


A woman with long brown hair, wearing a black cycling helmet and a bright pink cycling jacket with black accents on the sleeves, is riding a bicycle. She is looking towards the camera with a slight smile. The background is a lush green forest with tall trees. In the top left corner, there is a stylized graphic of a leaf or fan shape in shades of green and pink.

# Kaukovainio

*Innovative energy  
solutions in co-operation*

**OULU**



*Cities today have an essential role to play in tackling climate change by reducing their carbon emissions. Making-City aims to address and demonstrate the urban energy system transformation towards smart and low-carbon cities. One of the pilot cities in the Making-City project is Oulu and its residential area of Kaukovainio.*

**Working towards a positive energy district (PED)**

The innovative energy solutions implemented in Kaukovainio are a step towards a positive energy district or a PED. A PED is a delimited urban area composed of buildings with different typologies and public spaces where the total annual energy balance must be positive. Therefore, the district will have an extra energy production that can be shared with other urban

zones. This means that the amount of energy delivered by the district must be higher than the amount of energy supplied from outside.

In Making-City, the City Vision 2050 is used as a longer timescale to address the urban energy system transformation towards low-carbon cities, bringing appropriate energy planning tools as

well as reconsidering municipal organisation. One of the main objectives of Making-City is to enable the urban energy system transformation towards low-carbon cities. In Kaukovainio, the successful collaboration between Oulun Energia Oy and Arinan Kiinteistöt Oy is a perfect example of how energy companies can work together with local companies to create sustainable energy solutions.

### **Heat pump installations**


In Kaukovainio, different kinds of heat pump installations are tested. The heat sources are excess heat from refrigeration, district heating return water, exhaust air and uncovered solar collectors. Kaukovainio's grocery store has a CO<sub>2</sub> heat pump. The main source of heat comes from the cold storages of the store. Also solar heat from uncovered tube collectors on the roof can be used. The heat is fed into a district heating (DH) supply pipe. The heat in the DH supply temperature has to be under 80 °C, which means that the outside temperature is about zero degrees or higher. In colder weather, the collected heat can be stored in a borehole field located under the store.

### **Multi-source heat pumps**

In apartment blocks, multi-source heat pumps are used. Using exhaust air as the heat source suits especially for existing buildings without heat recovery from exhaust air, since air-to-air heat exchangers are expensive to build afterwards. Using one unit of electricity, an exhaust air heat pump can produce about four units of heat. The most heat from heat pumps is used for space heating.

### **District heating return water**

The modular heat pump unit also has a module with heat exchangers for DH. This way the cooling of the DH water is maintained good despite using heat pumps. This is important for the performance of the DH system as a whole. To have the DH return water even cooler, we are also testing cooling it down by a heat pump. In new buildings, this is the primary heat source.



*Kaukouvainio is a model for  
energy-efficient living*

### **Solar panels**

Solar panels have also been installed on the roofs and on exterior walls of an apartment building. This helps us to learn about the significance of the solar reflection from snow to the panels. In Finnish conditions, it is important to maximise the production especially during other seasons than summer.

### **Soil as thermal storage**

One robust, but a not too much used way to save energy is to pre-heat the incoming fresh air using the soil under the building as thermal storage. The same thermal mass can be used also to cool the air during summers. This solution is used in rental houses.

### **Utilising waste water**

In addition to exhaust air, heat can be recovered from waste waters. In our case, this is realised with building-wise, passive exchangers. This means that no heat pump is used, but instead a simple, tube-type heat exchanger from the waste water to the incoming cold water is used. This can save about 20 % of the heating energy of hot tap water.

### **The habits of the residents**

In apartments, energy consumption, temperature, moisture and pressure difference over the building envelope are measured at short intervals. These measurements reveal the habits of the residents. Showing their own data directly to the residents promotes energy savings and a shift of the energy use to the cheapest and least emission moments.

### **Models for the future**

Making-City also includes tasks related to larger systems. A model is built to predict the energy consumption of the buildings, energy road maps to 2050, recommendations for politicians and more. Our objective is to make and describe the solutions and their connections to the rest of the system so that the most suitable solution portfolios can be found for different contexts. This is important since the energy systems, climates and cultures differ significantly in different parts of Europe.

## Contacts

If you have any question about the Making-City project and the Kaukovainio development, please feel free to contact us directly or visit our web site at **[www.ouka.fi/kaukovainio](http://www.ouka.fi/kaukovainio)** and **[www.makingcity.eu](http://www.makingcity.eu)**.

Mr Samuli Rinne, Project Manager  
[samuli.rinne@ouka.fi](mailto:samuli.rinne@ouka.fi), +358 46 923 4945

Mr Antti Määttä, Zoning Architect  
[antti.m.maatta@ouka.fi](mailto:antti.m.maatta@ouka.fi), +358 44 703 2428



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