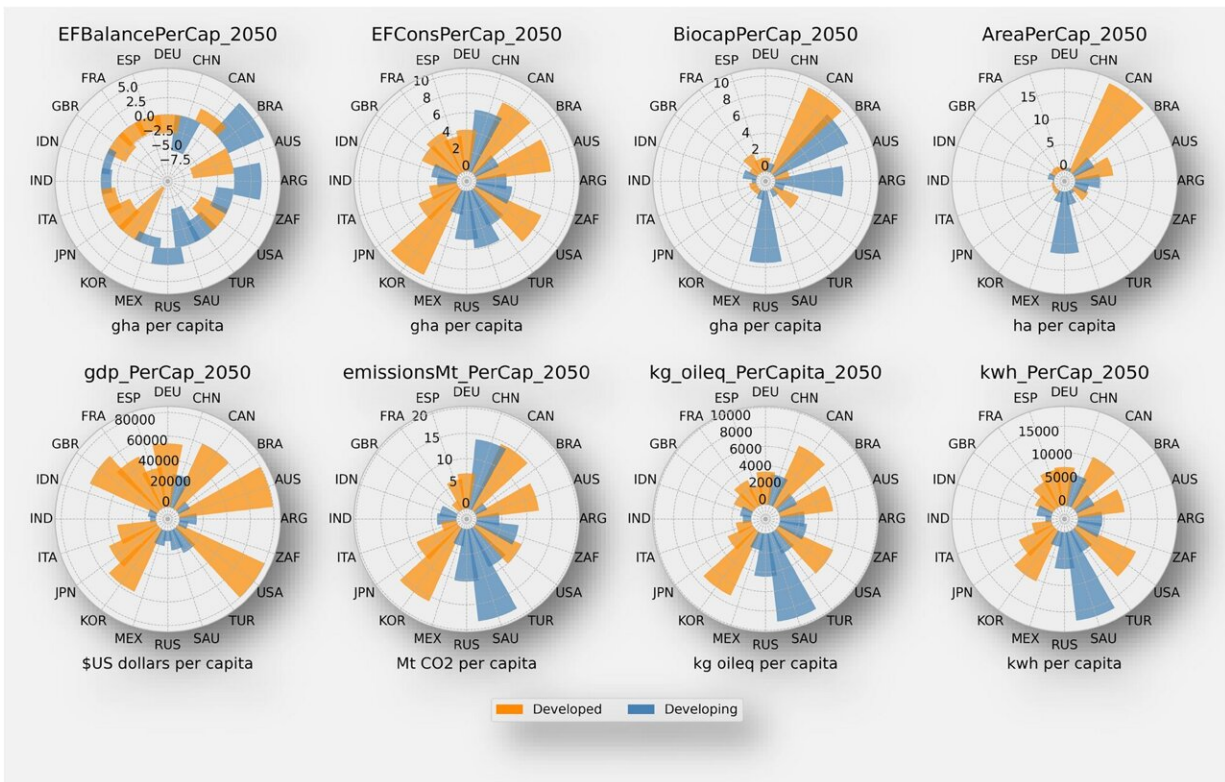


Only four G20 countries set for positive ecological footprint by 2050, study finds

April 30 2024



Plot shows a group of polar charts arranged from top left to bottom right displaying: The ecological footprint balance in global hectares per capita (gha/cap) by the 2050 circa year where developed countries are illustrated in orange color and developing countries in blue. Credit: *Scientific Reports* (2024). DOI: 10.1038/s41598-024-57994-z

The U.K. along with 15 of the G20 nations are forecast to have a negative ecological footprint by 2050, according to new research from the University of Sheffield.

In a study led by Professor Lenny Koh from Sheffield's Energy Institute and [published](#) in the journal *Scientific Reports*, researchers have revealed that only Argentina, Brazil, Canada and Russia are expected to have a positive impact on the environment by 2050—the milestone for net zero.

The research is the first to forecast the [ecological footprint](#) of all G20 nations over the next 30 years and highlights the urgent need for economic and industrial activities that not only support growth, but do not drain the planet of key resources, destroy ecosystems and lead to the extinction of wildlife.

The study also presents a new method for predicting ecological impacts using AI, which could be more accurate at predicting future trends.

Researchers used a combination of the ARIMA, Auto-ARIMA, and Prophet models—sophisticated forecasting tools that are widely used to analyze historical data. The team then fed these models into a new AI-based forecasting tool to further improve their accuracy.

This analysis used key data for each G20 nation, such as consumption per capita, biocapacity per capita, area per capita, GDP per capita, electricity use per capita, emissions per capita, and fossil fuel consumption per capita. These variables help understand the patterns and trends of each country's ecological footprint.

Researchers in the study believe this method, using a combination of the three models with the new AI, can help assess the potential impacts of policy measures on the environment.

Findings from the study show that out of all the G20 nations, Brazil is forecast to have the most positive ecological footprint per capita by 2050. This is due to the South American country making less intensive use of resources compared to the other nations.

Despite the U.K. being forecast to have a negative footprint, the model shows that it is on track to have the greatest reduction of carbon emissions in the G20, due to it having stringent climate change policies.

Professor Lenny Koh, Chair in Operations Management at the University of Sheffield, said, "The G20 represents some of the world's largest economies, so predicting what impact each of these will have on the environment over the next 30 years is key to helping us understand what the future of our planet might look like. It is also key to helping us understand what changes can be made now to have a more positive impact on the environment over the coming years.

"The implications of these findings are profound for both policy and global sustainability efforts. There is a pressing requirement for robust environmental policies that effectively address the unique challenges faced by different countries. Additionally, enhancing international cooperation and support for developing nations is crucial to bolster global efforts in reducing ecological footprints and promoting [sustainable development](#)."

In light of the findings, the researchers are calling for an integrated approach to environmental policy-making that combines economic, technological, and social strategies to foster a sustainable future. They recommend a shift towards more sustainable energy sources, such as solar and wind power, which are less harmful to the environment and are becoming increasingly cost-effective. Moreover, there is a need for G20 nations to invest in green infrastructure and technologies that reduce the ecological impact of urbanization and industrialization.

The importance of education and public awareness on sustainability issues cannot be overstated, according to the academics. The study suggests that governments should implement educational programs that promote the understanding of ecological impacts and the benefits of sustainable living. These initiatives could encourage individuals and communities to adopt more sustainable lifestyles, thereby reducing their ecological footprint.

Professor Lenny Koh added, "This study provides a critical forecast that should guide future research, policy-making, and practical applications in environmental sustainability. It's imperative that G20 nations collaborate to address these challenges, focusing on minimizing resource scarcity and enhancing ecological resilience."

More information: Rafael M. Eufrazio Espinosa et al, Forecasting the ecological footprint of G20 countries in the next 30 years, *Scientific Reports* (2024). [DOI: 10.1038/s41598-024-57994-z](https://doi.org/10.1038/s41598-024-57994-z)

Provided by University of Sheffield

Citation: Only four G20 countries set for positive ecological footprint by 2050, study finds (2024, April 30) retrieved 17 May 2024 from <https://phys.org/news/2024-04-g20-countries-positive-ecological-footprint.html>

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