

# Dietary shifts driving up phosphorus use

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Dietary changes since the early 1960s have fueled a sharp increase in the amount of mined phosphorus used to produce the food consumed by the average person over the course of a year, according to a new study led by researchers at McGill University.

Between 1961 and 2007, rising [meat consumption](#) and total [calorie intake](#) underpinned a 38% increase in the world's per capita "phosphorus footprint," the researchers conclude in a paper published online in *Environmental Research Letters*.

The findings underscore a significant challenge to efforts to sustainably manage the supply of mined phosphorus, a non-[renewable resource](#) widely used as fertilizer. When phosphorus is lost through [agricultural runoff](#) or sewage systems, it can pollute waterways downstream. In addition, because deposits are heavily concentrated in a few countries, global supplies and prices for the resource are vulnerable to geopolitical tensions.

In recent years, many researchers have explored how human activity has altered the [phosphorus cycle](#) in the environment and how management of phosphorus could be altered to ensure long-term sustainability. This new study sheds more light, in particular, on how diet choices have affected the intensity of phosphorus use around the world.

"Our results demonstrate that changes in diet can be a significant part of the strategy for enhancing sustainability of phosphorus management," says lead author Geneviève Metson, a doctoral student in McGill's

Department of Natural Resource Sciences. "In particular, reduced consumption of meat, and especially beef, in countries with large phosphorus footprints could put a big dent in demand for mined phosphorus – since it takes many kilograms of feed, which is fertilized, to produce a kilogram of meat."

Metson and her co-authors, Prof. Elena M. Bennett of the McGill School of the Environment and Arizona State University Prof. James J. Elser, computed phosphorus-footprint values based on annual country-by-country diet composition data from the Food and Agriculture Organization. They calculated the total amount of phosphorus applied to food crops for humans and animals by using fertilizer-application rates available through the International Fertilizer Association, among other sources. The authors also examined the statistical relationship between economic development and phosphorus-footprint values, and developed scenarios to consider the relative importance of diet changes.

"It is really remarkable how much influence changes in diet have had on our demand for this very limited resource," Bennett says. "As research in this area proceeds, it would also be interesting to learn how much of the [phosphorus](#) used in food production is able to be recycled and how much is currently reused. Food waste and human waste generally aren't reused today, but can be a valuable resource if turned into fertilizer or compost for use on nearby agricultural fields."

**More information:** [iopscience.iop.org/1748-9326/7/4/044043](https://iopscience.iop.org/1748-9326/7/4/044043)

Provided by McGill University

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