



## Feasibility study: Wastewater Heatpump, Jokkmokk

Jokkmokk municipality has about 5000 inhabitants on an area of 19 334 km<sup>2</sup>. About 800 inhabitants live in the Vuollerim village . The Waste Water Treatment Plan in Vuollerim is completely driven by electricity. Over the last years, improvements in energy efficiency reduced the electricity demand from 226 145 kWh in 2014 to 192 434 kWh in 2016. Part of the electricity is needed for electric appliances and the process, but there is no separated metering for that. For calculation a heat demand of about 110 000 kWh is assessed.



### Investment and payback time

Installing a heat pumpsystem that uses the thermal energy in the wastewater would mean an annual electricity saving of 65 MWh, which means saved electricity cost of about 9100 Euro . The investment cost for heatpump installation is about 53 150 Euro, but one have to add costs for installing a central (waterbased) heating system at an estimated cost of 10.000 Euro. This gives a payback time of about 7 years.

**Energy  
efficiency**

**Asset owner:** Jokkmokk municipality, Sweden

**Used assets:** Waste water treatment station

**Cost saving potential:** 9100 €/year

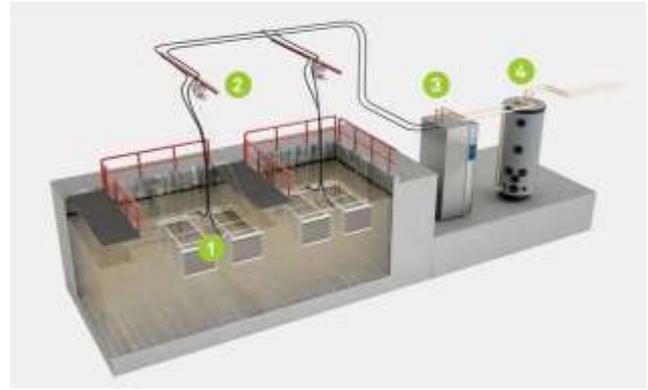
**CO2 reduction potential:** 8 ton/yr

**Investment costs:** 53 150 €

**Payback time:** about 7 years

## Technology waste water heatpump

Like a refrigerator or air conditioner, a heat pump forces the transfer of heat energy from the ground, water or air to the application. Using motive power to run the heat pump's process effects the transfer of several times as much energy to the application, be it heating, hot water or even cooling. In theory, heat can be extracted from any source, no matter how cold, but a warmer source allows higher efficiency. The relationship between how much power we use versus how much energy is delivered is known as a COP or Coefficient of Operating Performance. If a heat pump uses 2.6kW of power and delivers 15kW of energy it's COP is 5.77 ( $15 / 2.6 = 5.77$ ). Waste water is another heat source, which is not as common as air or ground heat pumps. In the case of a waste water treatment station, different parameters have to be considered: the appliance has to be re-



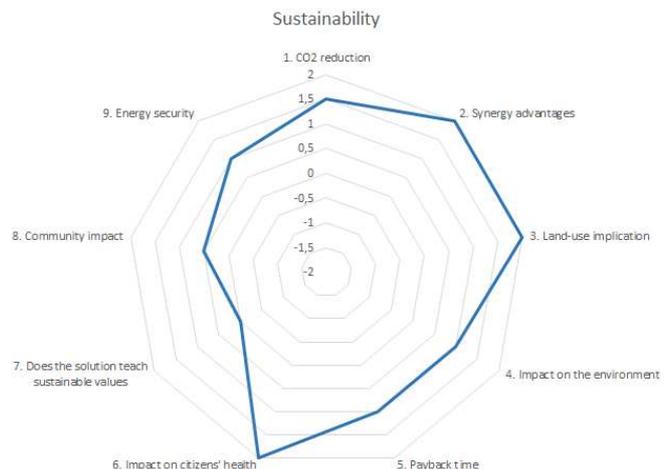
1. Heat Collector, to be placed in the waste water
2. Possibility for hanging collectors in the water to avoid problems with operation
3. Heat Pump
4. Heat Boiler if necessar

## Alternative air-air heat pump

A cheaper system that has been analyzed is to install an air-air heat pump combined with an FTX system to the processing hall. The total cost of this system amounts to EUR 17 480 and results in an electricity saving of 37 MWh per year. This gives a payback time of 3,4 years. This system is most economically advantageous as the investment is paid back in a short while, while a significant power saving is made. Compared with a wastewater heat pump, this solution provides 57% of the electricity saving, for just under one third of the investment cost.

## Sustainability

Jokkmokk is a Swedish Eco-Municipality and a signatory of the EU Covenant of Mayors. It has developed its Sustainable Energy Action Plan and is committed to reduce its GHG emissions by at least 20% until 2020.



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