



Online calculator measures consumers' 'nitrogen footprint'

Individuals can assess how their behaviour is affecting nitrogen pollution with a newly developed nitrogen footprint calculator, which was developed by a team from the University of Virginia (U.S.) and the Energy Research Centre (ECN, the Netherlands). For many people in wealthy countries, reducing protein consumption to the recommended levels and reducing the amount of red meat and energy they consume would significantly lower their nitrogen footprint.

Although nitrogen occurs naturally and is essential for life, human activities are releasing excessive, polluting amounts into the environment. The largest sources of nitrogen pollution come from food production and the burning of fossil fuels. For example, artificial nitrogen fertilisers are used to improve food yields, but overuse of fertilisers results in surplus nitrogen that contaminates the environment.

Nitrogen pollution affects the health of people and ecosystems. It disrupts the natural nitrogen cycle, damages air and water quality and contributes to the formation of smog, acid rain, ozone depletion in the upper atmosphere and eutrophication of coastal waters. One form of nitrogen, nitrous oxide, is a potent greenhouse gas.

This study addresses one aspect of tackling nitrogen pollution. It argues that if people can understand how their consumption of food and energy is contributing to the problem, they can make appropriate lifestyle changes to reduce pollution. The researchers created an online tool, the N-Calculator¹, that estimates how much nitrogen one person releases to the environment. By answering questions related to food and energy use, an individual can determine their nitrogen footprint and compare it with their national average.

The nitrogen footprint includes nitrogen contained in consumed food, plus nitrogen released during the whole chain of production, distribution and preparation of the food. The other component of the nitrogen footprint determines the amount of nitrogen (as NO_x emissions) released from the burning of fossil fuels related to energy use in housing (e.g. cooking, heating, cooling); transport (e.g. use of private or public transport); and the energy used to produce goods and provide services.

To illustrate the use of the N-Calculator, the researchers calculated the average nitrogen footprint for each person in the United States and the Netherlands. For the U.S., the average footprint is 41kg of nitrogen a year (N/yr), whilst for the Netherlands it is 25kg N/yr. Most of a footprint relates to food. In the U.S., food created a nitrogen footprint of 30kg N/yr. 25kg of this is related to food production and 5kg to the post-consumption of food, e.g. excretion of human waste. In the Netherlands, food accounted for a footprint of 22kg N/yr, with 21kg N/yr related to production and 1kg N/yr related to post-consumption.

Reasons for the differences in the two countries' footprints were considered. In the Netherlands, people eat more dairy, eggs and fish than Americans, who tend to eat more meat. In addition, advanced sewage treatment which removes nutrients, including nitrogen, is widespread in the Netherlands, but not in the U.S. People living in the U.S. also tend to consume more energy; in particular, they use more private transport than the Dutch. On average, Americans use private car travel for about 400km/week, compared with 170km/week in the Netherlands.

The N-Calculator can help people make changes to their lifestyle to reduce their nitrogen footprint, the study says. The biggest changes are related to diet. For example, eating less red meat, which is nitrogen intensive to produce, and switching to fish, poultry or legumes, would substantially lower an individual's nitrogen footprint, in addition to using more sustainable transport.

1. See: www.n-print.org

Source: Leach, A.M., Galloway, J.N., Bleeker, A. *et al.* (2012) A nitrogen footprint model to help consumers understand their role in nitrogen losses to the environment. *Environmental Development*. 1: 40-66.

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