

Summary of the report: Open data solutions in circular economy

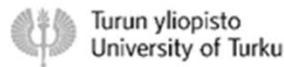
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1. Goals and work methods

- The purpose of the work was to find out how companies, organizations, cities and networks in Finland and in the rest of the world are using open data in circular economy activities (e.g. services, products, and operating models).
- The main focus was to identify circular economy solutions that utilize open data to conduct **commercially viable business**.
 - Therefore case studies of open data in the circular economy business focus primarily on companies, with other organizations, cities and networks playing the role of open data provider.
- The work was done by Gaia Consulting during June – August 2019 as an assignment from Turku University of Applied Sciences. The work is connected to the Open DaaS project* and the results are published openly.
- The study was carried out in two stages:
 1. collecting examples of interesting circular economy companies that use open data or open information successfully in their business; and
 2. interviewing Finnish companies operating in the circular economy about their interest in utilizing open data for business development.
- Case descriptions were carried out as expert work based on publicly available material.
- Finnish circular economy companies (8 companies) were interviewed by telephone and the results were summarized in this report. The companies were selected from Sitra's list "The most interesting companies in the circular economy in Finland".

2. Definition of open data*

- Open data refers to **information in digital and structured form, which is freely accessible, editable, sharable and usable by anyone, including commercial use, free of charge.**
- Transparency is guaranteed to the user by a license granted by the publisher, which is in practice subject only to identification of the original source.
- The **machine-readable structure** of the information is essential, which enables it to be downloaded and edited.
- Typical open data sources so far have been primarily public organizations' data reserves, such as statistics, which are motivated not only by increased transparency in democracy and governance, but also by the idea of promoting new markets and innovation.

3. Definition of circular economy*

- The circular economy is an economic model that seeks to preserve resources and their value within the economic system. Consumption is based on the use of services rather than ownership; sharing, renting, and recycling.
- Loss and waste are minimized in order to preserve the value of the introduced materials in society.
- Five circular economy business models have been considered:
 1. **Product as a service:** providing services instead of products.
 2. **Renewability:** using renewable and recyclable materials as well as renewable energy in product design and manufacturing.
 3. **Sharing platforms:** maximising the usage of goods and resources, and extending their life cycles by using digital platforms for renting, selling, sharing, and reuse.
 4. **Product-life extension:** using products according to their original purpose for as long as possible or enabling multiple instances of reuse through means such as maintenance, repair, and refurbishment.
 5. **Resource efficiency and recycling:** material and energy-efficient solutions, and the collection and reuse of products and raw materials that have reached the end of their life cycle.

* Sitra, <https://www.sitra.fi/artikkelit/mita-nama-kasitteet-tarkoittavat/> ja <https://www.sitra.fi/hankkeet/kiertotalouden-kiinnostavimmat/#mista-on-kyse>

4. Case studies of utilization of open data in circular economy business



- Selected examples of open data utilization in business described in this chapter have been examined based on publicly available sources (corporate websites, news sources, etc.).
- Each case study presents
 - an overview of the business concept
 - an assessment of the role of open data in the business, and
 - the opportunities and challenges of open data related to the concept.
- In addition, the share of open data in the business has been qualitatively estimated, since it is not possible to quantify the share based on publicly available materials. Three different ways of using open data were identified as qualitative categories for evaluation
 - a) open data is used in own business
 - b) open data is used in the customer interface
 - c) open data is not used but publicly displayed information is produced.

Own business

Customer interface

Produces open
information

ENEVO (FI)

Own business

Customer interface



Business concept

- Waste technology company operating in the European and US markets.
- In Europe, the company sells smart waste management solutions to cities.
- In the US Enevo operates in day-to-day waste management.
- Offers sensors to waste bins and an analytics software that monitors the degree of filling.
- The company's software also includes a map application that displays the best service routes for waste collection trucks calculated by the application
- The technology enables reductions in emissions, noise and traffic.

Role of open data

- The data utilized comes from the waste bin sensors and analytics software.
- Sensor and analytics data is available to customers and subcontractors, but a paid contract is required.
- Maintenance routes and timetables are transmitted to the waste truck drivers via a GoogleMaps-based software.
- Open data does not appear to be necessary for the core business, but it is a part of the overall business solution.

Open data opportunities

- Traffic data could be connected to the company software to avoid traffic jams.

Open data challenges

- Google Maps does not fully meet the open data criteria, as it charges companies when the utilization rate is higher.
- Opening up business data without charge is not a viable option as sensor data is the core business.

ENIRAM (FI)

Own business

Customer interface



Business concept

- A company aiming at optimizing maritime operations, in particular to reduce fuel consumption.
- Customers include businesses operating vessels.
- Company's own sensor technology and software, as well as the nearly real-time data they collect form the core business.
- Monthly subscription, different types of contracts.

Role of open data

- Main share of data used by Eniram comes from company's own sensors attached to vessels. Information about e.g. speed, location, and fuel consumption is collected.
- Sensor-based data is complemented with third party data, such as weather forecasts and weather data, so that external factors such as wind speed and waves can be included in the calculations.
- Open data is not necessary for the core business but presents an added value, expands the service, and improves optimisation.

Open data opportunities

- Weather data is made available by many actors worldwide.

Open data challenges

- A general challenge in exploiting weather data is probably the difficulty in discovering commercial potential.

SCRAP MONSTER (CA)

Own business

Customer interface



Business concept

- Canadian electronic sales and purchasing platform for recycled industrial waste and materials. The company provides site users with up-to-date information, news and information on world market prices for materials, which is an essential part of the platform.
- Sales and purchase announcements are partially downloadable free of charge, but e.g. getting the detailed contact information necessary for trading requires a paid monthly subscription.

Role of open data

- Collects up to date information on the price development of materials from material sellers and other sources.
- Presents an average material price range for the customers.
- The customers / site users can utilize the information on the website in graph and table form freely e.g. on their own websites.
- Older price information is freely available, up-to-date information requires a paid subscription.
- Scrap Monster also offers search function that utilizes Google's open spatial information on the Google Maps platform.

Open data opportunities

- OpenStreetMap would be an open data map application.

Open data challenges

- Material price data challenges are minor; the price data collection from site users is easily automatized using algorithms.
- Google Maps does not fully fit into the open data definition, as it e.g. charges companies for the use if the map application is popular enough.

NETLET (FI)

Produces open information



Business concept

- Netlet offers a service concept for collection of usable surplus materials from construction sites. The target group are construction professionals. The collected materials are sold in the Building outlet (Rakennusoutlet) webshop and at the warehouse store with prices that are 50-80% more affordable compared to hardware stores.
- Business model is based on the construction companies giving away the surplus goods for free (the construction sites save on the hassle of disposal and waste costs), Netlet's revenue is made up of resold materials.

Role of open data

- Pickup is ordered over the phone or by filling out a pickup order on the company website, so Netlet's core business in this regard is not based on utilizing open data at all.
- Netlet does not use open data but produces openly displayed information (sales announcements) that could be transformed into open data by certain steps.

Open data opportunities

- The company could e.g. collect price information on materials (like ScrapMonster does) and have this information freely available. This would make budgeting and price comparison easier when planning circular economy building projects.

Open data challenges

- It does not make sense for the company to open up e.g. information on material origin, because this would jeopardise the business making direct collections from construction sites possible.

GASUM (FI)

Own business

Customer interface



Business concept

- Gasum is a natural gas and biogas expert operating in Finland, Sweden and Norway. The company imports natural gas to Finland, produces and refines biogas in Finland and Sweden, and transmits and supplies them to energy production, industry, households, as well as land and sea transport.
- Gasum has 12 biogas plants in Finland and Sweden, as well as a wide distribution network.
- Biogas is produced from business partner's waste, energy produced for partner's production and nutrients returned to the field creating closed circulation loops.

Role of open data

- Gasum has a map service based on Google Maps on their website. The platform shows all the filling stations of Gasum and other gas producers, as well as the locations of upcoming gas stations.
- The website also has a link to the tankille.fi map application, where gas station information can be found completed with price information.
- Gasum organized a "HackTheGas" event where they opened their data to coders to find solutions that promote sustainable development and the Nordic gas ecosystem.

Open data opportunities

- The amount of biodegradable waste or side streams in an area can be estimated based on public, open statistics.
- When planning a biogas plant or filling station, public information on spatial planning can also be utilized.

Open data challenges

- Statistical information is usually updated once a year, so they're not fully up to date.
- Google Maps does not fully fit into the open data definition, as it e.g. charges companies for the use if the map application is popular enough.

YCLOSET (CN)

Produces open information



Business concept

- A Chinese monthly subscription fee-based clothing rental service online.
- The clothing on offer is casual, from mid-priced brands to luxury brands. The difference with other similar services is that the service does not only offer festive or more expensive clothes.
- The value of the service is that it provides access to a huge selection of clothing that allows customers to try out new styles regularly.

Role of open data

- The information openly available to the customer at YCloset consists of rental clothes announcements (catalogue) requiring the download of the YCloset application and user registration.
- The app allows users to communicate, share styles, and create their own online community
- The company utilizes RFID tracking technology, which enables the type of clothing to be identified in the laundry and includes associated washing instructions and history. This information does not appear to be openly accessible.

Open data opportunities

- The data collected by the company includes information about e.g. material durability. Opening up such information would help consumers to understand the significance of quality and designers to use more durable materials.
- Information about what happens to clothes at the end of life would act as a trigger to think about circular economy from a wider perspective.

Open data challenges

- The usage information could alienate a part of the customers.
- Making the catalogue publicly available (no registration, fees, downloadable) could threaten the business as the competitors would be able to utilize the data freely on their own websites.

5. Views on utilization of open data

Current situation

- All companies had not explored open data possibilities extensively.
- Companies typically use open data in the form of maps or spatial data. In addition, companies apply weather data, trade sector data and statistical data. This type of information is not always conceived as open data.
- Utilizing open data in the circular economy business is challenging.
- In many cases, the circular economy business requires knowing and controlling material flows, and the disclosure of this information exposes companies in the industry to more intense competition.
- Different types of public sector information interests most the interviewed companies and e.g. opening up licensing and demographics information is desired.
- Some companies have considered the use of open data in the future, and identified data that would benefit the company. Most of this information is related to public sector activities.

5. Views on utilization of open data

Challenges and opportunities of open data

- The biggest obstacle to exploiting open data was the uncertainty about existing data publishers and their data reserves.
- The question of responsibility and accuracy of the data transmitted also came up: the accuracy of information on the quality of the side stream or other material can be critical for business.
- The interviewees were cautious about setting up business on open data, unless the issues of responsibility and quality were clarified.
- The potential of open data for enhancing operational processes such as logistics or for generating sales forecasts was recognised by the companies.
- Real-time information on flows and availability of various materials was repeatedly raised when asked about the potential of open data. On the other hand, the topic is problematic as the core business of many actors is based on the management of material flows and related information.
- Some of the interviewed companies also identified opportunities in open data in terms of being a data provider themselves. However, there is a need to find out exactly what kind of data can be shared and what kind of information one wants to publish.

5. Views on utilization of open data

Views on materiaalitori.fi service

- Finally, the interviewees were asked for views on the materiaalitori.fi service developed by the Ministry of the Environment and Motiva to support the circular economy.
- Not all companies were familiar with the service.
- Some companies saw the service as a competitor to their own business rather than a useful service to the company.
- Not all interviewees were dealing with material or raw materials, and this type of companies did not see the service as meaningful to their business.
- Some companies saw potential in the service, either for sharing their own side streams or for obtaining material, but the use was not yet active.

6. Conclusions

Open data and the circular economy – not yet connected

- The potential related to open data has not been thoroughly considered in the circular economy related business of companies, and it does not exist as a strategic point of view for the business.
- The companies in circular economy do not actively communicate about the utilization of open data on their websites or attempt to distinguish from others using this type of data.
- It appears that companies have not always examined their business opportunities according to the open data principle and the connection between circular economy and open data is not very clear.
- Openness is primarily understood to refer to publicly available data bases, which are considered essential.
- Companies have successful business and customer interface concepts that have adopted open data approaches
 - These usually rely on existing platforms that are not by definition classified as fully open data, such as Google Maps.
 - Open weather data and statistical data is utilised somewhat
- The circular economy business is often connected to knowledge and control of material flows and opening data is not always desired.
- In some cases, opening own data to customers to improve service has been considered.

6. Conclusions

Circular economy material platform

- The interviews highlighted the cautious attitude of several actors towards the Materiaalitori platform.
- The potential intensification of competition on side streams as a result of the service, which could lead to market overheating was seen as a threat to the widespread use of this type of services.
- The importance of places like Materiaalitori for the circular economy is twofold.
 - First, they do not in themselves increase the total amount of materials, but they may reveal some hidden material streams.
 - Second, awareness can improve the quality of materials when the producer of the waste or side stream is aware of the importance of sorting.
- During the study, it was not observed that the presence of public open services as such would generate or present untapped material flows of high volume and high value added.
 - These are already known to companies in the circular economy and they are competing for the utilisation if the material has added value.
 - Instead, in complementing local ecosystems or improving the resource efficiency of smaller players it can play a role.
- Previous studies have identified the importance of exploring how different customer segments are motivated, monitoring the impact of operations, and ensuring effective communication when designing services such as the Materiaalitori.
- At the same time, fully or partly public funds are constantly used to collect material information that is not open to all. It could be possible to link this information to the platform in the future, if so decided.

6. Conclusions

Potential impacts on actors

- Presently, information on valuable material flows is a key competitive factor and covered by the business secrets of circular economy companies. The question is whether limited and closed data slows down investment and competition - and what is the importance of open material data to the market.
- The utilisation of large waste and side streams between companies often requires a partnership where the producer of side streams gets fuel for their use and increases the sustainability of their activities.
- The circular economy companies look for long standing partnerships that enable growth and investments. If the availability of materials is uncertain, there is no incentive to build a facility.
- The Finnish Waste Act aims to guarantee the availability of waste management for everyone, including sparsely populated areas and smaller companies. The different responsibilities, obligations, authorization procedures, and investment needs created by processing technologies and storage capacity make the entry of a new player capital intensive.
- One could speculate on what would happen if all the information were publicly produced open data - either through coercion or through incentives. The amount of waste would not increase. Competition between operators providing waste management services could increase and the service would probably be used to leverage prices in business-to-business contract negotiations and to seek alternatives.
- Effective control is required to avoid misuse and sub-optimization. A single batch of waste may have a significant value (for example metals) or may require expensive treatment and possibly permanent disposal (permanently contaminated soil).

6. Conclusions

Open data motivators

- Reliability and liability issues of open data are closely linked to the use of open data in business. Who has the responsibility for the quality, accuracy, and impartiality of the information that the companies transmit?
- When talking about open material flow data in a circular economy, it is also important to determine who is responsible for ensuring that the quality and accuracy of the information is correct.
- If the responsibility is perceived as the sole responsibility of the material buyer to check the quality of the material, the risks associated with the material will slow down the development of the market.
- In order to develop the use of open data in the circular economy, the circular economy actors should be made more aware of existing data reserves.
- Increased cooperation between the various parties and a joint debate on the quality, accuracy, and accountability issues of potential open market material and similar trading platforms could also be needed.
- As companies become more aware of open data streams and their opportunities, the utilization of data in business is also expected to increase. As such, developing and sharing good tools for managing information becomes increasingly important.

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- We assume no responsibility and make no representations with respect to the accuracy or completeness of the information in this report unless otherwise stated. The report should not be regarded, or be relied upon, as a recommendation in decision making concerning any matter referred to in it.
- It should be understood that we do not assert that we have identified all matters included in these documents that may be relevant if these documents are included as disclosures against the warranties of the future agreements. Our review of the documents has only been what we consider appropriate in the context of the scope of our work as set out in our offer.
- Further, we accept no responsibility to update the report in light of subsequent events (after the date of this report).

Annex 1: Companies interviewed



- Encore Ympäristöpalvelut Oy
- eRent
- Konecranes
- KotkaMills
- Maapörssi
- Silmusalaatti
- Soilfood
- Solnet

Annex 2: Interview questions



1. Utilization of open data presently: What role does open data play in the business?
2. Utilization of open data in the future: Does the company have plans or interest to utilize open data more in the future?
3. What kind of opportunities are there in open data? What kind of challenges do you see?
4. Wishes regarding open data: What kind of open data would support your business development?
5. Ministry of the Environment and Motiva are preparing a material market place for companies and organisations, enabling professional exchange of wastes and side streams (<https://www.materiaalitori.fi>). What would you hope to get out of Materiaalitori (e.g. data, material)?