

## Life Cycle Assessment (LCA) of Urine Recycling in Residential Spaces: Evaluating Sustainable Treatment Locations and Configurations (30 hp)

### Projektbeskrivning

#### Background:

Technologies for recycling urine are part of the emerging innovations that aim to increase resource recovery from human waste streams. Urine contains most of the nutrients in human excreta, making it a valuable fraction. Urine recycling technologies can potentially convert human urine into commercial-quality fertilizer and reduce transport and treatment costs. At SLU, researchers have developed a technology capable of converting urine into a nutrient-rich solid fertilizer suitable for use in conventional agriculture machinery. With such recycling, nearly 25% of the fertilizer demand in Sweden could be met. This would also improve the resilience of local food production to external shocks, such as the recent war in Ukraine and the subsequent global shortage of fertilizers.

Nevertheless, introducing such groundbreaking technologies into society requires a comprehensive understanding of their socio-cultural, institutional, and environmental impacts. This research project seeks to explore the environmental implications of urine recycling systems within urban contexts and how their environmental profiles change based on the treatment location. After urine is separated from the other wastewater fractions, it can be treated in the toilet, the building's basement, or a decentralized treatment plant.

To achieve this, we are using Life Cycle Assessment (LCA), a powerful tool for quantifying potential impacts across the entire lifecycle of products, processes, and services. This will be a comparative LCA comparing three treatment locations (toilet level, building basement, and decentralized treatment plant) and potentially different treatment configurations.

This master's thesis project offers an exciting opportunity to delve into the critical field of sustainable sanitation through the lens of urine recycling systems. The project aims to conduct a comprehensive Life Cycle Assessment (LCA) to evaluate different urine recycling system configurations and determine the most environmentally sustainable treatment location for urine in residential buildings.

#### Project Scope:

As a master's student researcher, you will have the opportunity to:

- Conduct an extensive literature review on urine recycling systems, LCA methodologies, and sustainable sanitation practices.
- Collaborate with seniors in the field to design and plan a systematic LCA study.
- Collect data on urine recycling systems, considering various treatment locations such as at the toilet, in a basement, or at a decentralized treatment plant.
- Analyze and interpret LCA results to assess the environmental impacts of different urine recycling configurations.
- Explore innovative approaches and propose recommendations for optimizing urine recycling systems in residential spaces.

- Present your findings through a master's thesis, which may contribute valuable insights to the field of sustainable sanitation and resource management.

**Qualifications:**

We are looking for a highly motivated master's student with the following qualifications:

- Familiarity with LCA methodologies and data analysis tools is mandatory.
- Strong research and analytical skills, with a keen interest in sustainability and environmental impact assessment.
- Ability to work independently and as part of a research team.

**Benefits:**

- Gain valuable research experience in a rapidly evolving field with real-world implications.
- Collaborate with leading experts and professionals in the field of sustainable sanitation.
- Contribute to the development of sustainable solutions for wastewater management.

**Kontaktperson**

<b>Namn</b>	Abdulhamid (Abood) Aliahmad		
<b>Organisation</b>	Swedish university of agricultural sciences		
<b>E-postadress</b>	Abdulhamid.aliahmad@slu.se		
<b>Telefonnummer</b>	0706272620		
<b>Ev. samarbetspartners</b>	<input type="checkbox"/> Enköping kommun <input type="checkbox"/> Eskilstuna energi & miljö <input type="checkbox"/> Falu energi & vatten <input type="checkbox"/> Käppalaförbundet <input type="checkbox"/> Mälarenergi <input type="checkbox"/> Nodra <input type="checkbox"/> Roslagsvatten	<input type="checkbox"/> Stockholm vatten <input type="checkbox"/> Syvab <input type="checkbox"/> Tekniska verken <input type="checkbox"/> Uppsala vatten <input type="checkbox"/> Växjö kommun <input type="checkbox"/> Örebro kommun	<input type="checkbox"/> KTH <input type="checkbox"/> Lunds universitet <input type="checkbox"/> Mälardalens universitet <input checked="" type="checkbox"/> SLU <input type="checkbox"/> Uppsala universitet <input type="checkbox"/> IVL <input type="checkbox"/> Rise