Circwaste

Towards Circular Economy

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NEARLY **20**
PILOT PROJECTS

REGIONAL COOPERATION **AND NEW INITIATIVES**

EXPERT SERVICES FROM **THE CIRCULAR ECONOMY NETWORK**

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AT THE LEADING EDGE OF CIRCULAR ECONOMY

Finland wishes to be the leader in circular economy by 2025. Real-life measures have been in demand to support discussion and visions, and the CIRCWASTE project addresses this demand. Plenty has happened since the European Commission's LIFE programme at the end of 2016 granted nearly €12 million for implementing the goals of the national waste plan and promoting circular economy. New solutions are constantly needed so that we can meet the challenges of waste legislation and business. Long-term funding makes it possible for Finland to attain identifiable change. During seven years, Finland not only can reach the goals set for waste management but also profile herself as an international pioneer in circular economy and strengthen the competitiveness of the economy.

The 20 partners of the project each for their part have started sub-projects that seek operating models that reduce waste, design new waste management and sorting equipment, conceptualise new products from recycled raw materials, develop new food services and utilise smart solutions for optimising storage, collection and expenses. In addition, training is arranged, collaboration networks are created and best practices are collected.

The trial areas are the core regions of the project: Pori Region, Southwest Finland, Central Finland, North Karelia and South Karelia. However, the aim is to also promote good work done elsewhere in Finland in the fields of waste and environmental management. Best practices are collected all over Finland. The work done in the sub-projects is supported by a specialist network formed by SYKE and MOTIVA, the Circular Economy Service Centre. It works as a support for collaboration groups comprising operators in the field to start regional processes and collaboration networks. Attaining change requires collaboration, commitment and common goals, and CIRCWASTE provides the national collaboration platform for attaining the goals of circular economy. It is with pride that we try out and spread best practices throughout Finland and elsewhere in the EU. Welcome on board!

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CIRCWASTE – Towards circular economy, promotes efficient use of materials, waste prevention and resource management.

Implemented during 2016-2023.

Total budget 19 Me,
main financier EU-Life.

CIRCWASTE LIFE15/IPE/FI/004

Nearly 20 projects, 20 partners,
10 co-financers.

Five regions: Southwest Finland (Finland Proper and Pori region)

Central Finland, South Karelia and North Karelia.

Regional cooperation is supported by Expert Network on Circular Economy formed by Finnish Environment Institute and Motiva.

Project coordination
Finnish Environment Institute SYKE.

SYKE

CIRCWASTE CHANGES
THE WAYS **—JOIN US!**

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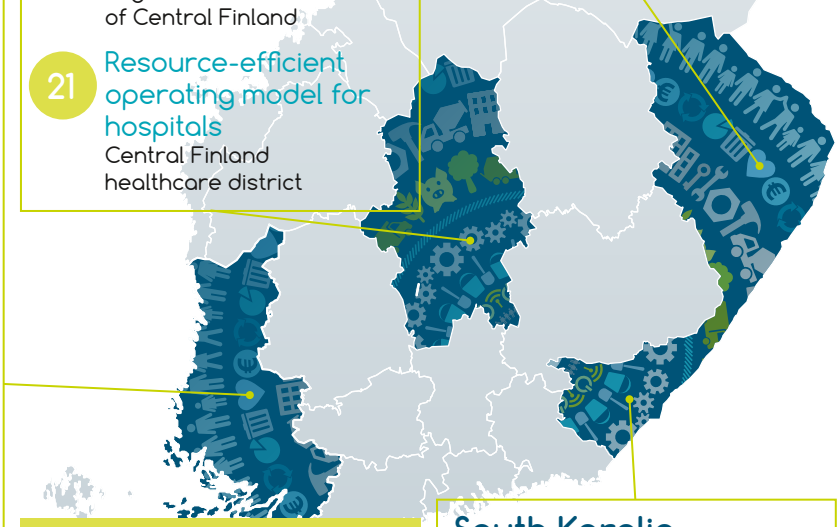


21 Regional collaboration network

Support and specialist help for promoting circular economy and implementing waste plans

Regional Council of Central Finland, City of Lappeenranta Regional Council of North Karelia, Regional Council of Southwest Finland

South Karelia

CIRCULAR ECONOMY TO PUT THE ECONOMY ON A SUSTAINABLE TRACK

Circular economy has remained at the core of the EU's environmental policy as a desirable economic model since the Commission in 2015 published the first Circular Economy Package, or the action plan for the transition to circular economy, and proposals on legislative changes in support of the plan.

Circular economy is one of the tools with which the economy can be directed to a sustainable track. The economic model conformant to circular economy aims at preserving natural resources, products and materials and the value committed to them for as long as possible and at creating maximum added value from a variety of services. Circular economy requires a multifaceted and comprehensive paradigm shift and change of operating and business models. The change applies to all product and service value chains, from design to consumer behaviour and waste management.

The idea of circular economy has rapidly made a break-through in Finland

The publication of the circular economy package triggered extensive and important discussion on the national will in Finland for implementing circular economy and what it requires and means. The traditional models must be overhauled and the different fields must be networked extensively.

The work on deploying circular economy in Finland culminated in the creation of the national road map. The road map shaped a common position on means that will result in circular economy, which will support Finland's growth into a pioneer of circular economy. The work was carried out under Sitra's co-ordination in collaboration with the Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Employment and the Economy and other significant interest groups—altogether more than a thousand operators on different fields of the society.

In addition to enhancing the efficiency of the flow of materials and waste management, considerable potential is identified in innovative service concepts. Utilising the potential of the circular economy improves the possibility to send the economy to a positive cycle.

Projects creating business

From the EU LIFE funding perspective, recent years have been a Finnish success story. CIRCWASTE, the flagship project of circular economy is a direct continuum of the FRESHABIT project in the Nature theme that received funding a year earlier. The Ministry of the Environment has been involved from the beginning in both processes.

Circular economy will play a key role when the societies of the future migrate toward more sustainable production and consumption. Smart solutions are needed that take the environment's capacity into account and guide growth to a sustainable track. At best, they can generate new business and jobs while decreasing the use of natural resources and amount of waste.

The CIRCWASTE project has excellent capacity for developing the implementation of the national waste plan and promoting circular economy toward the right course.

KIMMO TIILIKAINEN
Minister of the Environment

CIRCULAR ECONOMY WILL PLAY A KEY ROLE WHEN THE SOCIETIES OF THE FUTURE MIGRATE TOWARD MORE **SUSTAINABLE PRODUCTION AND CONSUMPTION.**

PROJECT CO-ORDINATOR Soile Ollikainen of LIVE HERRING and technical supervisor Jarkko Kaunismäki of the Jyväskylä Art Museum explain that plenty of necessary equipment has been distributed through the equipment borrowing service, for example audio-visual devices.

PHOTO: ELINA SAARINEN

SOMETHING BORROWED

The cultural and arts producers in Central Finland borrow equipment from each other if it were too expensive to buy them alone.

ELINA SAARINEN

Projector. Video projector. Sound reproduction equipment. Spotlights. Fog machine. Mirror balls.

A work of media art, theatre performance, event, arts week or performance may easily require equipment that not everyone has in stock. Should the idea not be implemented?

Acquiring expensive equipment no longer becomes an obstacle to creativity. This was decided by cultural and arts doers in Central Finland, inventing the equipment borrowing service. Through the borrowing service, they distribute audio-visual devices, for instance, for shared use.

The project collaboration group has consisted of over ten different parties, such as the organiser, Live Herring association, concentrating on the promotion of media arts and culture, Jyväskylä Art Museum, Film Centre of Central Finland, Äkkigalleria, Kankaan Palvelu, Jyväskylän Taiteilijaseura, Hear, Centre for Creative Photography, Yläkaupungin yö Festival and Keski-Suomen Harrastajateatteriyhdistys KeHy.

"The equipment borrowing service enables the arranging of greater events and wholes without skyrocketing costs. In addition, this kind of activity is needed so that events can be arranged more easily without owning a lot of equipment," comments one of the users of the service.

On a digital platform

Initially, the activity started a few years ago. The concept of equipment borrowing was prepared as part of the regional artists' work at the Arts Promotion Centre Finland and later with the CreaDemo support granted by The Promotion Centre for Audiovisual Culture. In addition, Live Herring has tested the equipment pool model with its partners as part of the Media Art on the Map project, supported by the Finnish Cultural Foundation. The experiences from the trial have been good according to Live Herring's project co-ordinator **Soile Ollikainen** and technical supervisor **Jarkko Kaunismäki** of the Jyväskylä Art Museum.

"The borrowing service broadens the possibilities for making art," Kaunismäki summarises.

For now, borrowing has been handled with manually updated lists that show the type of equipment available for borrowing. Associations have been able to borrow equipment by application. The activity has been kept running with a small operating fee. "Now there is a further need to develop the idea. We are now designing a digital platform or online service through which the equipment borrowing service could be expanded. If the participants have the interest of obtaining certain types of equipment but would themselves have only little use for them, they could be purchased for this shared pool," Ollikainen explains.

"THE BORROWING SERVICE IMPROVES **THE PREMISE FOR MAKING ART"**

Sharing economy

The equipment borrowing service implements the idea of circular economy on the optimal efficiency of resource use through sharing. The variety of equipment in the service is great, both with respect to type and quality. Performances may demand also old technology, which may be nearing the final stage of its life cycle.

"If, for example, the LCD panel of a video projector is damaged, it may still be useful in an outdoor event with dusty conditions. I often spot equipment that is being discontinued that someone else can still use," Kaunismäki explains.

Ollikainen adds that the money saved in equipment procurement often generates new, creative activity. "The savings from shared use can be invested in hiring an employee, organising an event or paying the rent for a venue. Through many circles, the money remains in the field of cultural activity." At this stage, plans have been made for the borrowing service to be used by the arts and culture community but the idea can be replicated and broadened elsewhere.

IDEAS FROM THE RESIDENTS

The equipment borrowing service and its digital platform were one of the ideas the City of Jyväskylä gained in the Circwaste sub-project when collecting circular economy ideas from citizens during the *Innovate, Strip, Fix and Recycle idea hunt*. Pirkko Melville, R&D Manager at City of Jyväskylä, says that the first call for ideas produced numerous good ideas for trials. Six or seven of them will be taken to the implementation and pilot stage. A total of three idea hunts will be organised during the Circwaste project.

WHY IS THERE FOOD LEFT ON

Natural Resources Institute of Finland brings circular thinking to the dinner table.

HANNA OJANPÄÄ

In the CIRCWASTE project, the Natural Resources Institute of Finland (LUKE) promotes the circular economy of the food system: reduced food waste, better utilisation of co-products and recycling of nutrients. The project partners are seeking new solutions for preventing and reducing the amount of wasted food, for redistributing food and for increasing the use of animal parts of lesser value. LUKE also improves the efficiency of nutrient recycling using trial cultivation. The purpose is to utilise plant co-products and promote the recycling of nutrients in manure and biogas processing. **Juha-Matti Katajajuuri**, senior scientist at LUKE, says circular economy thinking is a big issue, part of LUKE's core business.

In the CIRCWASTE project, the Natural Resources Institute of Finland (LUKE) promotes the circular economy of the food system: reduced food waste, better utilisation of co-products and recycling of nutrients. The project partners are seeking new solutions for preventing and reducing the amount of wasted food, for redistributing food and for increasing the use of animal parts of lesser value. LUKE also improves the efficiency of nutrient recycling using trial cultivation. The purpose is to utilise plant co-products and promote the recycling of nutrients in manure and biogas processing. Juha-Matti Katajajuuri, senior scientist at LUKE, says circular economy thinking is a big issue, part of LUKE's core business.

Common values

LUKE's partner in the waste food sub-project in is Arkea Oy, active in Southwest Finland. "We make food for kindergartens, schools, hospitals, workplace canteens, retirement homes and assisted living services. We have approximately 60 kitchens where we make the food ourselves, some 70 kitchen customers where we send the food but our own personnel serves it and dozens of food delivery points. We have four school kitchens and two workplace canteens in the trial," says **Paula Juvonen**, head of services. Manufacturing and serving loss has been measured at Arkea for years now. In particular, at workplace canteens it is already possible to a certain extent to use excess food for further refining of food. With the LUKE project, Arkea can now also measure plate loss for the first time. "We want to develop our operations continuously. Our goal is that proactive work will allow us to contribute to food going to the bellies, not biowaste containers," Juhonen summarises. There will be a bidding competition for vendors producing the metrics technology during the spring. The measurements themselves can be started in the autumn. Both the clients and the staff measure food loss twice in periods of four weeks. "The idea is that the cycles have the same menu. The first four weeks will provide us with a baseline, which we then compare to

PHOTO: SCANSTOCK/KPHOTO

PEOPLE IN FINNISH HOUSEHOLDS THROW AWAY 20–25 MILLION KILOS OF FOOD AWAY, **TOTALLING 120–160 KILOS.**

THE PLATE?

the follow-up period after rectifying measures," Katajajuuri says. He sees the most critical phase in the return of dishes. "To reduce food loss, we continuously need new ideas, experiments and research. In this research, the customer must separate the food waste from other biowaste, such as napkins, into separate containers and then weigh its proportion. In addition, we use an electronic survey where the customer fills in the food types sorted. We make everything as effortless for the end customer, the eater, as possible."

Juvonen believes that manufacturing and catering loss can be influenced with a planned approach, while plate loss is affected by attitude. Children and the youth in particular she considers rather enlightened eaters.

"We run shared promotions with schools that teach the children to take the right amount of food on the plate. We will inform our customers regarding this project and train and motivate our staff together with LUKE. This is a shared goal," Juvonen thanks.

REUSING NUTRIENTS IN SEWING

LUKE also promotes the recycling of nutrients in another two-year sub-project. The idea is to implement better recycling of nutrients, for example during sewing. "The pilot sewing will be done this spring at our research farm in Vihti. Because of the late spring, we cannot start sewing until the end of May. The aim is to also carry out experiments on two farms in Southwest Finland during autumn sewing," says senior scientist **Liisa Pesonen** of LUKE.

The pilot sewing of the spring are done on a 25-hectare precision-farming field with over a dozen zones of different growth potential. The field is sewn normally on the sewing tracks, but fertilizer and seeds are dosed individually in each zone using a combi drill. The combi drill reads an electronic task map and automatically implements the adjustments for each growth zone during the ride with GPS assistance. The combi drill doses two fertilizers with location-specific amounts, one of which is a liquid recycling fertilizer, a seed and two different cover crop seeds.

Potato into the field

"The goal is to optimise the dosing of phosphor, potassium and nitrogen according to the growth stock in each zone in the pilot area. In the spring, we use one additional container compared to normal sewing for spreading Bio-Kal, a product made of the vacuolar fluid of starch potato, containing potassium and nitrogen. In addition, recycled nitrogen is administered as ammonium sulphate during the growth season as location-specific leaf mould," Pesonen explains.

"There are always things to adjust in a pilot. If the experiment of the spring goes as expected, we will add another liquid container in the autumn sewing for ammonium sulphate. This allows us to administer three main nutrients in one ride," Pesonen reasons.

The long-term goal is to achieve better nutrient recycling efficiency. In addition to the vacuolar fluid of starch potatoes, extra phosphorus and nitrogen can be collected from farm manure and waste biomass to manufacture products for use along artificial fertilizers when sewing.

PHOTO: LUKE

THE UNIQUE combi drill unit works on the fields in the Circwaste project. The white container in the front is the container for liquid recycled fertilizer. The development of the device has been a joint effort of Junkkari, EPEC, Valtra, LiljaFarms, Happowa, Suonentieto, Finnamyl and Envor Group.

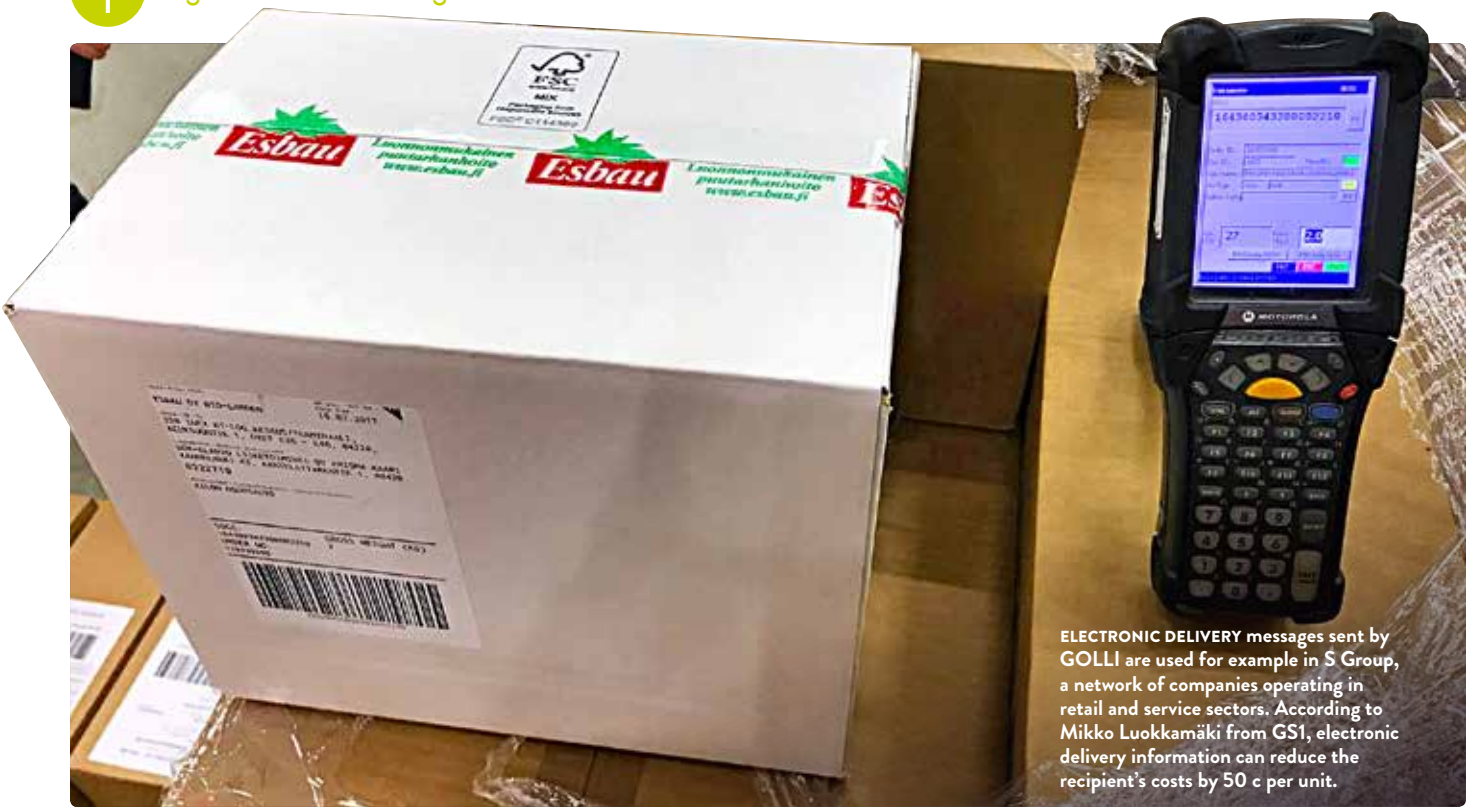


PHOTO: GS1 FINLAND

ELECTRONIC DELIVERY messages sent by GOLLI are used for example in S Group, a network of companies operating in retail and service sectors. According to Mikko Luokkamäki from GS1, electronic delivery information can reduce the recipient's costs by 50 c per unit.

CLOUD EFFICIENCY

Cloud services improve the resource efficiency of goods vendors and retail trade.

ELINA SAARINEN

Digital and cloud services will help small and medium-sized Finnish enterprises, as they seek ways to attain resource-efficient methods.

For example, Gold&Green Foods, the supplier of pulled oats that hit the vegetable food trend, has been using the Golli cloud service from GS1 Finland for a year now. With the cloud service, the company administers the orders and deliveries of PULLED OATS from store chains.

"Golli required no investments in hardware. It can be used with a regular computer. We could join it quickly and seamlessly," says **Sirpa Kemppainen**, procurement director at Gold&Green Foods. "Large customers have certain requirements, concerning for example the markings on the shipping lists and pallets. All of this was conveniently available in Golli. It has saved us time and money," Kemppainen adds.

To the cloud with smartphones

Known for its GTIN codes (formerly EAN codes), GS1's Finnish subsidiary GS1 Finland wants to facilitate the interaction between goods vendors and the retailers and improve the resource efficiency of the supply chains using digital services. The Golli information service, which modernises the order-delivery chain, is developed by GS1 Finland as part of the Circwaste project. The cloud service improves product turnover, makes products available on store shelves faster than before and increases the selling time. This also reduces loss. "In this case, cloud service means that the customer does not need to install or get anything on their machine but they can use the service via a web browser. This means the latest version is always available. The service can be used with any terminal. Its users can be mobile anywhere in the world," explains **Mikko Luokkamäki**, sector manager (transport & logistics) at GS1 Finland Oy. The service computerises the management of the entire supply chain, from order to delivery and billing. In addition, the service has the required supporting functions, such as electronic transportation orders. With the cloud service, the goods vendor receives the chain's order and sends an intensive delivery and invoice message to the retail chain's system.

"The vendor can concentrate on manufacturing high-quality products instead of e-mailing order confirmations," Luokkamäki explains.

Traceability

Golli is an information proxy. The goods vendor can track where products have been delivered and with what dates. An electronic archive is generated from the actions for use by the customers. It creates traceability and transparency, which is one of the goals of the Circwaste sub-project, as well.

The service is now used by a little over 110 goods vendors and store chains, among them the largest retailers in Finland, such as the S Group and Inex Partners, Kesko and Kespro, Tuko Logistics and Stockmann. In addition, the service is used by transportation companies.

Inex Partners uses Golli in terminal deliveries as well as warehouse deliveries, and particularly in the commodity terminal model. "The greatest benefit from the service is the digitalisation of the order-delivery chain, which, in our minds, means streamlined and simplified workflow and use of automation. From the environmental perspective, we are using a lot less paper in the processes, for instance," says Jussi Naukkarinen, development manager at Inex Partners Oy.

Less waste pallets

In spring 2017, GS1 Finland commenced a pilot in the Circwaste sub-project that monitors the circulation of pallets and the accrued data. The partner is Encore Kuormalavapalvelu, a subsidiary of Paperinkeräys Oy that supplies green, recyclable pallets. Since the start of its business, Gold&Green Foods has been using these recyclable and reusable pallets instead of disposable ones.

Instead of Gold&Green Foods buying wooden pallets, they rent Encore pallets from Paperinkeräys, who supplies the required number of pallets for the company to use. This reduces the need for owning the pallets and minimises pallet waste. Each recycled pallet replaces up to one hundred disposable ones.

"Our clientele values the ecologic approach," Kemppainen explains.

The long time the pallets remain in circulation opens up new technological possibilities, says Luokkamäki.

PHOTO: GOLD&GREEN FOODS

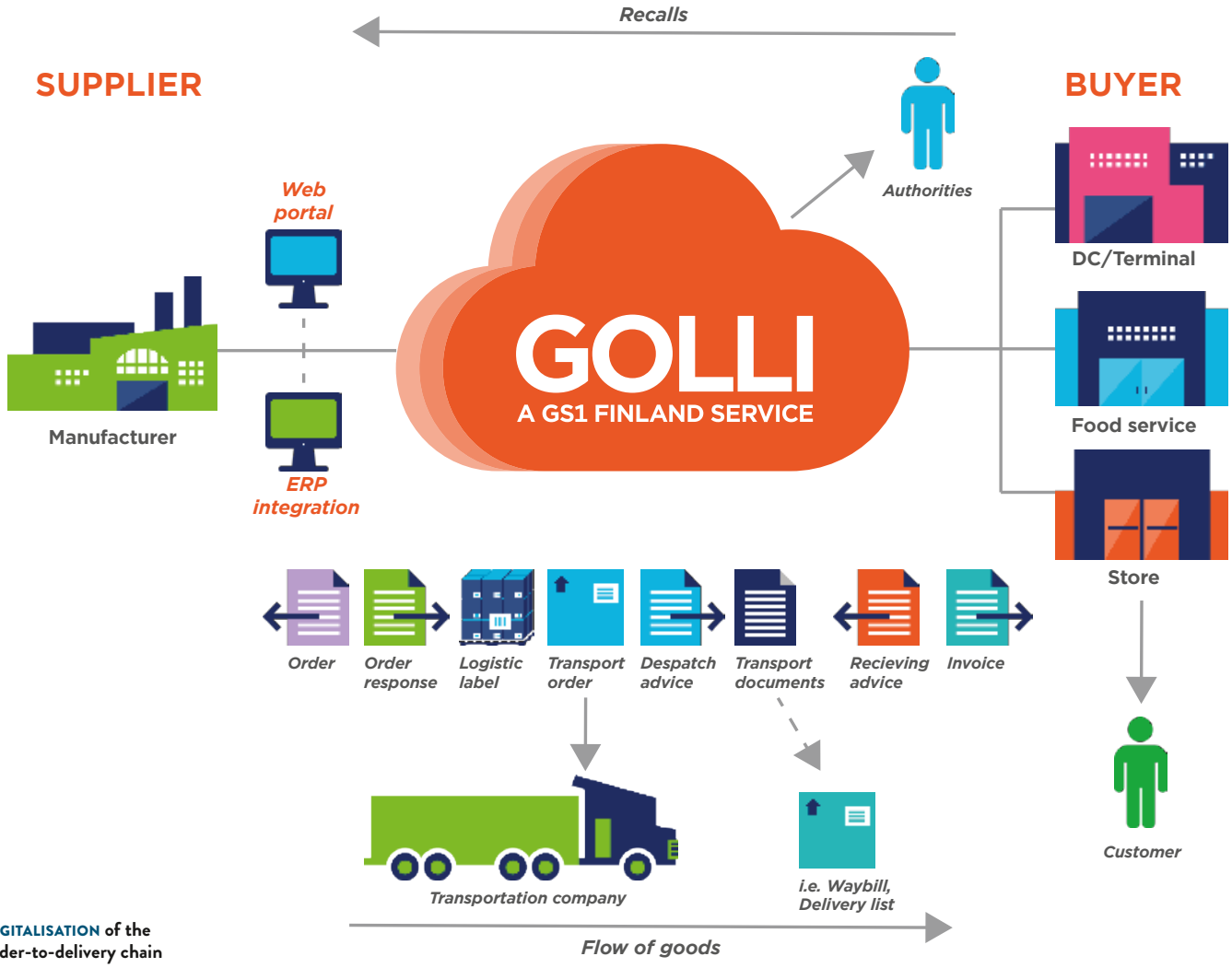
VEGETABLE FOOD ALTERNATIVE
Pulled oats is transported to stores in a resource-efficient way.

"Encore's green pallets come with RFID tags. With them, it is possible to trace the pallets and connect the product on the pallet to the pallet. This provides the goods vendor with data with which they gain a good understanding of the whereabouts and moves of pulled oats in Finland."

During the two-year Circwaste sub-project, the project partners research the possibilities for using the accrued data.

"In the future, we can calculate the carbon footprint of the transports, for instance. Such information may be of competitive advantage to a company," Luokkamäki says.

Golli is available in several languages and can be scaled for international use. The service has already expanded to the international market, with the first implementation outside of Finland in Estonia.



GS1 FINLAND

DIGITALISATION of the order-to-delivery chain

PHOTO: SCANSTOCKPHOTO

RECOVERING AGRICULTURAL PLASTIC WASTE

Even strawberry plastic is recycled in North Karelia.

VESA KEINONEN

The Circwaste circular economy project includes actors also in North Karelia. Measures are implemented in the region as part of the project to prevent the accumulation of waste, to improve waste sorting and to utilise industrial co-products. In addition, Karelia University of Applied Sciences participates in the project and prepares a study of the creation of plastic waste in North Karelia. In particular, the plastic waste from the rural areas and construction are in focus. And that is no small issue. Finnish agriculture and fuel peat production alone produce up to 12,000 tonnes of plastic waste. "To date, it has not been possible to properly utilise this considerable amount of waste. For the time being, collecting the waste has not been very attractive for farms," explains **Simo Paukkunen**, project expert at Karelia University of Applied Sciences.

Commercial potential exists

According to Paukkunen, Circwaste funding now allows for implementing things that have been thought about for years.

"Many businesses have emerged also in Finland that have started collecting and recycling agricultural plastic waste. This is done also in North Karelia."

"It is now our job to support these companies so that plastic waste can be recovered and reused even better. I believe that the field has commercial potential. The majority, or 65%, of agricultural and peat production plastic waste is decommissioned baling and clamping film. They have good material properties for recycling.

In addition, cans and various packaging material, on strawberry farms also covering plastic, end up as waste," Paukkunen explains.

Challenges do exist

There also challenges in the development of the recycling process. The plastic films contain organic impurities, such as peat and plant residue. "In addition, arranging for efficient collection logistics still requires plenty of work." One of the goals of Karelia University of Applied Sciences is to assess the technical and commercial usage potential of plastic waste. The starting point is collecting the basic data.

"We determine the location of the farms with a geographic information system. Then we find out how much plastic waste is produced and where the good places are for collecting it for further refining."

In the next stage, small-scale tests are implemented with partners. "We will refine plastic into raw material. At the same time, we consider what the raw material is suitable for and what it is not suitable for."

EXPERIENCE FROM THE CONSTRUCTION BUSINESS

As part of the Circwaste project, Karelia University of Applied Sciences also analyses the formation and utilisation of plastic waste from the construction business.

"In that field, we are basically talking of the same things as in agriculture, just the companies are larger than farms. The construction industry is further ahead in these matters than on the agricultural side," comments Simo Paukkunen of Karelia University of Applied Sciences. The project specialist hopes that the logistic operating models already developed on the construction side could be utilised in agriculture, as well, at least where applicable.

"We will be thinking of this, as well, during the project."

TWEETING AND SINGING BIN

The Kangas residential area in Jyväskylä intends to make its waste management smart.

ELINA SAARINEN

"Intelligent waste management is part of a smart town," explains **Tanja Oksa**, liaison manager at the City of Jyväskylä.

The new Kangas residential area in Jyväskylä will integrate smart functions in waste management in the city's Circwaste sub-project. Locked, deep collection container groups that open with residence-specific sensors are supplied by Molok Oy. Information is obtained on the amount of waste produced by the households, and it can then be utilised in waste invoicing, for example, that encourages sorting. "The idea is that at least mixed and biowaste invoicing could be based on the visits to the bin. At the first stage, we are studying this by means of a game," Oksa says.

The Kangas area developers are considering a sensor system, for monitoring the container filling level. "The waste bin could tweet, 'I'm full today, please use another bin'."

Poems and waste

As part of the city district's culture, art, for example, can be combined with the waste bins in the future. It can be interactive, as well. "The bins could sing or recite poetry," explains Anu Hakala, managing director of Kankaan Palvelu Oy, the company responsible for waste management design and maintenance. At present, mixed, bio, metal, paper, cardboard and glass waste are collected to the bins. The developers are thinking whether also the recycling of plastic packages could be arranged. Likewise, a compression system has been in the designs for the container doors.

"We are eager to be a piloting area," Oka and Hakala comment. They hope that communality can result in ideas from the residents. "The residents' propositions could implement the idea of sharing economy. For example, borrowing a 20-person tableware set from a neighbour. Kangas has the framework for resource-smartness to grow and bloom."

PHOTO: ELINA SAARINEN

KANGAS IN JYVÄSKYLÄ turning from an old paper mill environment to a resource-smart, intelligent district. In 2040, the area will be home to some five thousand people. The Circwaste sub-project integrates digital aspects and intelligence into the waste management logistics.

FLEXIBILITY FROM INFORMATION TECHNOLOGY

Kalevi Rissanen moved to Jyväskylä's Kangas to the Raina Building among the first residents in January 2017. He has plenty of experience of living in semi-detached and detached houses and in block buildings. The advantage of Kangas was its location close to the town centre. He has already reserved his own plot to farm in the Kangas garden.

"Also the difference of the Kangas area interests me: it is everything that I have heard and read about sustainable development here," Rissanen says. "The normal waste collection system is rigid. Sometimes the containers are overflowing, sometimes a half-empty container is emptied. When we are talking of intelligent Kangas, I hope that information technology will enable the emptying of the bins when needed." Rissanen welcomes senior experiments and proposes that also plastic be collected in the area. There should also be sufficient number of small waste bins for cigarette butts, dog poop bags and the market area's waste.

PHOTO: SCANSTOCKPHOTO

GET THE ENGINE RU

Rare earth metals are soon recycled back to engines in Pori.

ELINA SAARINEN

Many green tech and renewable energy devices require rare earth metals. For example, they are used in the batteries of electric cars and in the magnets of the generators in engines and wind turbines. Currently, the EU must rely on importing these precious metals from outside of the EU. Ideas are being devised in the Pori region on recovering rare earth metals and reusing them from the magnets in engines and generators and other metal waste. The Circwaste sub-project brings together parties from the region to utilise materials that otherwise would be lost. The City of Pori and the Pori region's business to business service, Prizztech Oy, promote circular economy experiments and demonstrations in the Peittoo recycling park in Pori.

Demo plant in the works

The magnets in scrap metal are full of precious material. For example, after powdering magnets, a mixture containing neodymium, praseodymium and dysprosium could be separated from it. These recycled raw materials could replace imported metals in Europe's magnet production, increase Europe's self-sufficiency and reduce the need for earthwork.

Powdering has previously been done in laboratory environments. Equipment used in normal magnet manufacture can mostly be utilised for separating the precious materials at an industrial scale. The first experiments done with the equipment will be completed by the end of 2018. The experiment will involve the Ulvila-based magnet manufacturer Neorem Magnets Oy and other Finnish partners, such as generator and engine manufacturers. The actors also plan on supplementing the powdering method with dissolving, for example. In the best case scenario, raw materials of magnets from decommissioned engines will be reused in new engines.

Field from foundry sand

"The Peittoo recycling park is turning into a hub of material flows of several hundred meters, which will process, store and utilise waste and produce new raw material and renewable energy," explains **Tuula Raukola**, project manager at Prizztech.

"Peittoo is also a demo environment. This is where businesses can carry out practical experiments and pilots and demonstrate that their ide-

PHOTO: PRIZZTECH OY

THE PEITTOO recycling park in Pori is a huge complex of hundreds of hectares with space for circular economy experiments.

CIRCULAR ECONOMY NETWORK AND RESOURCE-EFFICIENT CONSTRUCTION

Also other Circwaste sub-projects are being implemented in Pori. The Department of the Environment at the City of Pori plans to launch a specialist and advisory network in the Pori region, concentrating on circular economy. The resource-efficient construction sub-project, for its part, strengthens the collaboration between different operators in the construction business. "The aim is to minimise the amount of construction way through the development of new methods for new construction and demolishing of existing structures," explains **Marjo Kekki**, project manager at the Department of the Environment.

NNING

as have been tested and found working and replicable elsewhere. They not only reduce waste but also create new business opportunities," Raukola summarises.

Another trial related to the Circwaste project is being shaped in the Peittoo recycling park: Two or three new movement areas are being built in the park. The structures of the constructions make use of foundry waste. A new use has been in demand for foundry waste. Earlier, it has been used in dump site coverings because of it bentonite content but the need for dump site construction is decreasing continuously.

New movement areas are needed in the construction of the Peittoo area. Were it not for the recycled material, fresh natural rock would have been needed for the construction. The Circwaste sub-project determines whether pristine rock material can be replaced in earthwork with a mixture made of foundry sand and other recycled materials. The Peittoo fields are an excellent object for field tests and monitoring the durability and functioning of the structure.

"The experiment aims to demonstrate that a mixture containing foundry waste is suitable for earthwork and field construction and that it has certain desired properties. The goal is that the results will allow for using the mixture for corresponding structures elsewhere with a lighter permit process," Raukola explains. Circwaste funding has already pushed many ideas forward and joined operators. This work will be continued. Says Raukola, "New opportunities and ideas for promoting the circular economy are continuously studied."

"NEW OPPORTUNITIES AND IDEAS FOR **PROMOTING THE CIRCULAR ECONOMY** ARE CONTINUOUSLY STUDIED."

MANY USE

Also soil can be recycled, reminds Kiertomaa Oy.

HANNA OJANPÄÄ

In the Turku region, just eight kilometres from the main market, a new materials terminal is emerging in the Saramäki area, preparing to accept, store and recycle surplus soil among other materials. Kiertomaa's aim is to also develop an online application with which the infrastructure constructors and other users of soil in the area can meet more easily. The aim is to also find more efficient means for recycling rock material and for utilising new recycled soil materials. One of the goals of the Turku-based Kiertomaa Oy's sub-project is to develop the reuse and recycling of usable soil and to minimise the amount of soil taken to dump sites. A materials terminal is being built in the Saramäki region in the City of Turku. In addition to soil, also other materials, such as wood and brushwood are recycled there.

"Promoting the circular economy has also been noticed in the leading projects of the country," says **Tiia Isotalo**, environmental geologist at Kiertomaa Oy.

The implementers of the sub-project additionally want to support the national waste management plan on increasing the substitution of recycled materials for maiden soil matter. "High-quality rock is getting scarcer close to large towns. We want to increase the people's awareness of the recycling possibilities for soil," Isotalo says.

Regional co-operation

Kiertomaa was founded in October 2016. The company is owned by Lounais-Suomen Jätehuolto with an 80% share and by the City of Turku.

The initiator for the Circwaste project funding for the recycling park was the City of Turku. The project was transferred to Kiertomaa Oy when the company was founded. "Turku participates actively in circular economy projects. Landfill areas are growing fewer in the Turku region, and therefore the Saramäki soil park caters to the needs of the area in that respect, as well," Isotalo explains.

"Although we are strongly committed to this project, Kiertomaa's business in Saramäki will continue for decades after the end of the project."

The rock mined from the area is crushed and sold so that the area thus formed can accept clean soil for intermediate storage or final depositing. "Our customers are mostly builders and infrastructure enterprises. In addition, we have started university collaboration in the form of research related to the project, focusing on bedrock and market research, for in-

PHOTO: KIERTOMAA OY

KIERTOMAA IS STARTING a materials terminal. It can receive and store usable, clean excess soil, such as surplus rock waste, moraine and hard clay, surface soil and finished crushed material. In addition, the area is suitable for the final depositing of soil. The company will get space for the operation of the materials terminal by excavating rock material from the area.

S FOR SOIL

stance." The operative activities started in May. Kiertomaa has also started designing an online service. "Corresponding applications of this type have not existed in Finland at this scale. We have studied a few applications, and they may be useful as supplements to this application in the future," Isotalo says.

Evolving rock material washer

The development of potential new materials with partners will be started in the second stage of the sub-project, within a couple years. "For example, here in the Turku region, the soil is former sea bottom, which means mostly clay. The clay per se may be useless in land use but, mixed with various soil matter that are formed in the area or as co-products from industry and energy production, it may become more stable and, consequently, more useful," Isotalo explains.

The last stage of the sub-project aims to develop a rock material washer. The MARA and MASA regulations that control the use of waste for earthwork and use of soil waste must be taken into account when it is developed. They can affect the reuse of sanding macadam, for example. After the development of the rock material washer, the clean, treated or untreated surplus soil is sent for reuse. Only completely unusable soil will be deposited in the area administered by Kiertomaa. "Reusing sanding macadam is currently not possible without alterations because it is considered waste due to the mixed impurities and its fine consistency," Isotalo says.

Nothing random

In addition to the sub-projects, Kiertomaa wants to work as an ambassador. "We want to educate people not to dig and mix the ground randomly. Instead, source separation plays an important role. There are several layers in the soil, such as vegetation, sand, moraine and clay. Systematic work allows for utilising all of these layers," Isotalo points out.

"FOR EXAMPLE, **REUSING SANDING MACADAM** IS CURRENTLY NOT POSSIBLE WITHOUT ALTERATIONS."

OKARIINA RAUTA and **TUULI MYLLYMAA** are rejoicing for the opportunity to collect information and networks for promoting circular economy.

LONG-TERM COMMITMENT TO CIRCULAR ECONOMY

Motiva and SYKE together form the Circular Economy Service Centre.

SIRPA MUSTONEN

The Service Centre is a specialist network tasked with producing data and services for promoting the circular economy. The network also relays information on the Circwaste project funded by the EU's LIFE programme throughout Finland.

The project has five core regions: Pori Region, Southwest Finland, Central Finland, North Karelia and South Karelia. The work in these regions is carried out in sub-projects. Experiments in the core regions, new solutions and best examples are copied elsewhere in Finland.

Place of networking

The Service Centre is not only a service that consolidates information but also provides advice and networking possibilities. A further role it has is handling international connections, as well. The aim is to promote material-efficient circular economy and the better utilisation of waste in a variety of ways.

"We are actively supporting the creation of road maps for different areas. We also offer information on public procurement, industrial symbioses and material reviews. One important task the Service Centre has is communication," explains Okariina Rauta, specialist at Motiva.

Permanent effect

The role of the Service Centre also includes the development of methods for evaluating circular economy. In addition, the impact of the project is monitored. The benefits of the fresh EU project include its long duration. Circwaste will run for seven years, and the EU is expecting a lot from it. A project of this magnitude for promoting circular economy has not existed before.

"Funding of this length means a long-term approach, which provides an entirely new foundation for deploying new operating models and accomplishing permanent change," says Tuuli Myllymaa, accountable project manager at Finnish Environment Institute. The Circular Economy Service Centre sub-project is funded by the EU, SITRA and the Ministry of the Environment.

The activities of the Circwaste project are controlled by a steering group with representatives from the Ministry of the Environment, TEKES, Southeast Finland's Centre for Economic Development, Transport and the Environment, SITRA, the Ministry of Employment and the Economy, Association of Finnish Local and Regional Authorities, Regional Council of Southwest Finland, City of Jyväskylä, Regional Council of Central Finland, MOTIVA, Central Finland's Centre for Economic Development, Transport and the Environment, Technology Industries of Finland, Regional Council of Satakunta, North Karelia's Centre for Economic Development, Transport and the Environment, Ministry of Transport and Communications, City of Lappeenranta, Southwest Finland's Centre for Economic Development, Transport and the Environment, Regional Council of North Karelia, Ministry of Agriculture and Forestry, City of Turku and SYKE.

CATALYSING CHANGE

Our planet and our economy cannot survive if we continue with a linear, 'take, make, use and throw away' -approach. We need to recover resources wherever we can and fully exploit all the economic value within them.

The circular economy is about reducing waste and protecting the environment, but it is also about a profound transformation of the way our entire economy works. By rethinking the way we produce, work and buy we can generate new opportunities and create new jobs.

The Commission's Circular Economy package will help make this change happen. It sets an ambitious path for better waste management in Europe with supportive actions that cover the full product cycle. It will help businesses and consumers, as well as national and local authorities, to drive this transformation.

The activities foreseen in the framework of the LIFE IP CIRCWASTE-FINLAND, such as enhancing capacity building with different stakeholders in order to prevent waste, keeping materials circulating in the economy for longer and encouraging the re-use of by-products, are key to supporting the transition towards a circular economy.

CIRCWASTE is one of the LIFE Integrated projects, which are a new type of intervention introduced by the LIFE 2014-2020 Regulation. They catalyse the implementation of environmental or climate plans or strategies on a large territorial scale, focusing on the implementation of specific directives related to waste, nature, water, and air.

I am pleased to hear that CIRCWASTE has successfully started and is actively working towards the implementation of Finland's current National Waste Plan as well as the optimisation of the National Waste Plan for 2017-22.

I wish the Finnish Environment Institute and the associated beneficiaries of the project every success with the implementation of CIRCWASTE, which will provide relevant examples of good practice for an efficient and well-coordinated implementation of EU policy in Finland and in the whole Union.

KESTUTIS SADAUSKAS
Director for Circular Economy and
Green Growth at the Directorate General
for the Environment of the European Commission

PHOTO: ELINA SAARINEN

OUTI PAKARINEN hopes that Central Finland will at the end of the project in seven years have 5,000 personal vehicles that use biogas (currently there are one hundred) and also heavy-duty biogas equipment. "I am hopeful that even fighter jets could use biogas as a fuel."

WINGS FROM BIOGAS

Outi Pakarinen drives a biogas-powered car and dreams of biogas fuelling even fighter planes at some point.

ELINA SAARINEN

Project manager **Outi Pakarinen** of the Regional Council of Central Finland pulls into the driveway with her Volkswagen Touran. The automobile, which is fuelled by biogas, has been her ride for six years now, making her well acquainted with the benefits of biogas driving. "Environmental friendliness and renewability are the main things. Also locality is important. It feels smarter to pay for the fuel to an operator in our area instead of giving money to a far-away oil producer," Pakarinen smiles.

Considerably more gas

Soon, the fuelling network will grow, thanks to Mustankorkea Oy and Gasum Oy. In addition to Sammakkokangas Oy, both of the companies participate in the Regional Council of Central Finland's Circwaste sub-project, which aims at more efficient utilisation of biowaste and significant increase of biogas as a traffic fuel. The project partners carry out research on source separation, provide advice and make communication material. The Regional Council of Central Finland also co-ordinates the preparation of a regional circular economy road map in another Circwaste sub-project. "Promoting the production and use of biogas are prominently visible in Central Finland," Pakarinen says and starts her car. And presses the gas.

INDUSTRIAL WASTE FOR EARTHWORK

Ramboll is testing the use of contaminated soil and surplus masses from industry in earthwork.

SUVI-ANNE KINNUNEN

Projects that aim at utilising waste intend to reduce the use of pristine natural resources in earthwork and dumpsite disposal of waste. According to development manager Pentti Lahtinen at Ramboll, a total of some 30 million tonnes of different surplus masses are produced annually in Finland, while 100 million tonnes of rock material are used for infrastructure building. "Contaminated sediments are typically difficult to dispose of. Ramboll's pilot involves a waterway used for timber transport, where we intend to fill the bay and build an industrial area. The sediment from the nearby areas and the material accrued at the bottom of the bay will be stabilised in such a way that no harmful substances are released to the nature," Lahtinen explains.

PENTTI LAHTINEN explains how the next step is broad-scale utilisation of surplus masses.

Ramboll also wants to replace the cement used as a binding agent in earthwork with recycled materials. In the pilot, the sediment is stabilised using primarily waste material from the forestry industry. Also roadwork allows for reusing poor-quality soil, minimising the cost of transporting construction material. Ramboll is testing the hardware technology and building with new materials. Based on the experiences, instructions will be prepared on the best type structures and design practices.

Both construction projects and recyclable materials can be found everywhere in the world. The projects utilise a variety of industrial surplus materials, providing excellent possibilities for developing new business.

HOSPITAL DOING WASTE MANAGEMENT

Waste management sorted out in the new hospital in Jyväskylä.

ELINA SAARINEN

A new central hospital is being built in the Kukkumäki region of Jyväskylä. In 2020, its single resource-smart building will replace the current Central Finland central hospital, where the operations are distributed across nine separate units. The Circwaste sub-project helps designers make solutions for producing minimal amounts of waste in the new hospital. The Central Finland Healthcare District is studying the volumes of waste produced at the current hospital, and develops and tests new models for waste collection, sorting and transportation.

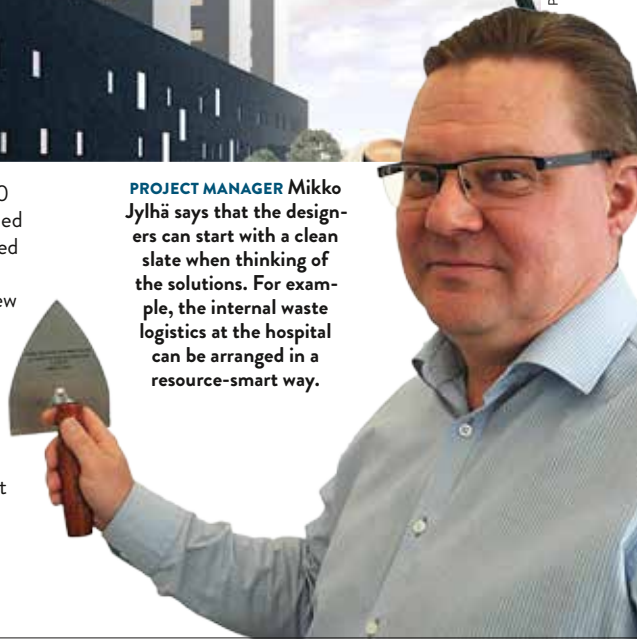
Project manager **Mikko Jylhä** and project co-ordinator **Kia Paasivirta** of the new hospital explain that the hospital currently produces approximately 1,360 tonnes of waste, 42% of which is recycled and reused, 51% is burned, 3% is disposed of and the rest is otherwise reused. The waste volumes will be reduced at the new hospital because of the procurement method. The hospital will not have a central warehouse. Supplies are delivered as trolleys at each ward. A computer-based inventory system knows exactly what supplies are in demand and can order the right amount of products at the right time.

"This minimises inventory loss while reducing waste and expenses," Jylhä summarises.

PHOTO: JKMM ARKKITEHDIT OY

THE NEW HOSPITAL will be finished in the Kukkumäki district of Jyväskylä in 2020.

PHOTO: ELINA SAARINEN



PROJECT MANAGER Mikko Jylhä says that the designers can start with a clean slate when thinking of the solutions. For example, the internal waste logistics at the hospital can be arranged in a resource-smart way.

GETTING THE DRIVERS OF CIRCULAR ECONOMY GOING

Four regional co-ordinators for circular economy have started their work with the support of the CIRCWASTE project.

KAARINA KAMINEN

Support from the CIRCWASTE project has made it possible to hire four regional co-ordinators whose job is to start new activities for increasing material efficiency and the recycling level. The co-ordinators work in Southwest Finland, Central Finland, South Karelia and North Karelia. Their work is to support a collaboration project formed of the important interest groups in the region and the Circular Economy Service Centre, founded by SYKE and Motiva.

Catalysts

The regional co-ordinators' work includes dialogue with municipalities, businesses and representatives of administration, for example. In practice, the work refers to communication and guidance regarding the tools and methods of circular economy. In addition, the regional co-ordinators support the launch of new projects and participate in the preparation of regional circular economy road maps, which define the goals and measures according to the regional strengths and resources.

PHOTO: SYKE

THE CO-ORDINATORS ACTIVATE and support businesses, municipalities and citizens and provide decision-makers with information and start new projects. In the photo, regional co-ordinators Markku Mäki-Hokkonen, Aleksis Klap, Pasi Lamminluoto and Outi Pakarinen and project specialist Anni Lahtela.

Enjoying the benefits

The essential in the work of the regional co-ordinators is motivation and engaging. To enable the transition toward circular economy, it is important for the co-ordinators to explain the benefits: new business opportunities, cost savings, employment impact and positive environmental effects. These effects are also verified with various studies and calculations.

MANAGING DIRECTOR VILLE IMMONEN says that a composite product made of recycled materials saves its weight in emissions compared to fresh raw materials.

PHOTO: WIMAO OY

COMPOSITE PRODUCTS FROM RECYCLING MATERIALS

Kompotek Oy is building a pilot plant in Lappeenranta, next to the Etelä-Karjalan Jätehuolto waste management facility, to manufacture bio-composite products from recycled materials. Kompotek and the sales and marketing company Wimao Oy have developed a patented extrusion compression technology. In the Circwaste sub-project, the company can test the technology at an industrial scale.

"We can utilise materials in a versatile way, as our technology allows for minor variations in content. Our raw materials include wool, gypsum, fabric, wood, paper and plastic. In practice, any recycled fibre will do, be it synthetic, glass, carbon or mineral fibre," says Kompotek and Wimao managing director, **Ville Immonen**. The plant's material factory is the place where the raw material flows are refined. The manufacturing line of the end product combines the fibres and recycled plastic and shapes the final product. Specialised products for the construction, packaging, logistics and vehicle industry replace plastic and metal products, even concrete.

"Our aim is to create closed systems and find partners for that," Immonen says, adding, "We can also recycle the products we manufacture."

2,000 tonnes recycled

Immonen says that the company plans to recycle a total of 2,000 tonnes of waste material in 2018 that otherwise would be difficult to recycle. Once the pilot plant is up and running, the goal is to replicate the concept and start new, similar plants elsewhere in the world.

JOENSUU PILOT ENVIRONMENT SEEKING IDEAS

Does your company have a new idea of product related to the urban environment's circular economy or bioeconomy that needs a test environment? Joensuu Science Park is calling for Finnish companies to pilot solutions and technologies for sustainable development. The companies can develop their ideas and products with the customer with the city of Joensuu working as the development platform. "We provide a central location in Joensuu and the Science Park's buildings as a development platform for companies to test their business idea," says the Juha-Pekka Luukkainen, development manager at the Science Park, and encourages businesses to boldly contact him at juha-pekka.luukkainen@tiedepuisto.fi or his colleague at terttu.kinnunen@tiedepuisto.fi. The Circwaste sub-project promotes and supports concept and business models, service concepts and actual products of circular and bio economies.

The Science Park has building space in excess of 40,000 square metres on Joensuu's Länsikatu street. A couple thousand people visit the premises on a daily basis. The Science Park is applying a new concept and offers its buildings and business community as a development platform.

The Science Park also has an extensive network of international and Finnish specialists, scientific and research collaboration and start-up services and a business incubator. All this lays out a unique piloting environment for ideas.

Ympäristösi hyväksi.

Jätehuollon PALVELUT

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