Sodankylä municipality planned to utilize the wastewater sludge, which is currently stored outside the wastewater treatment facility. The decision was made for an aerobic co-digester (AD) that would also utilize separately collected bio-waste from the municipality, offal of the Sodankylä’s slaughterhouse and energy crops to be grown on fields currently not in use. At the moment, the potential feedstock materials for anaerobic digestion are not treated in the most efficient and sustainable way. The digester would be located next to the wastewater treatment plant. The municipality aims to utilize the biogas as transportation fuel.

**Energy generation potential:**
The amount of biogas to be generated was calculated to be 223,705 m³ annually, of which the methane content is 81%. The potential biomethane yield of the projects is 188,000 m³, which is enough to replace the gasoline need of 130 cars, or equal to 1,820 MWh/year. Replacing the fossil fuels used in transportation or electricity production will result with environmental benefits such as emissions reduction. CO₂ reduction would be 382,200 kg/year.

**Investment and payback time**
The investment cost for the reactor and the refinery is 400,000 euros. Related to investments required and payback period, that depends on the price of biogas and on average the payback period of the project is around 11 years.
**Assets**

Input materials for the AD plant would be wastewater sludge (1250 tons/yr), separately collected bio-waste from the municipality (645 tons/yr), offal (97 tons/yr) and energy crops (750 tons/yr). Bio-waste is not yet collected separately. There are about 100 hectares of unused fields for energy crop cultivation. Availability of different feedstocks per month and temperature can be seen in figure.

**Technology**

Reactor size of 500 m$^3$ was selected. From February to the end of June the retention time is longer, and from July to November the retention time is shorter. A dry process seems to be the most suitable, as the total solid content is 22-26%. Mesophilic process is suggested to be used, because it can withstand more changes in the process. Also, flow of raw materials is not constant, which might be a problem for a thermophilic process. From an economic point of view, using a single-stage reactor is reasonable.

**Sustainability assessment**

CO$_2$ reduction would be 382 t/year. There are notable synergy advantages as the solution would solve waste, water, energy, climate change and transportation related problems. Solution requires active participation of stakeholders and increases communicating of the bio-waste related issues. More work is created as energy crops and fuel are produced locally.