



HOW TO ESTABLISH AN ECO-INDUSTRIAL PARK



As part of the Circular Economy Centre project, launched in 2018 and funded by Sitra, Digipolis in Kemi created a network of eco-industrial parks across Finland. This guide is based on the work done by the network.

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The planet's carrying capacity cannot sustain our current way of life. Our economic model is based on the overconsumption of natural resources. Stopping climate change and securing biodiversity require the adoption of carbon-neutral circular economy solutions throughout our society.

Industrial symbioses in which one company's waste is another company's raw material or the process industry's excess energy serves as an indispensable source of energy for another company, are principal pillars for eco-industrial parks. As the use of virgin raw materials becomes more complicated – due to reasons related to usage restrictions, availability, security of supply and pricing – the significance of industrial symbioses will increase.

The pressure to reduce energy consumption and the transformation of production methods make business support networks increasingly important. For example, the Kemi-Tornio and Kokkola regions in Finland have carried out successful development work to tackle these challenges for years already. The industrial circular economy expertise of Kemi's Digipolis and the Digipolis-led Circular Economy Centre have been recognised both in Finland and internationally.

An eco-industrial park is a geographically defined area where materials, energy and information circulate between companies. Its operations aim for profitable business while making environmental values a high priority. Eco-industrial parks create added value for the participating companies through co-operation. There are about 20 large-scale eco-industrial parks in Finland promoting regional business in line with the principles of sustainable development.

An eco-industrial park can also be a cluster of pioneering companies in the field of environmental technology or a source of products and services that respond to the challenges of climate change. In many cases, the planning of the park's energy production is also as environmentally sustainable as possible. Energy efficiency and resource efficiency are routine at eco-industrial parks, and the physical proximity between the companies creates important trust capital for them. The networks of companies create substantial cost savings through support services and joint purchasing, for example.

Circular Economy Centre and Sitra have gathered eco-industrial parks together to create a network for co-operation throughout Finland. Circular Economy Centre co-ordinates the operations of the network in Finland. The network offers an excellent forum for sharing information, learning from each other and facilitating dialogue between companies.

This guide describes how eco-industrial parks work, how they can be developed and what should be taken into account when establishing a new eco-industrial park.

BIRTH MECHANISMS OF ECO-INDUSTRIAL PARKS

Many eco-industrial parks have emerged spontaneously through co-operation between different parties. Networks emerge and evolve over time, turning into eco-industrial parks when companies start to co-operate to respond to their own needs and those of their customers. This has happened in Circular Economy Centre and in Kokkola Industrial Park, for example.

The industrial history of the Kemi-Tornio region dates back to the 19th century. Industrial symbioses and the use of side streams have been an integral part of the region's industrial development for decades. New opportunities are sought constantly and systematically with the assistance of Circular Economy Centre.

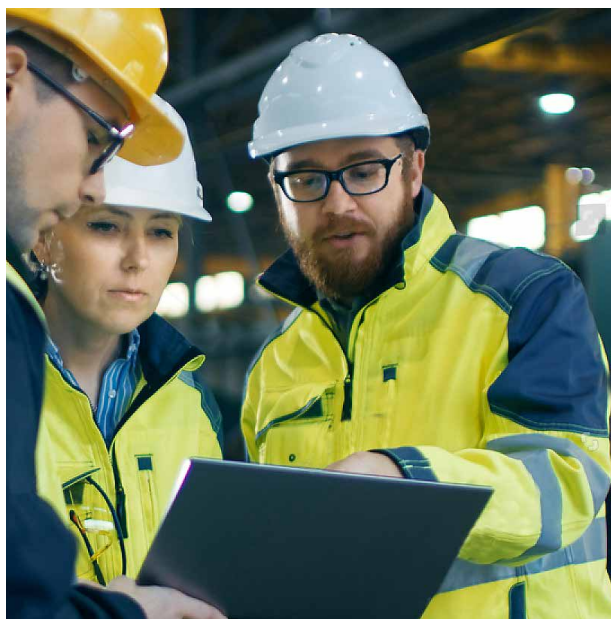
In Kokkola, chemical industry operations began in the 1940s. Kokkola Industrial Park's (KIP) chemistry ecosystem is a prime example of an advanced circular economy environment. Since the 1960s, the companies in the area have lived in a so-called industrial symbiosis. They operate in genuine, close co-operation and make use of synergies in production and operations.

On the other hand, some eco-industrial parks have been built through determined effort. The eco-industrial parks in Turku and Kemijärvi are good examples of this. The planning of Smart Chemistry Park in Turku started already in 2013–2014, with an analysis of the region's strengths and the companies operating in the fields of the bioeconomy and the circular economy. Raisio plc's laboratory, office and hall facilities were becoming vacant and were a good match for the region's high-growth companies' need to find suitable premises, which had proven to be challenging.

Turku Science Park launched the operations of Smart Chemistry Park in 2015 and the first four companies moved into the premises. Smart Chemistry Park's operations have been financed by Sitra, for example, and supported by the cities of Turku and Raisio. The launch stage of Smart Chemistry Park was planned for three years. During that period, preparations were made for operations and a national bioeconomy and circular economy network was built. In the launch stage, the premises became almost fully occupied. There are now 10 companies operating in the park, involved in close co-operation with approximately 60 other companies through the national network.

In Kemijärvi, financing for establishment stage analyses was applied for from the Regional Council of Lapland, the European Regional Development Fund and the Centre for Economic Development, Transport and the Environment of Lapland (operating environment development subsidy).

Eco3 in Nokia was established through close co-operation between the private and public sectors. A key role was played by the City of Nokia, which created zoning for the eco-industrial park. When the park's operations started, the city has also been one of its customers, buying biogas produced in the park. Eco3 is an excellent example of how a carbon-neutral circular economy needs close co-operation between different sectors so that everything runs smoothly.



AN ECO-INDUSTRIAL PARK REQUIRES SPACE

When planning an eco-industrial park, it is better to reserve too large an area in zoning than to make too small a reservation. For example, in the area where Kokkola Industrial Park is located, hundreds of hectares were reserved in zoning for industrial purposes already in the early 2000s. The area has filled up gradually. Having zoned land readily available is a substantial competitive advantage and inducement. Zoning-related changes, if any, are handled flexibly with the city.

Land use planning can be used to create long-term competitive advantage in relation to potential benchmark regions. Profiling regions creates better conditions for marketing and makes it easier for new companies to join the circular economy ecosystem of the region that is best suited for them.

From the perspective of land use, different eco-industrial parks may have different starting positions. We have identified the following starting positions, for example:

- Large geographical areas where companies make use of each other's side streams despite not being located in the same industrial zone (Kemi-Tornio)
- New bioeconomy and circular economy parks (Kemijärvi)
- Former landfills and other waste processing areas that are being transformed into recycling or circular economy parks
- Industrial parks where industrial symbioses based on the bioeconomy and the circular economy are built around a significant industrial facility (such as a bioproduct plant) or multiple operators (Äänekoski)
- New industrial area, originating for a local shared strategic commitment and based on a public-private initiative, and its development (Eco3, Nokia)
- Clusters that develop industrial circular economy solutions driven by academic research (Turku Smart Chemistry Park).



WHAT DOES AN ECO-INDUSTRIAL PARK OFFER FOR COMPANIES?

A company that chooses an eco-industrial park as their operating location can save considerably in raw material, commodity, energy, waste management, production and logistics costs. The existing infrastructure in the park offers the opportunity to achieve significant cost savings. Cost savings are also achieved by shared premises, services (such as property maintenance), information and training as well as purchasing, for example. Synergies between companies also increase material and energy efficiency while reducing negative environmental impacts.

The building of trust-based co-operation supports the companies in the eco-industrial park in the development of shared business and facilitates the establishment of joint research and development projects. The park co-ordinator may also actively promote co-operation between companies and universities and create new joint development projects.



NINE STEPS TO ESTABLISH AN ECO-INDUSTRIAL PARK

1. Create a vision and plan

Think about what kinds of companies the eco-industrial park will serve. Right from the start, take the future growth of the park into consideration when it comes to infrastructure planning and zoning, for example. Early on, consider different options for financing the establishment of the park and the running of its operations.

Digipolis in Kemi and Kokkola Industrial Park are good examples of eco-industrial parks that have evolved over a long period of time and that are based on an industrial circular economy. Years of determined co-operation have made it possible to put the companies' side streams into good use. Everything is based on a clear vision. Parks built through determined effort include Kemijärvi and Smart Chemistry Park.

2. Remember to set interim targets

Divide the project into small parts. Milestones support progress. Remember to enjoy the moments of success – even the small victories. Getting started takes time and patience.

3. Choose a dedicated co-ordinator

The eco-industrial park's operations need to be marketed and co-ordinated. For this, you need a co-ordinator that is dedicated to the network and earns the network members' trust. This role is typically assigned to a local or regional development company, one of the park's companies or an association.

For example, Circular Economy Centre has gained the trust of local companies through active high-quality work and companies are willing to constantly look for new business in co-operation with Circular Economy Centre.

Kokkola Industrial Park is co-ordinated by Kokkolan suurteollisuusalueyhdistys ry, a local association established in 2006, with all major production facilities in the region as well as service companies as its members. The establishment of the association has been a significant step that has increased awareness of the area and its development and co-operation. The goal of the association is to boost co-operation among the companies operating in the area, to improve business prerequisites and to increase the area's attractiveness as an operating location for companies and organisations and a place of employment. In addition, the association aims at strengthening the park's brand and takes part in exercising societal influence. The association has an executive director who is responsible for marketing. Moreover, the association has several active working groups operating under it, consisting of experts from the member companies.

The co-ordinator of Smart Chemistry Park is the regional development company Turku Science Park Ltd who has been co-ordinating the park's operations since its establishment. The active co-ordinator has played a key role both in launching the operations and in maintaining and developing them.

4. Prepare the park's business model carefully

To ensure that the eco-industrial park will operate effectively, the expectations of the companies should be realistic and financially feasible. New eco-industrial projects may also involve new financial risks for companies, related to financing and the movement of capital. On the other hand, new thinking and the clustering of expertise may also present new business opportunities that can be turned into a substantial competitive advantage.

From the companies' point of view, choosing a public and neutral non-profit co-ordinator is a favourable option and makes it possible to create unbiased co-operation between different parties. When considering the business model, keep in mind that in the process and chemical industries, the path from idea to product is long and development efforts require a lot of capital. The industry's high-growth companies will spark interest in larger corporations that are in search of new circular economy and bioeconomy expertise and technologies.

In the launch stage of Smart Chemistry Park's innovation platform, several co-ordination models were analysed, including a co-operative, an association and an operator company. However, it was finally decided that operations would continue under the co-ordination of Turku Science Park.

5. Maintain networks

To be highly effective, an eco-industrial park needs companies that are a good match with its profile. It is important that these anchor companies are firmly committed to the park's operations, as that usually ensures sufficient financial resources as well as adequate and continuous streams of by-products. The anchor companies also build trust between organisations and maintain the park's network.

An eco-industrial park functions best when it presents a healthy mix of larger and smaller companies operating in the same area. For the development of the park, it is important to attract also completely new small companies and start-ups, which are often established as a result of academic research projects and offer technological solutions.

The main anchor companies in the Circular Economy Centre area include, for example, Outokumpu, Metsä Group, Stora Enso and Tapojärvi. The network consists of more than 200 SMEs throughout the entire region. The network representatives are strongly committed to developing the operations of Digipolis and the Circular Economy Centre. There is active research and development co-operation with Lapland University of Applied Sciences, for example. In addition to participating in numerous national and international networks, Circular Economy Centre has also contributed actively to the development of a European alliance focusing on the financing of an industrial circular economy, to ensure that the investments of the park's companies would receive support.

Kokkola Industrial Park is home to several major chemical industry and metal processing production facilities. The park does not have a single production facility that is clearly larger than others. There are altogether 17 production facilities in the park as well as about 60 service companies that support their operations. The largest companies in the park are Boliden Kokkola Oy, Umicore Finland Oy, Freeport Cobalt Oy and CABB Oy.

In Smart Chemistry Park, there are 10 companies operating in the park and approximately 60 companies in close co-operation through the national network.

6. Communicate and train

For an eco-industrial park to prosper, the companies need extensive knowledge and skills related to operating as part of a network. The network co-ordinator, for example, can help with the assessment of co-operation opportunities. Circular Economy Centre has acted as the driving force in many different circular economy projects and invited the representatives of companies, authorities and financing partners to join in. In addition, Circular Economy Centre and Digipolis relay latest information to the companies in the park through many different channels. Maintaining a dialogue between the companies and the authorities is also an important element in this work.

Smart Chemistry Park carries out systematic communications and marketing (through websites, brochures, social media and other channels) to increase awareness of the innovation platform and to strengthen its networks. The companies have been satisfied with the visibility they have gained as part of a larger network. The ongoing systemic change towards a circular economy challenges companies to engage in a new kind of co-operation and to adopt new business models. In Smart Chemistry Park, business development training has been organised for companies with particular focus on bioeconomy and circular economy business models and the crystallisation of the company's business idea.

Conferences and seminars are also a good way to distribute information about industrial circular economy solutions. Examples include "Responsible Industry Leading the Sustainable Development on the example of Industry Clusters Connecting Circular Economy", organised in Kemi in February 2020 together with the European Union, and Material Week, organised annually in Kokkola.

The national eco-industrial park network offers the participating parks an excellent opportunity to learn good practices from each other. The network makes it possible to relay latest information to companies operating in the eco-industrial parks and to help them find new business opportunities.

7. Grow and develop

When the operations of the eco-industrial park have become well-established, think about ways to leverage the companies' networks to develop collaborative innovation activities as well as shared knowledge and services between the various parties involved in the park. Actively look for new organisations and operating methods for the park.

For example, the Kemi-Tornio side stream table, maintained by Circular Economy Centre,

provides companies starting operations in the region with up-to-date information about various business opportunities. A new aspect to be included in the table are the carbon dioxide use options available in the area.

Metsä Fibre's next-generation biorefinery project that is being planned in Kemi will also open up new opportunities for circular economy solutions and companies. Circular Economy Centre helps in bringing the solutions and the companies together. Furthermore, there are plans for various company-driven circular economy testing platforms and environments in the Kemi-Tornio region.

Kokkola Industrial Park has been living in an industrial circular economy for more than 50 years. The ecosystem still has significant development potential as circular economy synergies and a well-functioning infrastructure create interesting preconditions for new technologies and products generated by the merging of chemistry and bioeconomy, for example. Further synergies are created by the re-use of process industry side streams and centralised service production. Non-profit innovations are constantly developed in co-operation projects related training, the environment, safety and security, for example.

From the onset, the participants of Smart Chemistry Park's innovation platform have included companies, universities and public sector representatives. Since its launch stage, the park has been building the national bioeconomy and circular economy network. After the launch stage, the park has looked for ways to engage in international networking that supports the growth of companies. At the moment, Smart Chemistry Park participates in EU-level networks and is one of the founding members of the national SuSChem (Platform for Sustainable Chemistry) technology platform. In the future, Turku Science Park Ltd's goal as Smart Chemistry Park's co-ordinator will continue to support growth-oriented bioeconomy and circular economy companies over the long term both nationally and internationally.

8. Build and maintain trust

Trust is essential for an eco-industrial park's success. Trust makes it possible to optimise the sharing of know-how and various ideas between the companies. Mutually successful business relationships and social interaction also help maintain an atmosphere of trust.

The industrial symbiosis in the Kemi-Tornio region is an excellent example of open and trust-based sharing of information and successful business. Circular Economy Centre has a direct line of communications with the companies in the region, which makes it possible to plan and experiment new ideas together. Joint industrial circular economy solutions are a prime example of co-operation. Some of the preliminary ideas that started as experiments have grown into international industrial circular economy business.

In Kokkola, the traditions of co-operation between different parties span decades. The regional association contributes to close co-operation: Kokkolan suurteollisuusalueyhdistys ry has created a development strategy together with companies and organisations in the region. The association's working groups meet regularly. Each year, the association organises various regional meetings and events, such as executive meetings, training sessions, joint recruitment events, open house events and other events targeted at the general public. Communications are open and regular and there are regional publications, including a dedicated stakeholder magazine. The most important aspects of the association's activities



are safety and environmental issues. KIP is creating a new standard for the operations of large-scale industry areas, highlighting environmental and social responsibility and mutual trust among different parties.

In Smart Chemistry Park, the business insight of the co-ordinator and the shared desire of the parties to promote the bioeconomy and the circular economy have solidified the trust between the parties. From the onset, the parties in Turku have shared the vision that, with the aid of chemistry and new business models, it will be possible to tackle challenges related to the re-use of materials.

The Circular Economy Centre brings all these different eco-industrial park organisations and experts together to develop the industrial circular economy in Finland. A good, trust-based atmosphere for dialogue is a crucial part of this work. Without trust and extensive co-operation, the promotion of the industrial sector will remain merely partial optimisation.

9. Communicate success

In addition to ensuring effective internal communications, eco-industrial parks should also share their success stories. When the companies in the eco-industrial park prosper and grow, the co-ordinator is also partly responsible for spreading the message of their achievements to audiences outside the park. Having shared communication resources in place early on will help increase awareness of the park and its strengths. It is crucial for the park's appeal that the stories and achievements of the companies operating in the park are spread far and wide among customers and potential partners. When determining the channels and target groups and building the right image for the park, the power of the network is immeasurable. There is no need to be overly modest when you describe the park's success stories.

The latest success stories include the Circular Economy Centre -driven industrial-scale solutions that are fully based on industrial side streams, such as the cover structure of the Kittilä mine's gangue pile and the new kind of bike path in Kemi, with its recycled materials. These showcase excellently the opportunities offered by an industrial circular economy and the replacement of virgin raw materials. They also show that an industrial circular economy can genuinely open up new business areas for companies.



THE WORLD NEEDS CARBON-NEUTRAL CIRCULAR ECONOMY SOLUTIONS



Does your eco-industrial park feature solutions that could be turned into successful export items? The world needs carbon-neutral circular economy solutions, due to both the global economy and the state of the planet. We hope that in the future, Finland will be known as a safe country that looks after the environment and people and a country that has the best expertise and solutions in an industrial, carbon-neutral circular economy. Learn from the lessons we have collected and use them as a foundation for building an eco-industrial park that is best suited for your region and that creates circular economy solutions for the entire world!



ECO-INDUSTRIAL PARKS IN FINLAND

Circular Economy Centre, Digipolis, Kemi-Tornio

Future success requires resource-wise actions. Circular Economy Centre has the solution. Circular Economy Centre knows the opportunities offered by an industrial circular economy as well as local and global development challenges. Our activities have been recognised globally. Organisations operating in the Kemi-Tornio region already have decades of experience in an industrial circular economy.

Circular Economy Centre contributes to companies' success in making circular economy investments, produces information about the sector's best practices for companies to use as well as offers and develops expertise in the field to promote a circular economy. In addition, Circular Economy Centre participates in clearing the obstacles associated with the realisation of a profitable circular economy.

Kemi-Tornio is a strong and specialised region with a cluster of chemical and mechanical wood processing, metal and steel industry, wood construction, metalworking and engineering operations as well as a significant mining presence. The total amount of industrial side streams suitable for use is approximately 1.7 million tonnes per year. The region produces approximately 8 per cent of the total value of Finland's exports.

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Forestin eco-industrial park, Kemijärvi

Forestin eco-industrial park is located in Kemijärvi in the industrial area of Patokangas, which has a long history of wood processing. The park includes a Keitele Group sawmill, glulam and pellet factory as well as the largest raw timber terminal in Finland, and it has been earmarked as the site for the planned Boreal Bioref biorefinery. The area has an electrified railway line.

The eco-industrial park offers companies plots that have already been defined for industrial use in zoning, the city's well-functioning zoning and permit services and the region's training services. Kemijärven Kehitys Oy supports companies in all plans related to the company's location, development and expansion.

The Forestin eco-industrial park is still being built. New business opportunities are being analysed, and a masterplan will be created for the area, taking into account the companies' possibilities to use the area's energy and material flows and other business synergies. The area is being developed systematically and both a working group and a development project have been established for this purpose.

In the Forestin eco-industrial park, companies can benefit from industrial symbioses and responsible production is everyone's shared goal. Currently, the joint planning of the area falls under the responsibility of a working group led by Kemijärven Kehitys Oy.

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Kokkola Industrial Park, Kokkola

Kokkola Industrial Park (KIP) is the largest inorganic chemical industry ecosystem in Northern Europe. There are 17 leading international chemical industry and metal processing industry companies in the park. Most of their products are exported. The park is also home to about 60 service companies that support the core businesses of the industrial companies in the area. In addition to process-related expertise, the area's training and research expertise is in a league of its own even in an international comparison.

The circular economy of future is already reality in Kokkola where circularity has already been a natural part of industrial operations for a long time. The companies in the area live in a so-called industrial symbiosis, or they operate in close co-operation and make use of synergies in production and operations. Synergies are created by the re-use of process industry side streams and centralised service production, for example. Excellent non-profit innovations are constantly developed in co-operation projects related to training, the environment, safety and security, for example.

The companies of Kokkola Industrial Park have a shared goal: responsible success, jointly and separately. New companies are very welcome to the park. The area has premises and zoned plots available. All the services that an industrial company needs are also available, as are many industrial commodities, ranging from seawater to sulphuric acid. The park's existing infrastructure and excellent location facilitate the settling in and operating in the area. Kokkola's state-of-the-art port with its all-weather terminal is also in the immediate vicinity of the park.

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Smart Chemistry Park, Turku

Smart Chemistry Park is an innovation platform and network for start-ups and SMEs delivering new bioeconomy and circular economy solutions. The core business focus of the park's companies is on refining industrial side streams and biomass to create new products and materials, and there are also consulting companies that complement these activities with their services.

Smart Chemistry Park was established by Turku Science Park and companies in Raisio in 2015. The establishment was supported by Sitra and the cities of Turku and Raisio. Raisio's industrial area was the best location for the industrial park, due to its existing infrastructure.

Smart Chemistry Park offers companies laboratory, piloting and office premises. The companies in the park's network get the chance to participate in an extensive co-operation network with public-sector, university and corporate members that supports their growth. At the moment, Smart Chemistry Park is home to 10 chemical and process industry companies, with 60 more companies in the co-operation network.

Yhteystiedot

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Circular economy village, Riihimäki

The circular economy village in Riihimäki is a co-operation between the City of Riihimäki and Fortum Corporation, concentrating on municipal waste. The industries represented in the village include eco and plastics as well as a biorefinery.

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ECO3, Nokia

The ECO3 eco-industrial park is a bio and circular economy pioneer. The park houses a wide variety of activities, including nutrient circulation, a wood-based bio and circular economy, energy and fuel based on a bio and circular economy, and technical circulation.

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Kilpilahti industrial area, Porvoo

The Kilpilahti industrial area in Porvoo concentrates on oil products, renewable products and fuels, gas, plastic products and raw materials for plastic products. The park is built around Neste Oyj's refinery, which produces excess heat.

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Metsäjaanu, Salo

Metsäjaanu is an evolving business area for cleantech companies in Salo with excellent transport connections between the cities of Turku, Helsinki and Hanko. The 100-hectare area forms a cluster consisting of 10 companies and almost 100 employees.

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Pori-Harjavallan ekoteollisuuspuisto, Pori ja Harjavalta

This group of eco-industrial parks situated in South-West Finland concentrates on the refining of technology metals and the production of technology metal products and chemicals for use in batteries and electric cars needed for the electrification of society. Peittoo Recycling Park in Pori plays an important role in this ecosystem, offering a vast area for the handling, storage and landfill of industrial side streams.

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Envi Grow Park, Forssa

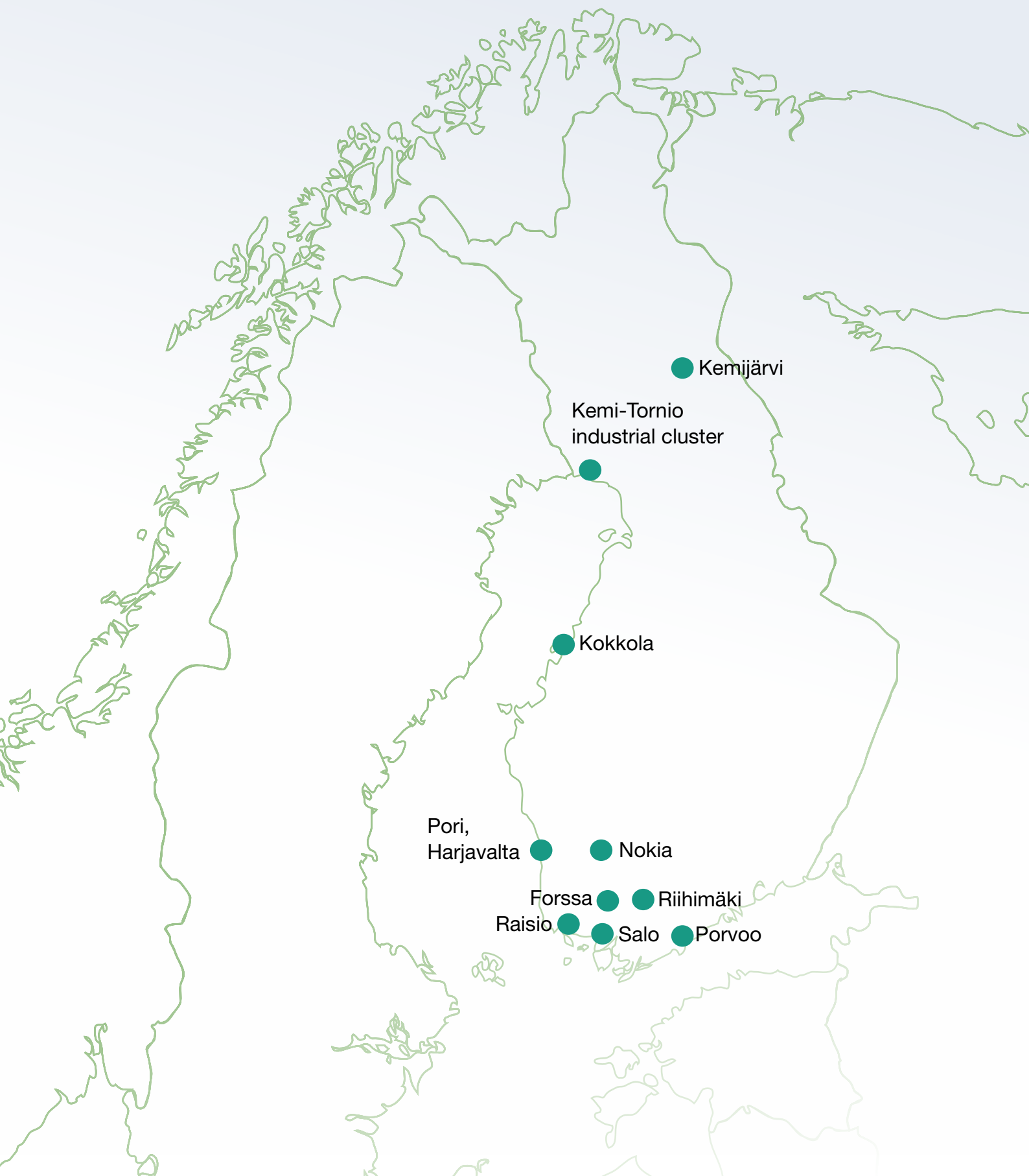
The Envi Grow eco-industrial park recycles materials, energy, expertise and information within the waste management, food and construction industries in a closed-loop system that is kind to the environment and good for local business.

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Eco-industrial park	Location	Co-ordinator	Key industries
Kemi	Kemi-Tornio industrial cluster	Circular Economy Centre Kemin Digipolis Oy	Bioeconomy, paper, mining and steel industry
Kokkola Industrial Park	Kokkola	Kokkola Industrial Park / Kokkolan Suurteollisuus-yhdistys ry	Chemical industry, metal processing industry
Smart Chemistry Park	Raisio	Turku Science Park Oy	Chemistry, chemical industry
Circular economy village	Riihimäki	Fortum Corporation/ co-operation with the City of Riihimäki	Municipal waste (eco, plastic and biorefinery)
ECO3	Nokia	Verte Oy	Nutrient circulation, wood-based bioeconomy and circular economy, energy and fuels based on bioeconomy and circular economy, technical circulation
Kilpilahti industrial area	Porvoo	Posintra Oy	Oil products, renewable products and fuels, gas, plastic products and raw materials for plastic products.
Pori-Harjavalta industrial park	Pori, Harjavalta	Prizztech Oy	Production of chemicals and metal products, machine industry
Metsäjaanu	Salo	Yrityssalo Oy	Cleantech companies
Envi Grow Park	Forssa	Forssan Yrityskehitys Oy	Waste management, food industry, construction industry
Patokangas bio-industrial park	Kemijärvi	Kemijärven Kehitys Oy	Bioeconomy and circular economy

Eco-industrial parks in Finland



**The following parties have contributed
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