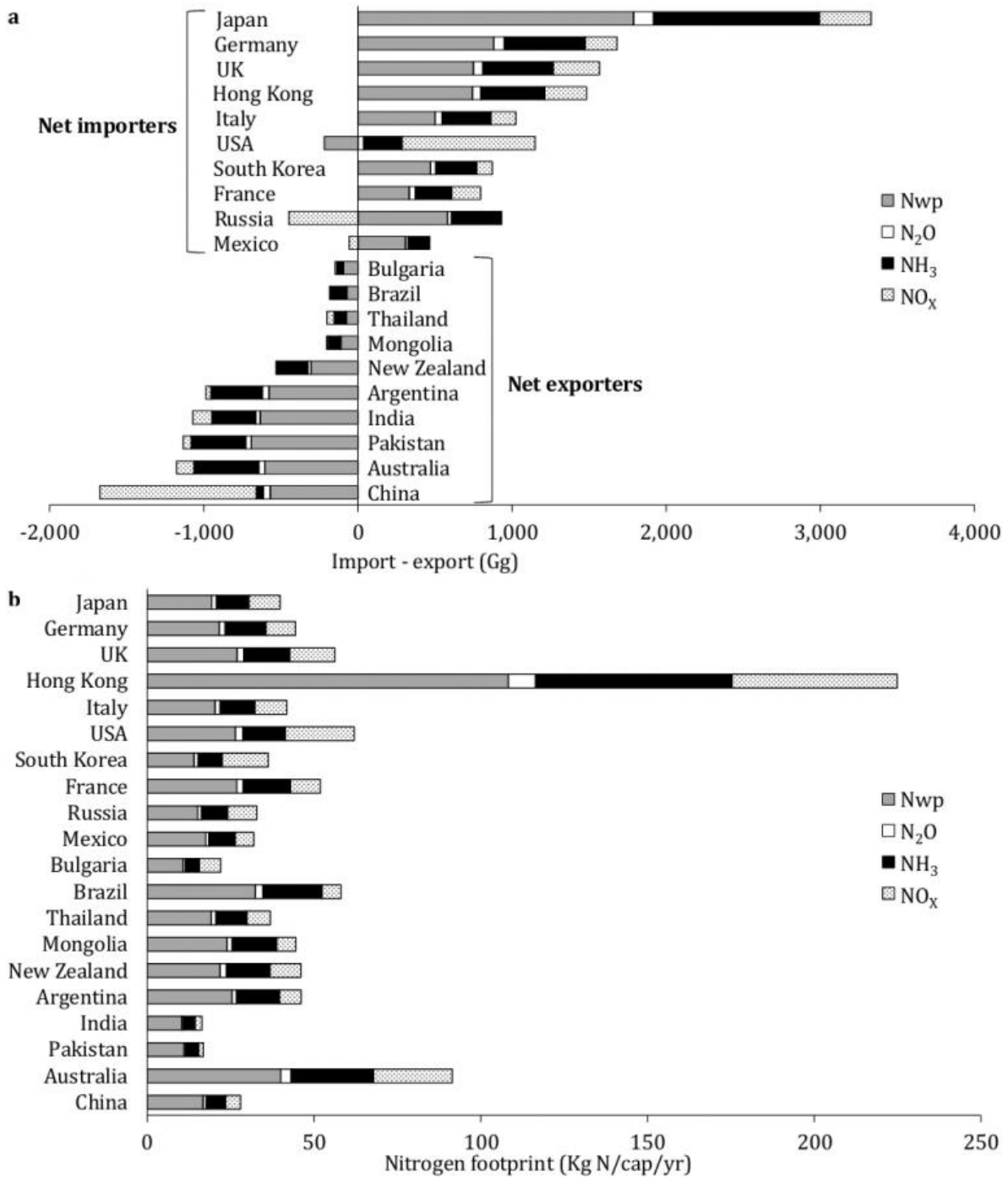


Global nitrogen footprint mapped for first time

January 25 2016



Net importers and net exporters. Credit: University of Sydney

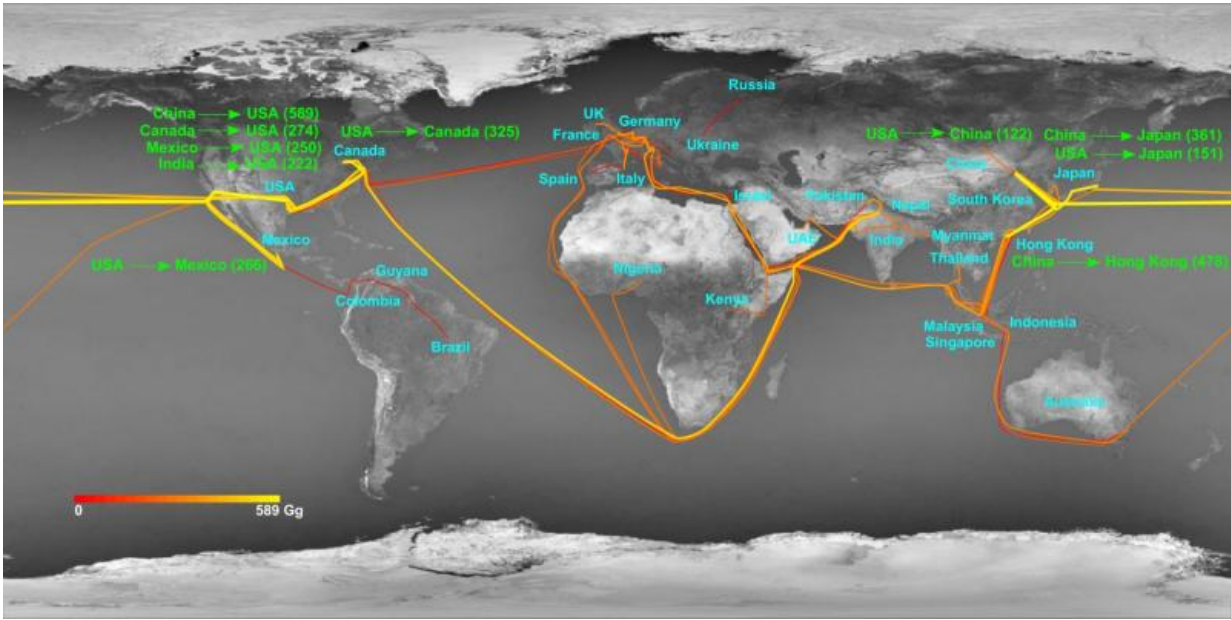
The first-ever global nitrogen footprint, encompassing 188 countries, has found the United States, China, India and Brazil are responsible for 46 percent of the world's nitrogen emissions.

The international collaboration, led by the University of Sydney's Integrated Sustainability Analysis team in the Faculty of Science, found developing countries tend to embody large amounts of nitrogen emissions from their exports of food, textiles and clothing. Australia is one of the few [wealthy nations](#) that is a net exporter of nitrogen, because of the substantial agriculture industry.

The economic modelling, which grouped the nitrogen footprint into top-ranking bilateral trade relationships, noted a trend for increased nitrogen production and found developed nations largely responsible for emissions abroad for their own consumption.

PhD candidate Ms Arunima Malik, who co-authored the paper with University of Sydney colleagues Professor Manfred Lenzen and Dr Arne Geschke, as well as two researchers from Yokohama National University and one from Kyushu University in Japan, said significant nitrogen net importers were almost exclusively developed economies.

"High-income nations are responsible for more than 10 times the emissions of the poorest nations," Ms Malik said. "This reflects greater consumption of animal products, highly processed foods and energy-intensive goods and services,"



Nitrogen international trade routes and intensity. Credit: University of Sydney

The vast bulk of emissions came from industries such as agriculture, transport and energy generation. Emissions from consumers-end use were mostly from sewage.

A paper on the research is published today by the international journal *Nature Geoscience*.

Nitrogen pollution was becoming an increasingly significant problem, as countries not only consumed the naturally occurring element but were also producing greater quantities of synthetic nitrogen, Professor Lenzen said. New work by the University of Sydney looking at trends was expected to be completed soon.

"Policies are needed to integrate nitrogen supply-chains globally in order to reduce pollution, Professor Lenzen said. "We know nitrogen

emissions are increasing - just as carbon emissions are increasing as populations expand.

"We are now analysing the trends, such as increased affluence and consumption, and looking at the various industries responsible for [nitrogen pollution](#)."

Findings of the research of 2010 data includes:

- Consumption in the United States, China, India and Brazil is responsible for 46 percent of global nitrogen emissions.
- Japan and other developed nations import reactive nitrogen embodied in Chinese-made clothing as well as US and Australian meat.
- The United Kingdom, Germany, Italy, and France exchange significant amounts of nitrogen emissions embodied in food products.
- Hong Kong's nitrogen imports are primary agricultural and raw food products because it lacks land to produce its own livestock and crops.
- Developing countries such as China, India, Pakistan, and Thailand embody large amounts of nitrogen emissions into their exports of textiles and clothing.
- High-income exceptions are Australia, New Zealand, and Argentina, which export significant nitrogen embodied in livestock products.
- Per-capita nitrogen emission ranged from more than 100 kg annually for wealthy nations such as Hong Kong and Luxembourg, to less than 7 kg for developing nations such as Papua New Guinea, Côte d'Ivoire, and Liberia.
- Of the 189 teragrams of [nitrogen](#) emitted worldwide in 2010, 161 Tg was emitted from industries and agriculture and only 28 Tg was emitted by consumers.

More information: *Nature Geoscience*, [DOI: 10.1038/ngeo2635](https://doi.org/10.1038/ngeo2635)

Provided by University of Sydney

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