

Eawag Seminar Invitation

Microbial cleantech solutions for nitrogen management on Earth and in Space: Enablers for air, food and water production

Speaker **Prof. Dr. Siegfried Vlaeminck, University of Antwerpen, Belgium**

When **May 19, 2022, 16:00 – 17:00, CEST**

Where **Online via Zoom, contact seminars@eawag.ch for access details.**

Abstract Food production chains drive on reactive nitrogen (Nr), yet are very leaky and Nr emissions to the environment surpass the planetary boundary. The mission of our research is to develop microbial cleantech for more sustainable Nr management in point-source secondary N flows, relieving pressure on our planet's life support system. In Space, long-duration human spaceflights require extreme autonomy and circularity to produce water, air and food. MELiSSA is ESA's regenerative life support system for Space. We also aim to contribute to this development, inspiring also more sustainable terrestrial solutions. We develop cleantech for water and food systems through a 'T profile' combination approach: vertical in-depth investigations of specific sustainable microbial technologies, complemented with horizontal computation-based systems analyses, ensuring implementation scenarios for maximum impact.

The talk will provide an overview of our latest insights on nitrogen fit for use, and the need (or not) for a paradigm shift from nitrogen removal to recovery. Then, solutions will be discussed to produce dinitrogen and Nr for fertilizer and feed applications from 'used' resources, based on sewage, urine, industrial wastewater and manure. Key topics include partial nitrification/anammox (PN/A) for energy-autonomous sewage treatment, PN/A for resource-efficient urine treatment on Earth and in Space (where dinitrogen is valuable resource). Further, liquid nitrate-based fertilizer solutions will be discussed, derived through nitrification from urine (also in Space), microbial fertilizers and ammonia stripped from slurries, or derived from stables. Finally, three types of microbial biomass will be highlighted for Nr recovery: aerobic heterotrophs, microalgae and purple non-sulfur bacteria. Their applications as microbial fertilizers and microbial protein for use as aquafeed ingredient will also be presented.