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# Supporting phosphorus management in Austria: Potential, priorities and limitations

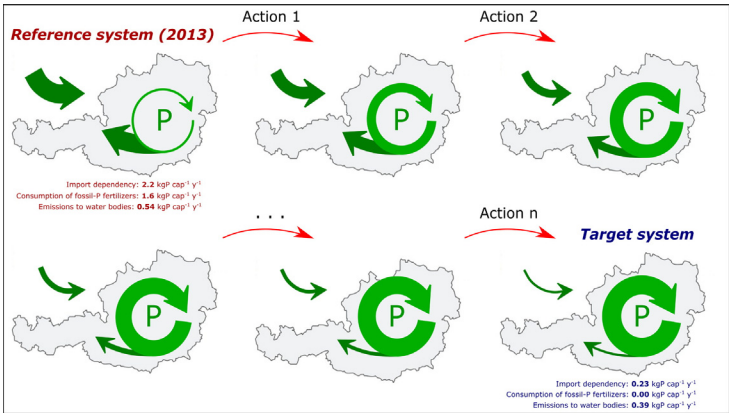
Ottavia Zoboli *, Matthias Zessner, Helmut Rechberger

[a] Centre for Water Resource Systems, TU Wien, Karlsplatz 13/222, 1040, Vienna, Austria
[b] Institute for Water Quality, Resource and Waste Management, TU Wien, Karlsplatz 13/226, 1040, Vienna, Austria

## HIGHLIGHTS

- Potentials and limitations for phosphorus stewardship in Austria are quantified.
- Phosphorus import dependency could be reduced from 2.2 to 0.23 kgP cap$^{-1}$ - y$^{-1}$.
- Consumption of fossil-P fertilizers could be completely replaced.
- Emissions to water bodies could be reduced by 28%.
- Systemic approach is essential to set priorities for decision making.

## GRAPHICAL ABSTRACT

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## ABSTRACT

Protecting water bodies from eutrophication, ensuring long-term food security and shifting to a circular economy represent compelling objectives to phosphorus management strategies. This study determines how and to which extent the management of phosphorus in Austria can be optimized. A detailed national model, obtained for the year 2013 through Material Flow Analysis, represents the reference situation. Applicability and limitations are discussed for a range of actions aimed at reducing consumption, increasing recycling, and lowering emissions. The potential contribution of each field of action is quantified and compared using three indicators: *Import dependency*, *Consumption of fossil-P fertilizers* and *Emissions to water bodies*. Further, the uncertainty of this assessment is characterized and priorities for the upgrade of data collection are identified. Moreover, all the potential gains discussed in the article are applied to the reference situation to generate an ideal target model. The results show that in Austria a large scope for phosphorus stewardship exists. Strategies based exclusively either on recycling or on the decline of P consumption hold a similar potential to reduce import dependency by 50% each. An enhanced P recycling from meat and bone meal, sewage sludge and compost could replace the current use of fossil-P fertilizers by 70%. The target model, i.e. the maximum that could be achieved taking into account trade-offs between different actions, is characterized by an extremely low import dependency of 0.23 kgP cap$^{-1}$ y$^{-1}$ (2.2 kgP cap$^{-1}$ y$^{-1}$ in 2013), by a 28% decline of emissions to water bodies and by null consumption of fossil-P fertilizers. This case study shows the added value of using Material Flow Analysis as a basis to design sound

* Corresponding author at: Centre for Water Resource Systems, TU Wien, Karlsplatz 13/222, 1040 Vienna, Austria.
*E-mail address:* ozoboli@iwag.tuwien.ac.at (O. Zoboli).

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