

Emission Monitoring of Energy Consumption of the Different Locations of Water Services

Summary of the pilot report 04/2023, the CO2 DataHub project

Name of the pilot	Emission Monitoring of Energy Consumption of the Different Locations of Water Services
Project team	Vastuu Group Oy, Platform of Trust, Sitowise Group Oyj
Participants	City of Lohja, water supply plant of the City of Lohja, Lining Oy, Caruna Oy

Finland aims for carbon neutrality by 2035.

The CO2 DataHub research and development project supports this goal by developing methods for the gathering, evaluation and data-based management of carbon dioxide emissions in the supply chains of companies and cities.

In the CO2 DataHub project, Sitowise and Vastuu Group executed a pilot project for the following five cities: Espoo, Lohja, Porvoo, Tampere and Raisio. The pilot project for the City of Lohja was divided into two separate cases. In the first case, the focus was on the energy consumption monitoring of water services and its locations, and on the carbon footprint calculation of electricity consumption.

The pilot examined how the electricity consumption and water flow data of water services' different locations (pumping stations and plants) could be automatically combined into hour-based monitoring data. This was piloted with a prototype where the electricity consumption of different locations is visualized in relation to the water volume pumped through the location. The carbon footprint of the energy consumption of the water services is also calculated in this prototype. Thanks to this visualized data, it is possible to compare the energy consumption of different locations as well as to monitor the time-based changes and carbon footprint of energy consumption.

The water supply plant and sewage system of the City of Lohja is responsible for the city's water services, i.e. it takes care of the acquisition of water, transmission of domestic and wastewater as well as the treatment of wastewater. The environmental impacts of the water

plant are mostly incurred by the energy consumption of the water distribution and purification processes (City of Lohja). The water plant had a need to have more accurate data on more cost-effective energy saving practices within water services.

Water services consist of the processing of domestic and wastewater as well as the distribution of water from the water intake building to residents and from residents to water treatment buildings. The carbon footprint calculation was limited to the assessment of energy consumption of pumping stations and plants. In addition to energy consumption, the production process of water purification chemicals, construction and repair of water infrastructure, transportation and logistics cause part of the emissions of water services.

For now, the people working at the City of Lohja's water services feel that the collection of data is arduous, and the large number of locations makes it difficult to assess them separately. Although there is available data on the different locations, their electricity consumption and water flow, the data is scattered around different systems and, thus, it is not easily comparable. Additionally, this data is not considered to be reliable, or its format is not seen as being suitable.

The aim of this pilot project is to produce continuously updating data on the changes in energy consumption and the distribution of energy consumption between different plants and operations. The designers and leaders of water services need data on the energy consumption of different plants in order to execute the right kind of renovation operations and device acquisitions. Another goal of this pilot project is to provide better information on the environmental impacts of water use based on refined measurement data to the residents of the municipality.

As a prototype of this pilot project, an energy consumption monitoring solution of the City of Lohja's water services was produced. The location-specific hourly electricity consumption data received from Caruna was combined with the location-specific hourly water flow data received from Lining Oy's monitoring system. As a result, it was possible to create an hourly electricity consumption of different locations in relation to the water flow data. The carbon footprint of water services' different locations was calculated based on the assessed electricity consumption.

The created prototype enabled the data filtering by location type, which, in turn, enables the comparison between different water intake buildings and their electricity consumptions. The prototype also enables time-based assessments to be made when the energy consumption can be assessed by location or location type in time. This time-based assessment can be performed both on an hourly or daily basis. The results of the carbon footprint and handprint calculations from the prototype were visualized into Sitowise's Louhi system's Power BI

environment that simulates the customer's user interface. To ensure the transparency of the calculation process, the prototype also includes the data sources of the calculation.

Delivering the hour-based monitoring data by hand requires too much manual work in order to turn the monitoring data into continuously updating data and, thus, purposeful data. An automated interface enables the water volume data to be brought automatically into the calculation process in the future and, thus, the automatic flow of data and the inclusion of all locations into the data to be visualized. A template and rules for the delivery of water volume data through the interface have already been created. Lining Oy produces equivalent monitoring systems for many other municipalities too and thanks to the automation of data transmission, the data product could easily be utilized by other users too.

Caruna+ system, which provided the electricity consumption data, however, is not ready for a similar interface connection. An hour-based consumption data search for a particular location is arduous and requires printing several Excel files manually every time there is a desire for data to be updated for the purposes of calculation processes. Thus, in the future, it would be advisable to receive the electricity consumption data directly from Fingrid's Datahub service. An integration will be provided into this service later on in the CO2 DataHub project. With this integration, the electricity consumption data of a specified location can be delivered automatically.

The pilot case report was prepared in co-operation by Vastuu Group Oy and Sitowise Oy. In accordance with the principles specified by the project steering group, the full report is only available to the organizations that participated in the research and development project.

Further information:

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