



SMART CITY CHALLENGE 2025

City Challenge

send to smartcity@taltech.ee by Sept 30, 2025

Challenge Title – Reed2Gas + (Common reed to biogas continued)

City/county and country Vaasa Finland

Main contact from your city/county – Simo Marttila, project coordinator, +358 400 668 649,
simo.marttila@vaasa.fi

What is the future urban challenge that would need a solution to?

Common reed and the little moving water in the Eteläinen kaupunginselkä (Southern city bay) area of Vaasa have suffered from declining water quality over the years as increasing nutrient loads and expanding reed beds reduce water circulation in the area. This has already impacted Vaasa's swimming water quality with two EU-beaches (Ahvensaari and Hietasaari) classified as having poor swimming water quality, despite being located in the heart of the city for public use. Combined the affected area of common reed is approximately 3 square kilometres just in one area, with several other large areas in river deltas around the Ostrobothnia.

The growth of common reed has coincided with the reduction of coastal grazing and increased use of agricultural fertilizers, both of which have strongly contributed to the current situation. Fertilizer runoff is carried from fields into rivers, which transport nutrients into deltas.

Vaasa wants to utilize local common reed (*phragmites australis*) as a source for a local renewable energy source for biogas-powered city buses. For this plan Vaasa needs funds to improve our cutting, collecting and transporting of common reed as well as further research the best solutions for storing the common reed. These plans are to improve Vaasa as a climate resilient and happy city: We are improving the sustainable options for local renewable energy solutions by using common reed for biogas. Plan is to collect common reed for use as a biomass for biogas production in local waste recycling center Stormossen Oy in the city's vicinity.

We aim for these piloting projects to serve as a blueprint for other cities with similar issues with common reed. Common reed usage has several bottlenecks which have required research to solve and we want these findings to be used for other cities to consider whether their locations are suitable for biogas production. Common reed is a similar issue in many cities with water. In modern times we are not using cattle anymore to graze on the reeds so they grow unimpeded. At the moment the business of common reed is in small scale cutting for cottage waterfront clearing generally, but we will use common reed as a biomass side stream for the digesters in Stormossen waste recycling facilities.

Common reed areas around Vaasa are also regulated by nature conservation efforts. The Southern City Bay of Vaasa is designated as a Natura 2000 site. This means separate permits from local water cooperatives in Southern bay area of Vaasa and a Natura2000-permit from Forest Authority (Metsähallitus) prior to ELY-center approving the cutting operation. Due to special Natura2000-area restrictions, there is also a bird nesting protection period between May and end of July. This limits the time of operations during



Municipal Engineering

Kirkkopuistikko 26
65100 Vaasa, Finland
+358 6 325 1111
firstname.lastname@vaasa.fi



summertime, but we plan to cover this time for other locations outside the Natura2000 restrictions, for example cutting reeds from Vaasa's own shorelines and small boat harbors. This ensures the steady flow of biomass material.

Innovation.

Prior to this project, Vaasa has identified the necessary permits required for common reed cutting. We have also confirmed that common reed is a suitable material for biogas production. This was proven in laboratory conditions by Patiwat Snickars in his student thesis.

In past two years we have been using the material in real-world conditions for biogas production in Stormossen. However due to the scale of the operation, we have realized that preserving the biomass is a bigger issue. Recent analysis of nine-month storage has shown that compared to freshly cut and crushed common reed, this older stored common reed has approximately 16% of methane potential left. This means we have to find out what is the possible longest time for common reed storage to keep at least 50 % of the methane potential in the material and which storage way preserves it the best.

We want to commit to a longer timeframe, the issue with common reed production is the uneven collection of the material. We also want to see the effects of repeated cutting of common reed in its growth. Longer timeframe requires funding to be able to invest into equipment guaranteeing future operations.

Vaasa is located in a land uplift area, which means many areas where common reed is located are very shallow. Our current equipment on a boat is not capable of traversing under 25cm of water. This limits the areas we can work in. Vaasa will purchase new improved equipment for reed cutting and crushing. This will improve the amount of common reed possible to gather compared to previous years. These purchases are based on the investment plans made by Jami-Matti Aho in his student thesis studying optimal ways of common reed cutting.

We do various storage methods on collected common reed and analyze the amount of methane released during storage, measured monthly, to solve the best way for reed biomass storage. This is crucial innovation to know the optimal time and limits for common reed use in biogas production.

The project will utilize long-term unemployed workers hired with pay subsidies. Important part of our work is also improving employment opportunities in Vaasa. Cost effective planning is also necessary for the biogas production to be achieved and for this, and due to seasonal nature of commonreed cutting, we cannot employ field workers all year.

Expected impact of your pilot solution.

The sustained removal of nutrients from the Eteläinen Kaupunginselkä area in the form of common reed will improve the water quality. This will have compounding effects on the biodiversity, quality of fishing, swimming and recreation in the area.

We create actual biogas from the collected reed material in Stormossen's digester. Our aim is to harvest up to 500 tons of common reed biomass per year. For this amount to be possible, we will purchase equipment for improved cutting and collecting of common reed based on a previous student thesis done for Vaasa city by mechanical engineering trainee Jami-Matti Aho. These will include two amphibious crafts for cutting and collecting with necessary additional tools such as reed rakes, cutters and trailers for transport.



Municipal Engineering

Kirkkopuistikko 26
65100 Vaasa, Finland
+358 6 325 1111
firstname.lastname@vaasa.fi



We want to analyze the optimal storage methods for common reed through experiments on how different methods affect its methane content.

After the research and investment into common reed cutting operation, Vaasa expects to create this into an ongoing process, with yearly gathering of biomass for biogas. Commonreed biomass will be used in Stormossen's waste recycling center as a sidestream for digesters, so the process can be kept fully operational continuously.

This operation and continual process aims to serve as a model for other cities on how to start utilizing local biomass for biogas in cost effective ways.

Piloting

Vaasa is committed to being a sustainable, carbon-neutral city. One of these aims is to create local renewable energy sources for local use. This project is one at the heart of this movement. Utilizing the common reed in cost-effective ways is an important part of revitalizing our nutrient-rich river delta areas. This piloting will be a great way for the city to collaborate with local university and companies enabling innovative solutions. Vaasa city is known as the Nordic energy cluster, with our expertise in energy and smart energy solutions. This makes Vaasa an ideal environment to test and improve smart city solutions revolving around environmental and climate themes. Vaasa is also a perfect size city for piloting these issues, large enough to meet the complicated challenges and small enough to adapt to them effectively. Vaasa is the winner of the European Green Leaf 2026 award for our climate-neutral goals, energy education pathway, innovative technology, community engagement, and environmental planning. This award highlights Vaasa's capacity to pilot a project for this smart city challenge.

Piloting in this project will involve a procurement process for two amphibious craft for reed cutting, along with their additional equipment. We will also do a procurement process for a biomass crusher, which will allow us to test different storage methods, either storing the reed before crushing or crushing it immediately prior to transport.

Piloting will include the employment of long-term unemployed personnel as field workers.

We will research varied ways of storing the common reed for increased methane retention prior to adding the biomass into digesters. We want to establish a known timetable for approximate methane loss every month for more accurate estimates of created biogas per tonne of reed material. This piloting will benefit tremendously all other coastal cities struggling with overgrowing reed areas. Piloting will also prove if biogassing common reed is cost-effective on a larger scale.

We have preliminarily explored similar needs in Estonia and identified that Vaasa's sister city Pärnu is also working with reed and biogas. We have not yet inquired about the possibility of cooperation, but we will do so if our project proceeds to the next round.



Municipal Engineering

Kirkkopuistikko 26
65100 Vaasa, Finland
+358 6 325 1111
firstname.lastname@vaasa.fi