Emissions Reduction From Wastewater Treatment

The Active Reduction of Emissions from Wastewater Treatment Plants (ARES) project aims to identify and promote actionable solutions for reducing greenhouse gas emissions from Danish wastewater treatment facilities, both domestically and internationally. Initiated in support of Denmark's 2020 climate goal to reduce CO_2 emissions by 70% by 2030 (compared to 1990 levels), the project evaluated emission reduction efforts using the Paris model and IPCC emission factors. The project confirmed that uncovered sludge storage tanks are a major source of CH_4 emissions. These findings highlight the potential of closed sludge storage systems to significantly reduce direct greenhouse gas emissions from treatment facilities.

RECOVER

ODENSE, DENMARK

WASTEWATER

wef | CASE STUDY

CHALLENGES FACED

VandCenter Syd utility faced high uncertainty in N_2O measurements because of temporal and spatial variability, alongside costly maintenance totaling 156,000 DKK annually. Unstable ammonium loads in pilot trials limited analysis, while restricted access to sewer junctions reduced data quality. Significant capital was also required for technologies like EloVac®-P and sensor systems.

TECHNOLOGIES & SOLUTIONS USED

At Ejby Mølle WWTP, a sludge storage tank and vacuum system captures biogas for energy production. Sensor-based controls were implemented to optimize denitrification and reduce N_2O emissions. To assess the overall climate impact of these technologies, life cycle assessments (LCA) were conducted, supported by pilot trials and laboratory tests to validate performance and outcomes.

IMPACT & INSIGHTS

The ARES project demonstrated that targeted methane reduction strategies can simultaneously lower emissions and strengthen utility economics.

Key Benefits:

- Methane emissions reduced by up to 56% with increased biogas yield.
- Sludge dewatering savings of 300,000–600,000 DKK/year with methane reduction cost well below the projected carbon tax.
- Proven at leading Danish facilities, showing scalability potential for wastewater treatment.

LESSONS LEARNED

The ARES project showed that effective climate action in wastewater goes beyond technology—it depends on collaboration, behavior change, and public engagement. By bringing together utilities, researchers, and agencies, it advanced scalable solutions aligned with national goals. The project highlighted the importance of circular practices such as energy and phosphorus recovery, and the human role in using digital tools. Public outreach reinforced the broader value of climate-smart wastewater management.

> **ARES supports a shift toward circular economy principles, where wastewater is not just treated but also mined for energy and resources, aligning environmental and economic sustainability.**

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