



Prof. Ming Xu
Editor in Chief of Resources,
Conservation & Recycling

Québec, November 16th, 2022

Dear Prof. Xu, Editor in Chief of Resources, Conservation & Recycling,

We are pleased to submit the original manuscript entitled "Mapping of phosphorus flows and analysis of the potential for recovery and reuse in Ontario, Canada" to be considered for publication.

In this work we aim to determine the phosphorus flows and the opportunities and challenges for phosphorus recovery and reuse in the real economy, using the Canadian province of Ontario for this purpose. In a first stage, we map the flows of phosphorus through the different economic sectors, including the food production and consumption system, the management of organic wastes, industrial activities and urban flows. The phosphorus flows have been determined through the use of open-source databases provided by governmental institutions and academic resources.

In a second stage, the information obtained about the phosphorus flows and the relationships between different economic sectors is used to determine the phosphorus inputs, outputs and losses in the system, identifying the potential for phosphorus recovery attending to the magnitude and characteristics of each flow. We found that, considering the current processes available, up to 86% of phosphorus imports for food production could be covered by recycled phosphorus, with an average recovery cost of 36 EUR/kg of phosphorus, which is lower than the economic losses of phosphorus releases into the environment estimated at 74.5 EUR/kg of phosphorus. However, the recovery cost shows a large variation among different flows. Moreover, we found that the economies of scale play a crucial role in the economic viability of phosphorus recovery, resulting in particularly large recovery costs in the small-scale facilities. These results suggest the need to develop phosphorus recovery technologies adapted to small-scale spatially sparse facilities, and regional cooperative mechanisms to distribute the phosphorus recovery costs.

We hope that our paper will be reviewed favorably for publication in your journal.

Sincerely yours,

Céline Vaneeckhaute