Direct Microplastic Inputs from Wastewater Treatment Plants to the Laurentian Great Lakes

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Whilst wastewater treatment plants (WWTPs) have an inadvertent high microplastics retention capacity (typically >70%), they are also an important point source of pollutants to aquatic environments[1]. This allows WWTPs to serve as important control points to reduce microplastics pollution to receiving water bodies. In this study, we used a combination of spatially explicit total plastic waste generation[2] and facility data from the *International Joint Commission*[3]*,* to estimate the annual inputs of microplastics associated with direct wastewater discharges into each of the five Laurentian Great Lakes. The empirical calculations and plastic inputs take into account the population density and gross regional product bordering the lakes' coastlines, as well as the relative proportions of primary, secondary, and tertiary treatment of the discharging WWTPs[3]. These inputs are then tracked within a simple microplastics balance model. The model is used to assess the impacts of converting and improving wastewater treatment processes along the Great Lakes continuum. Going further we consider possible future scenarios, e.g., diminishing per capita microplastic emissions and projected population growth in the Great Lakes region.

[1] Iyare, Ouki & Bond (2020) *Environmental Science, Water Research & Technology* 6, 2664-2675.

[2] Lebreton & Andrady (2019) *Palgrave Communications* 5, 6.

[3] Arvai, Klecka, Jasim, Melcer & Laitta (2014) *Water Quality Research Journal of Canada* 49.1, 23-31.