FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2025

City Challenge

Max 3 pages

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

Challenge Title – CO2 capture using existing infrastructure

City/county and country Vaasa Finland

Main contact from your city/county – suvi.aho@vaasa.fi

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

- **Please describe the challenge of your city / county neighboring a city?**
- Vaasa proposes an innovation challenge to capture CO2 directly from seawater by utilizing existing infrastructure such as power plant water pumps. The pilot can serve as a pathway towards carbon neutrality and provide a scalable model for other cities and industrial areas across the EU. This solution should have the potential to significantly reduce emissions, and offer valuable learning and development opportunities.
- Which category your challenge is primarily in: safe city, happy city, and climate resilient city? Climate resilient
- Why is it important for your city to solve it? How big priority it is for you and why? The co2 emissions from the City of vasa have been lowered but not yet sufficiently and carbon capture is a great next step to further reduce emissions
- Is this a unique challenge/problem of your city, why or is this by your knowledge a challenge/problem that many cities have – which kind of other cities? To our understanding this is a challenge that all cities have at this moment and our proposed challenge can be freely implemented on EU level

2. Innovation.

- How have you solved that issue so far? Why aren't the present solutions good enough? Are there legal obstacles, which ones? Currently the fossile emissions have been lowered in the city through use of innovate solutions for the district heating system (Underground thermal storage, electrical boilers and waste heat recovery by heat pumps) and by implementing biomethane as fuel for city buses. While the emissions are now at a historical low level, we are still not at the desired zero-level and we want to go even further and become a carbon sink in the future
- What should be the main features, characteristics of the future solution to be potentially best for that challenge or problem? The proposed innovation is to use CO2 capture directly from sea water by implementing direct ocean capture (DOC) technologies to the existing power plant where large amounts of water are being pumped continuously during the year. If the pilot is a success then there are possibilities to implement this solution to future cooling system for the planned industrial park in Vaasa (Gigavaasa) and it is freely scalable to suit other locations where water pumping is required (industrial parks, nuclear power stations, sea water heat pumps etc.) the solution can, if successful, be scaled to gigaton scale for carbon removal in the future and it will also be supportive of e-fuel plants. Imagine the water cleaning

system for a large-scale electrolyser plant that has water intake from sea and carbon dioxide si captured and recombined with the h2 from the electrolysers into methane or methanol on the same site

3. Expected impact of your pilot solution.

- What is the expected impact to your city environment you expect to see if the challenge gets solved? Reduction of fossile emissions from the city
- What is the expected impact to your citizens you expect to see if the challenge gets solved? We expect that this will give citizens a concrete example on what can be done to reduce our climate footprint and it will offer further possibilities for our students to develop and learn about carbon removal technologies
- What is the expected impact to your city governance you expect to see if the challenge gets solved? Vaasa as the Nordic Energy Capital will gladly lead the innovation in energy transition, and aims rigorously to out Carbon neutrality target with ground-breaking actions like this. With this innovation being funded, we are closer to solving the urban energy crisis in Europe.

4. Piloting

- Why would you be interested to become a piloting partner of a proposed solution to the challenge you are describing here? Describe shortly your capability to participate. Preliminary agreement has been made with Vaasan Voima, owner of the Vaskiluoto power plant, to develop a pilot where the utilisation of existing infrastructure is maximized. The powerplant already has all systems available such as water pumping, electrical connections and operation center. As the role for old CHP plants are diminishing the need to re-invent the plant is imminent.
  All needed skills for installation and operation are already available in the city of vaasa, the universisties have possibility to do research on the solution and a plan for scaling up the pilot is present.

CHECKLIST AND FAQ

Are you a city, municipality or a campus / private real estate developer?

Yes – you are warmly welcome to propose 1-3 challenges, one challenge per one template

yes

No – do not send us any challenges but wait until we have gathered urban challenges and you are welcome to propose solution ideas by November 30

Are you describing challenge or problem? – Yes, then great.

Does a city need to propose a solution idea as well? – No, the researchers and companies will propose their solution ideas to the challenges proposal by the cities.

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Can only Estonian cities propose challenges? Can only EU cities propose challenges? – No, cities* from whatever country are warmly welcome.

*A **City** is a local administrative unit where the majority of the population lives in an urban centre of at least 50 000 inhabitants and cities from countries with less than 5 cities of more than 100 000 inhabitants if they have more than 10 000 inhabitants. Those countries are: Croatia (HR), Cyprus (CY), Estonia (EE), Ireland (IE), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Slovenia (SI) and Slovakia (SK).

Can our city participate without proposing a challenge? – Yes, that is also possible but then you need to vote for challenges proposed by other cities. This can be done between Oct 2-30.

How will the challenges be evaluated? – We will not evaluate the proposed challenges but other cities/municipalities/campuses/private real estate developers can vote for the proposed challenges. In Round 5 researchers will start to propose solution ideas only to the challenges that have minimum one Estonian city/county and one city/county from another country.