American is around half that of the average inhabitant in most European nations. Because of its greater suburban expansion and lack of public transit, the USA consumes more fossil fuels and produces more carbon dioxide per person than most other nations. In addition, Americans use more water and energy per person than people in the majority of similar, industrialized nations. Perhaps the country's pervasive poverty, which prevents many people from having the money to heat their houses or buy cars, is reflected in India's ecological footprint per capita. India has a low biocapacity per person, probably due to its lesser geographical area than China and the USA.

Nonetheless, there is a successful eco-footprint example. Due mostly to decreases in the use of fossil fuels, the UK's ecological deficit, which was the fifth greatest only a few years ago, has decreased by about 30% and is expected to continue to decline.

4.2. Country overshoot days and ecological debt days calculations

The preliminary 2025 edition, which was published on Earth day 2025 and is being created by FoDaFo, serves as the basis for the CODs for 2025. Based on the most recent national data, these dates were published in December 2024. They depict the condition in 2023 for the majority of nations. Calculations are modified for a 366-day year rather than 365 in leap years, such as 2024.

The results from 1961 to 2024 are included in the 2025 edition. Because of delays in data reporting, the results from 2022 to 2024 were based on a combination of real data and initial predictions. The list of CODs for 2025 can be seen in Figure 2.

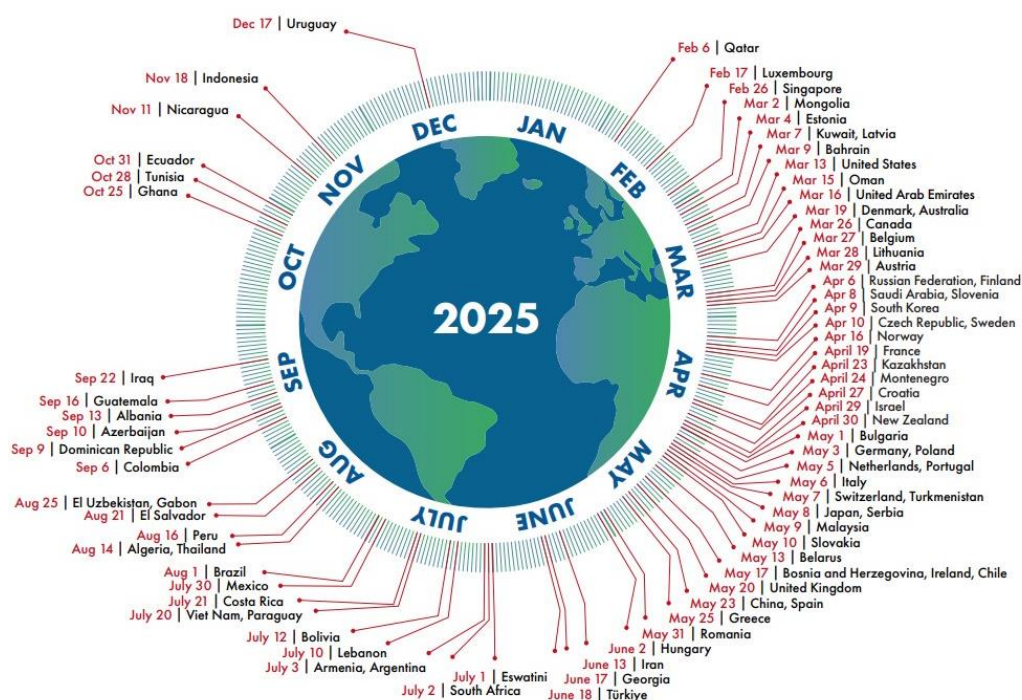


Figure 2. Country overshoot days 2025 (Global Footprint Network, 2025)

The GFN estimates the ecological debt date and evaluates the so-called global ecological debt day – when the world consumes as many resources as the Earth can renew in a year. That date is traditionally announced on June 5 every year, and in previous years, it was in the middle of summer. A specific country's ecological debt indicates when exactly the world would enter ecological debt if it consumed resources like that country on average.

This year, Serbia used up its resources on May 8, which means 15 days earlier than in 2024, when it used up the "annual resources" on May 23, and even 2 months earlier than in 2023, when it "raised" the credit from nature on July 8. This is when Serbia's annual demand and consumption of natural resources exceeded all the Earth can produce or renew throughout the year. So, all the resources nature gave Serbia for 2025 have been used up. This is Serbia's environmental debt date, meaning we live largely at the expense of future years and generations. All resources used after that day are out of balance with the ecosystem. This year, the date has been significantly moved to the detriment of the planet, including people. Since Serbia entered ecological debt on May 8, and the world will enter in mid-summer, Serbia is consuming resources faster and more unsustainably than the world average.

It is a worrying fact that Serbia steps into ecological debt much earlier every year than the previous year. When all the supplies that nature has prepared for us are used up, it means that the next half year is also spent in debt. However, this also has its explanation, which lies in the methodology of calculating the ecological debt towards the planet Earth, which is based on the data of the United Nations. The most important factor of this formula (man) lies in explaining the sudden jump backwards in Serbia regarding the ecological debt. Based on a country's population, the global hectare per capita is determined, and the smaller the country's population, the greater the environmental debt. Since the population census was carried out in Serbia in 2022, it showed that the number of inhabitants is lower compared to earlier periods, so the debt was entered earlier (World Wide Fund for Nature, 2024).

At the planet's level, the day of ecological debt last year was August 2, and the date it will be in 2025 will be announced on June 5. Given that we used up the annual resources in just seven months, humanity lives on unsustainable resources the rest of the year, depleting the planet. The picture would be even more devastating if everyone in the world spent like we do in Serbia. In that case, we would exhaust the available resources. Humanity is currently using nature 1.7 times faster than it can be regenerated. The ecological footprint of people living in countries like Germany and France is nearly twice that of the worldwide average, and if everyone lived as they do, there would need to be 3 to 3.3 Earths.

The European Union entered into ecological debt on April 27, and most of the countries in the region are in a similar framework as Serbia, except for Albania, which will enter into ecological debt on September 13. Based on statistical data, it can be concluded that Serbia has a positive trend concerning the region's countries, where the dates are close to last year's. In April and May 2025, almost all countries of the former Yugoslavia begin to owe the planet. The leaders are Slovenia (April 8), Montenegro (April 24) and Croatia (April 27). B&H entered environmental debt on May 17.

Several factors influence the calculation of ecological debt. One of them is accelerated industrialization, which increases the productivity of a territory but at the expense of natural resources. Industrialization, to the greatest extent, affects the planet's entire ecosystem, which implies the production of large amounts of carbon dioxide that is emitted into the atmosphere. This means that accelerated climate changes are occurring. To produce more food, we are clearing forests, drying up wetlands, and trying to exploit the seas, and these three ecosystems are the biggest absorbers of carbon dioxide. Of course, this does not mean we should carelessly accept this backward movement. On the contrary, now more than ever, we must take action to preserve what nature has given us.

It should be noted that, for example, back in 1971, the planet entered ecological debt on December 25, which means that five decades ago, the Earth had almost enough resources to meet the needs of civilization despite unsustainable production. From then until today, the demand for resources has increased, and we have outgrown the planet with our consumption habits. So far, the worst score, i.e., the earliest date within a year when we entered into ecological debt, was recorded on August 1, 2018, and 2022. During 2020, which was marked by the coronavirus pandemic and the accompanying lockdown measures, we were somewhat more frugal, so we entered into ecological debt globally on August 16.

Some countries do not have an overshoot day. If everyone consumed as those countries did, humanity would not surpass the planet's regenerative capacity in a year if the ecological footprint of that country per person was less than the global biocapacity per person. As a result, these nations are not included in Figure 2. Since data quality differs across UN datasets, some nations are also disqualified because their data is insufficient or untrustworthy.

Figure 2 clearly shows how unequal global consumption is because there are few African countries. For example, they do not even enter into ecological debt because they

consume fewer resources than nature can renew, and an individual's ecological footprint is less than the average global biocapacity per capita. If we all lived like them, the world would not even use the entire annual budget of renewable resources, and one Earth would suffice to meet the needs of humanity. In 2024, these were India, Pakistan, Yemen, Uruguay, and the Democratic Republic of Congo (Buchholz, 2024). The reason for this is more complex due to poverty, lower living standards, and limited access to resources. The reality is that, as long as we have an economic system that requires constant growth, overexploitation of resources will continue.

However, it should be kept in mind that the global picture includes all countries, starting with Qatar, which entered ecological debt only thirty-seven days after the beginning of the year (February 6, 2025), and Luxembourg (February 17), through Serbia, and up to Uruguay, whose ecological debt is forecast on December 17. As with any computation of this magnitude, the analysis has certain limitations. It is delayed by around one and a half years, and there are occasional gaps in the data, particularly for smaller nations.

On the other hand, if the entire global population lived like India, we wouldn't even be in ecological debt, considering that, to satisfy our needs in accordance with theirs, only four-fifths of the Earth would be enough for us. For the Afghans, even less: only two-fifths. This illustrates one of the many layers of injustice of the modern age. The countries of the Global South are, by and large, the least consumers of resources, but despite this, they bear the brunt of environmental degradation, climate change, and other negative impacts of overconsumption.

4.3. Changes due to updated data inputs and due to the country's actual change in consumption levels

It is inaccurate to compare country overshoot days between NFBAs editions. Improvements in underlying data, rather than real changes in consumption, are responsible for some of the differences. The main data input changes include agricultural area data, updated grazing land and cropland statistics, global carbon budget data, revised estimates for marine carbon uptake, and trade classifications and modifications in carbon embodied in trade.

For these reasons, for most countries, the change resulting from changed input data is greater than the change resulting from changes in consumption. To make this clear, Table 2 contrasts actual changes in consumption patterns with the amount of change in overshoot dates caused by modifications in input data and methodology, for Serbia and the countries of the region.

Table 2. Country Overshoot Days in 2025 and changes due to updated data inputs and due to country's actual change of consumption levels (Global Footprint Network, 2025)

Country	Country Overshoot Day (2025)	Days earlier than the previous year due to changes in data	Days earlier than the previous year due to changes in consumption
Slovenia	April 8	17	0
Montenegro	April 24	27	4
Croatia	April 27	28	1
Serbia	May 8	15	3
B&H	May 17	-9	0
Albania	September 13	8	-1

5. CONCLUSION

Year by year, we are more and more careless towards nature. More carbon dioxide is emitted into the atmosphere than the oceans and forests can absorb. Fish stocks are being depleted faster than they can be replenished. Forests are being cut down unplanned and before they can regrow. The consequences are unprecedented heat waves, devastating forest fires, devastating floods, and dramatic droughts occurring more frequently around the world. It's up to us to stop it and turn it around. If we want the entry date into ecological debt to be later, we must turn to more sustainable development. In the future, we could improve the planet's worrying state by developing sustainable mobility, afforestation, and a transition to renewable energy sources.

The most effective way to start achieving results is to oblige all states to adopt and fully implement Nature Restoration Acts, regulations that will ban the use of single-use plastics and protect 30% of the Earth's surface as planned. It is possible to prevent and slow down the entry into ecological debt through the development of a sustainable economy, energy transition, and increased work on protecting existing resources. Environmental awareness must be raised to a higher level, ecology and economy must be connected, and we must behave more responsibly towards nature and its resources. It is the right time for the profession to unite and respect all laws and strategic documents. Every individual is responsible. That's why it is necessary to carry out primary separation of household waste, recycle, and sparingly use all our resources, especially water, which is the most important.

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