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## **Phosphorus Cycling and Organic Waste Management on the Island of Montreal**

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**ABSTRACT** Phosphorous (P) is an essential nutrient for plant growth, but phosphate fertilizer is a non-renewable resource and its excessive use is unsustainable, negatively affecting both food security and downstream water quality. Cities provide a unique opportunity to address these issues through P recycling, because these urban areas concentrate P-rich organic products and the subsequent wastes. Conventional waste management practices, however, do not approach nutrient management from a holistic systems perspective. Alternative strategies such as composting and anaerobic digestion can be implemented that beneficially recycle waste organics into useful resources, reminiscent of natural nutrient cycling. However, current recycling rates for organic waste in the province of Quebec are extremely low: for instance, Montreal diverts only 12% of organic waste from landfills. Provincial legislation has therefore been enacted to mandate the diversion of organic waste in Quebec municipalities. This study will assess how current P flows through the island of Montreal may change as a result of this legislation and the resultant municipal policy adjustments. A survey of historical legislation and policy changes related to organic waste management in several regions will be completed. A computational model will be developed to represent current P flows through Montreal, and calibrated using the information from the historical survey. The model will then be used to explore possible changes to P flows through Montreal as a result of the legislative changes. Ideally, the model could then be used to identify technologies or policies that would maximize nutrient recycling.

**Keywords:** phosphorus, biogeochemistry, nutrient cycles, organic waste management.

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