NUTRIENT RECYCLING FROM HUMAN EXCRETA TO FOOD PRODUCTION
– Identifying preferable options to support food self-reliance in the Okanagan Bioregion, BC Canada.

Background
Current global agricultural production relies heavily on synthetic fertilisers produced with nutrients mined from finite reserves. Increasing concerns about eutrophication and future fertiliser availability have emphasised the need for better nutrient management, including comprehensive recovery of nutrients contained in human excreta and wastewater. A wide range of treatment processes exist that facilitate recovery of nutrients and organic matter from human excreta and wastewater, rendering a variety of products potentially useful as fertilisers for the production of food and other biomass.

Scope
The proposed project aims to explore the usefulness of a novel assessment framework – MuSIASEM (Multi-Scale Integrated Assessment of Societal and Ecosystem Metabolism) – to support planning and identification of feasible and preferable scenarios for nutrient recycling from human excreta and wastewater to the production of food and other biomass. MuSIASEM is a method of accounting that is used to analyse the metabolic pattern of social-ecological systems and that maintains coherence of different quantitative representations generated based on different perspectives and using different metrics across different scales and dimensions (e.g. economic, social, ecological, technical). It consists of a relational analysis of the functional and structural elements of a social-ecological system and is designed to detect and analyse patterns in the societal use of resources and the impacts they create on the environment. MuSIASEM has gained traction in recent years and has been used at various scales, for example to assess municipal solid waste management in the Naples metropolitan area or the nexus between food, water, and energy security in the European Union.

Approach
The Okanagan Bioregion in BC Canada will serve as a case study for the exploration of MuSIASEM. Stakeholders in the Okanagan Bioregion are currently exploring what a sustainable food system could look like and how it could be achieved, aiming among others at increasing food self-reliance. The Sustainable Agricultural Landscapes Laboratory at the University of British Columbia is currently mapping nutrient flows in the Okanagan Bioregion for the current and possible future waste management systems, with the aim to identify opportunities for improving food and nutrient self-reliance through closing nutrient cycles at the local and regional scales. A detailed description of the current and possible future solid and liquid waste management system in the Okanagan Bioregion, as well as associated nutrient flows, will be available by the end of December 2018 and will serve as starting point for exploring the MuSIASEM method to evaluate a range of different waste management options.

Expected Outcomes
Through application of the MuSIASEM method, we will identify preferable options for managing human excreta and other nutrient-rich waste streams to support food self-reliance in the Okanagan Bioregion. We will critically discuss the usefulness of the MuSIASEM method and how it compares to other frameworks such as Life Cycle Assessment (LCA). The results are expected to be useful for stakeholders in the Okanagan Bioregion. Given that MuSIASEM has not been applied to human excreta management as of yet, there is scope to contribute or take the lead on one or more scientific publications.

Examiner
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The project is suitable for 1-2 students.