International LUMAT conference: FUTURE CHALLENGES OF INTEGRATED LAND MANAGEMENT, Brdo pri Kranju 25.9.2018

Industrial symbiosis in Kranj City Municipality

Assoc. Prof. Dr. Lučka Ažman Momirski, University of Ljubljana

LUMAT Slovenia: Pilot project

The objective of the pilot project is to stimulate industrial symbiosis (IS) based on management of industrial sites (degraded urban areas (DUOs) and business zones) in the Municipality of Kranj.

To strengthen integral land management in the municipality, but also in functional urban areas (FUO), can be achieved by directing development within already urbanized areas, limiting interventions in greenfield areas, and finding spatial solutions outside the administrative borders of municipalities and regions, all due to the goal of implementing sustainable land use.

INDUSTRIAL SYMBIOSIS (IS)

An industrial ecosystem can function analogously to a biological ecosystem.

Part of an industrial ecosystem is IS, which engages “traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water and by-products.

The keys to IS are collaboration and the synergistic possibilities offered by geographic proximity.”

INDUSTRIAL SYMBIOSES ARE A PART OF THE CIRCULAR ECONOMY

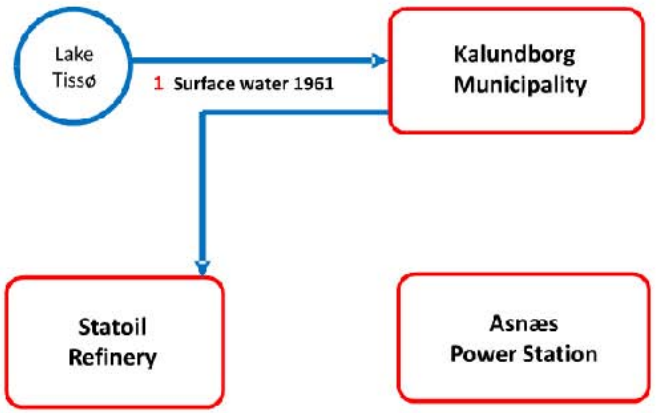
ISs create value for both companies and society by increasing competitiveness, reducing resource consumption and benefiting the economy, the climate and the environment.

MODELS OF INDUSTRIAL SYMBIOSIS

Two models of IS exist:
- the self-organized IS model and
- the planned IS model.

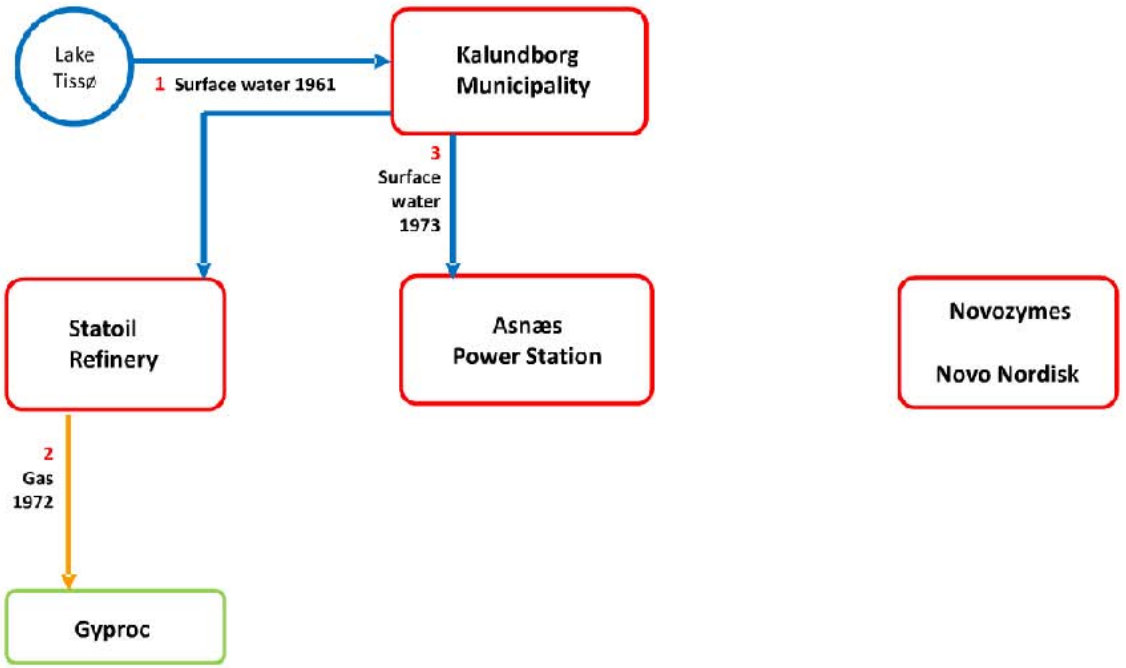
The paradigmatic example of **the first model** is Kalundborg, Denmark. Kalundborg evolved as a series of bilateral linkages over 30 years.

kalundborg 1961



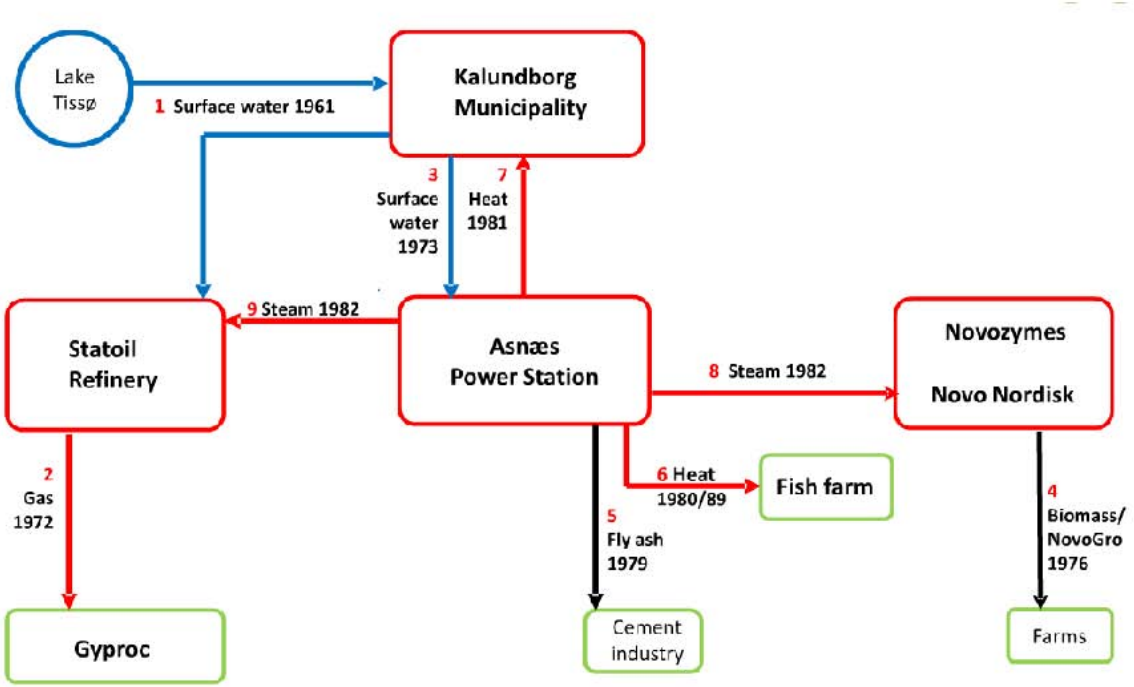
https://www.slideshare.net/slaura/industrial-symbiosis-1973612

kalundborg 1972



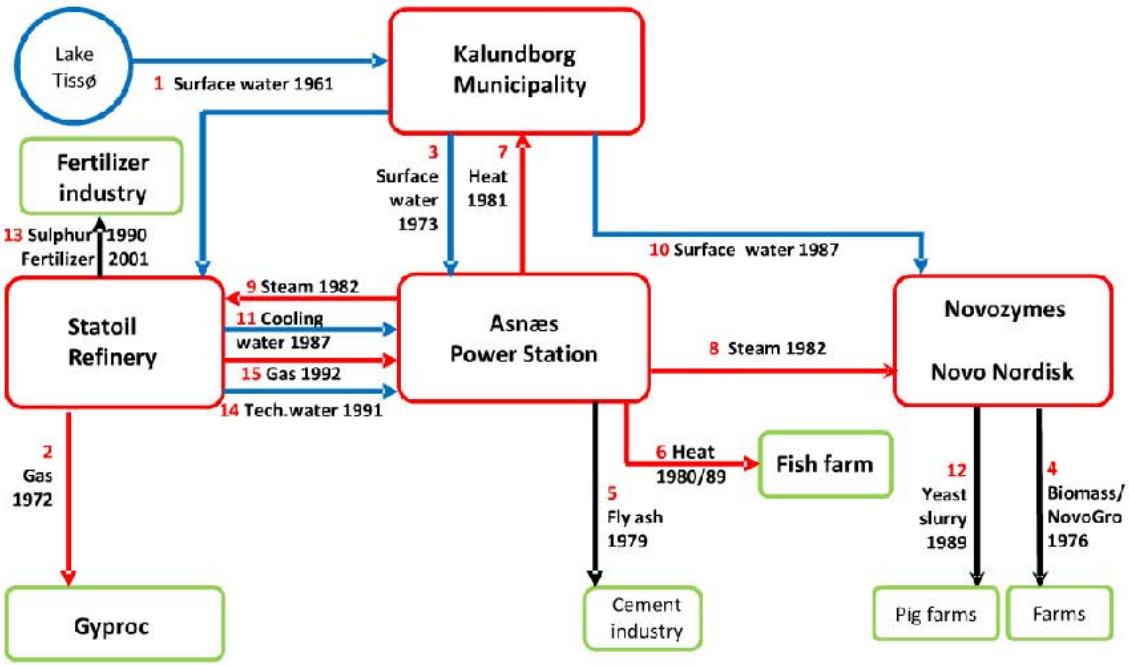
https://www.slideshare.net/slaura/industrial-symbiosis-1973612

kalundborg 1982



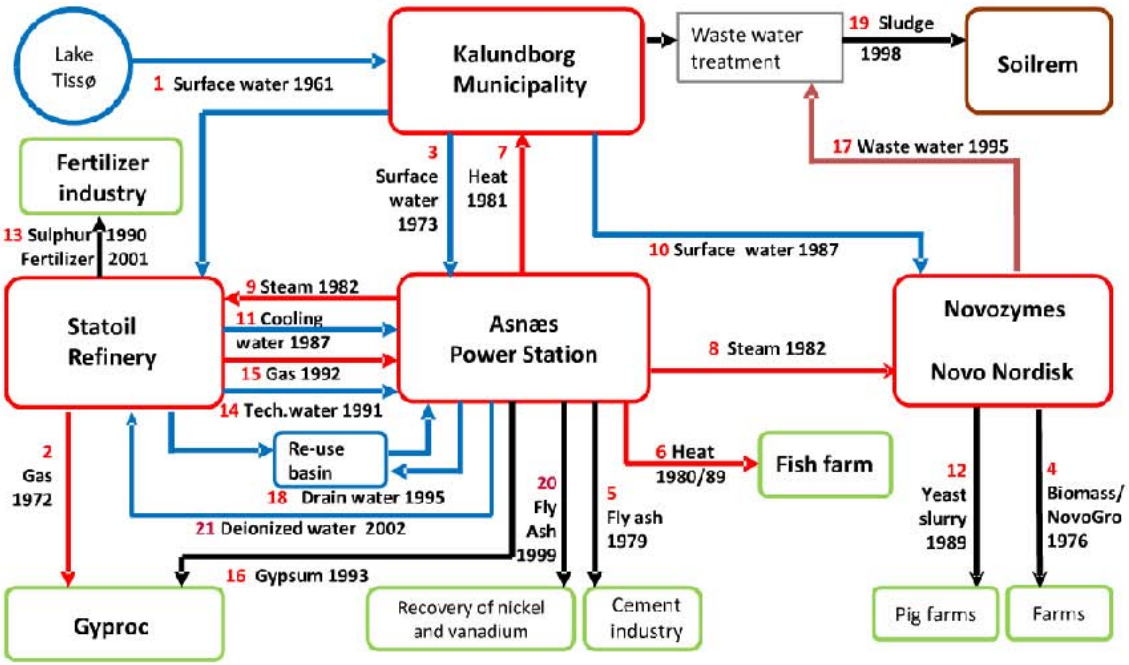
https://www.slideshare.net/slaura/industrial-symbiosis-1973612

kalundborg 1992



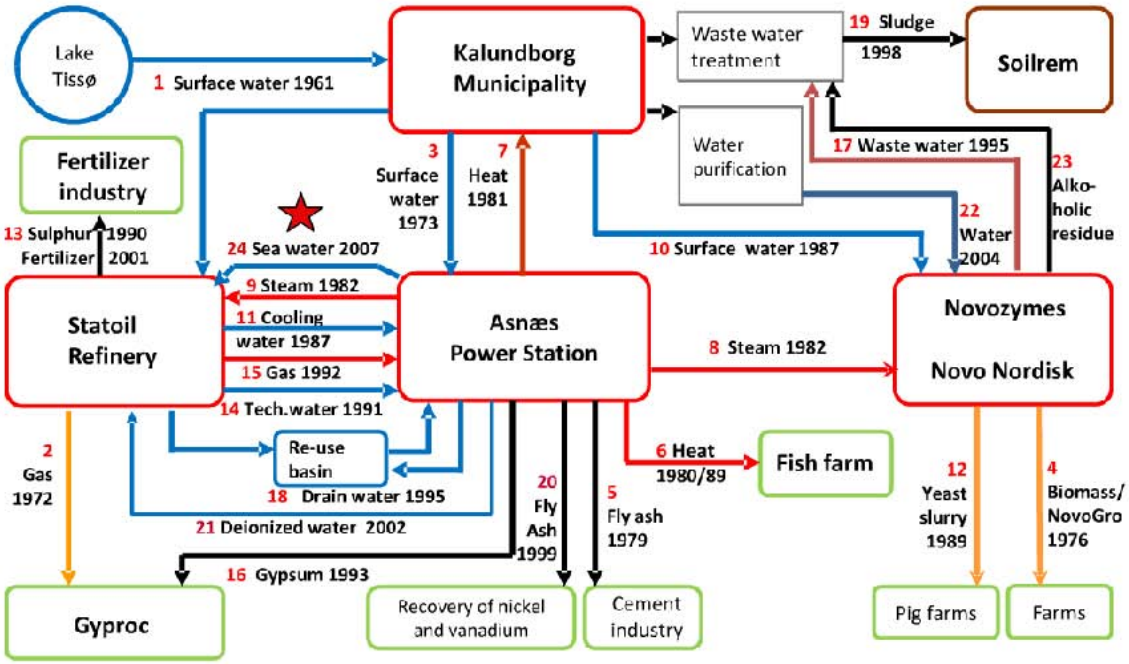
https://www.slideshare.net/slaura/industrial-symbiosis-1973612

kalundborg 2002



https://www.slideshare.net/slaura/industrial-symbiosis-1973612

kalundborg 2007



https://www.slideshare.net/slaura/industrial-symbiosis-1973612

https://www.slideshare.net/slaura/industrial-symbiosis-1973612

https://www.slideshare.net/slaura/industrial-symbiosis-1973612

https://www.slideshare.net/slaura/industrial-symbiosis-1973612

CAN KALUNDBORG SERVE AS A MODEL FOR LAND-USE PLANNING IN THE DEVELOPMENT OF IS IN OTHER CITIES?

Kalundborg's IS development is a greenfield development that cannot be seen as a model for land-use planning, especially not in urban areas where there are many degraded areas that are also potential sites for the development of new commercial and industrial areas.

The sustainable development of industrial activities therefore concentrated exclusively on the production process, but not on sustainable spatial planning and soil protection.

The second model is a conscious decision to identify various industrial companies that can share resources at the same location.

Interest in IS applications in the form of eco-industrial parks has developed for various purposes, including revitalizing urban and rural sites, the transformation of brownfield sites, and promoting sustainable development.

ECO-INDUSTRIAL PARK

The USPCSD (1997) has published the definition of an eco-industrial park:

it is a community of companies working together and with the local community to effectively share resources (information, materials, water, energy, infrastructure, and natural habitats), leading to economic gain, improved environmental quality, and equity in improving human resources for the economy and the local community. An industrial zone that establishes an effective exchange of raw materials and energy between economic entities (analogous to a low-waste or waste-free zone) is called an **eco-industrial zone or eco-industrial park**. The eco-industrial / economic zone is thus the place where the processes of IS can take place.

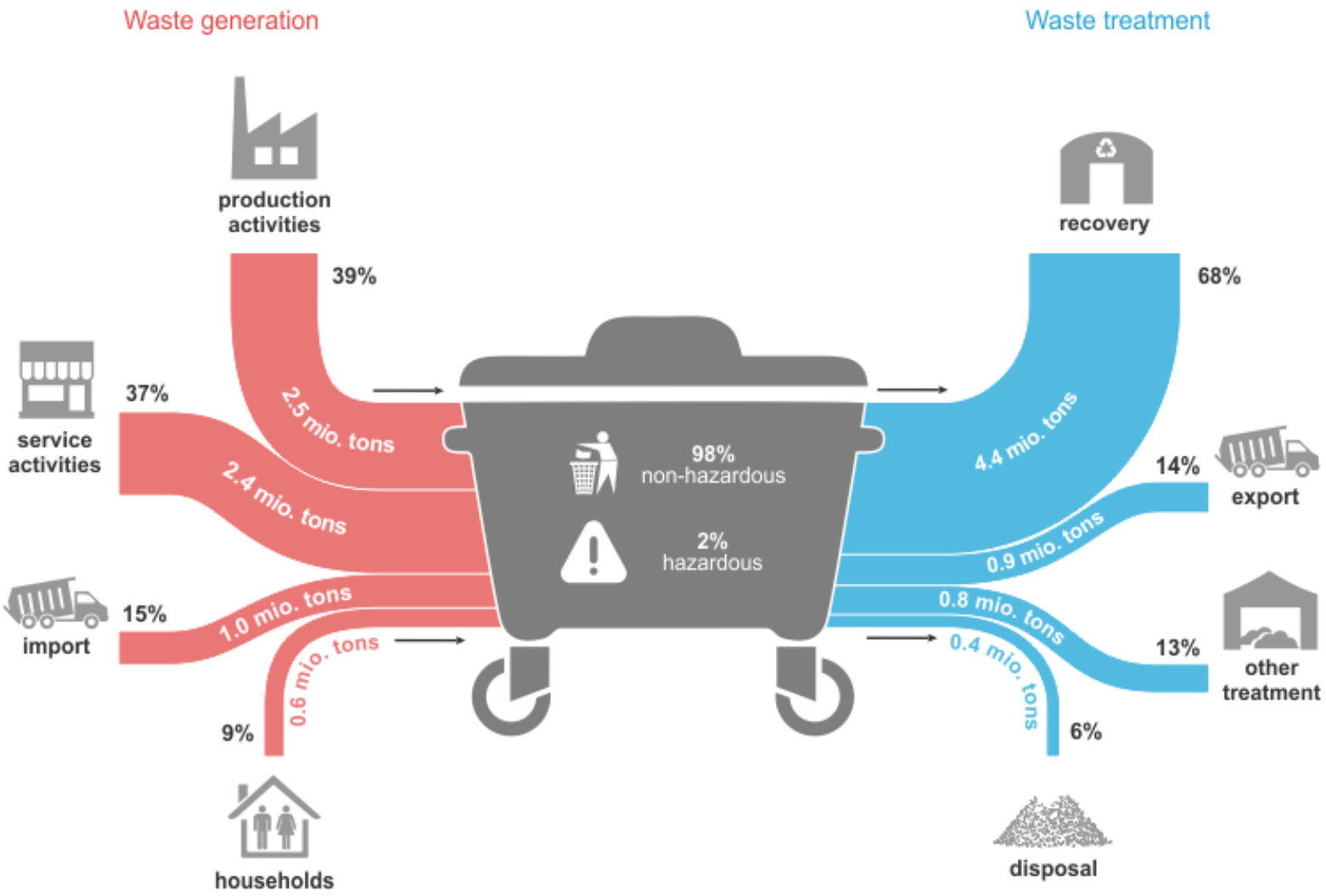
Slovenia: THE CIRCULAR ECONOMY RANKING

Municipal waste:	**1**5th out of 28 countries
Food waste:	1st
Recycling rate:	2nd
Trade in recyclable raw materials:	2nd
Material reuse rate:	13th
Patents:	23rd
Private investment:	20th

Since 2013 Slovenia has a web application titled **IS-Wastes** for electronic monitoring of waste.

https://www.politico.eu/article/ranking-how-eu-countries-do-with-the-circular-economy/

Waste stream, Slovenia, 2016



http://www.stat.si/StatWeb/News/Index/7099

Most of the waste from production activities in Slovenia is mineral waste.

Less than half of waste is recycled.
Waste management covers recovery, disposal, export, and other waste treatment operations. Other treatment includes temporary storage and preparation of waste (sorting) for final treatment operations. The aim is to reduce the amount of waste generated, and already generated waste should be prepared for reuse, recycled or otherwise recovered, but should not be disposed of in the landfill sites.

Of all waste generated in and imported to Slovenia, 62% of wood waste, 33% of chemical and medical waste and 16% of plastic, rubber and textile waste were used as fuel for the purpose of energy production.

hhttps://www.stat.si/StatWeb/en/News/Index/7067tt

ACTIVITIES FOR PILOT ACTION:

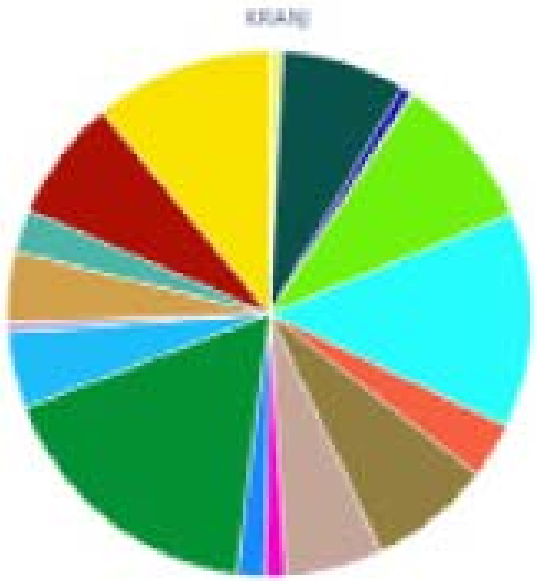
Selection of the most important materials and activities in IS in Slovenia, including an overview of established networks, European projects and programs, published documents, surveys of the topic, consultations, cases of circular economies in cities, study projects dealing with IS issues, and research and discussion articles on IS in Slovenia.

The key finding of the review is that the understanding of the IS process is still nascent in Slovenia.

The connection between IS and spatial indicators has not been worked out.

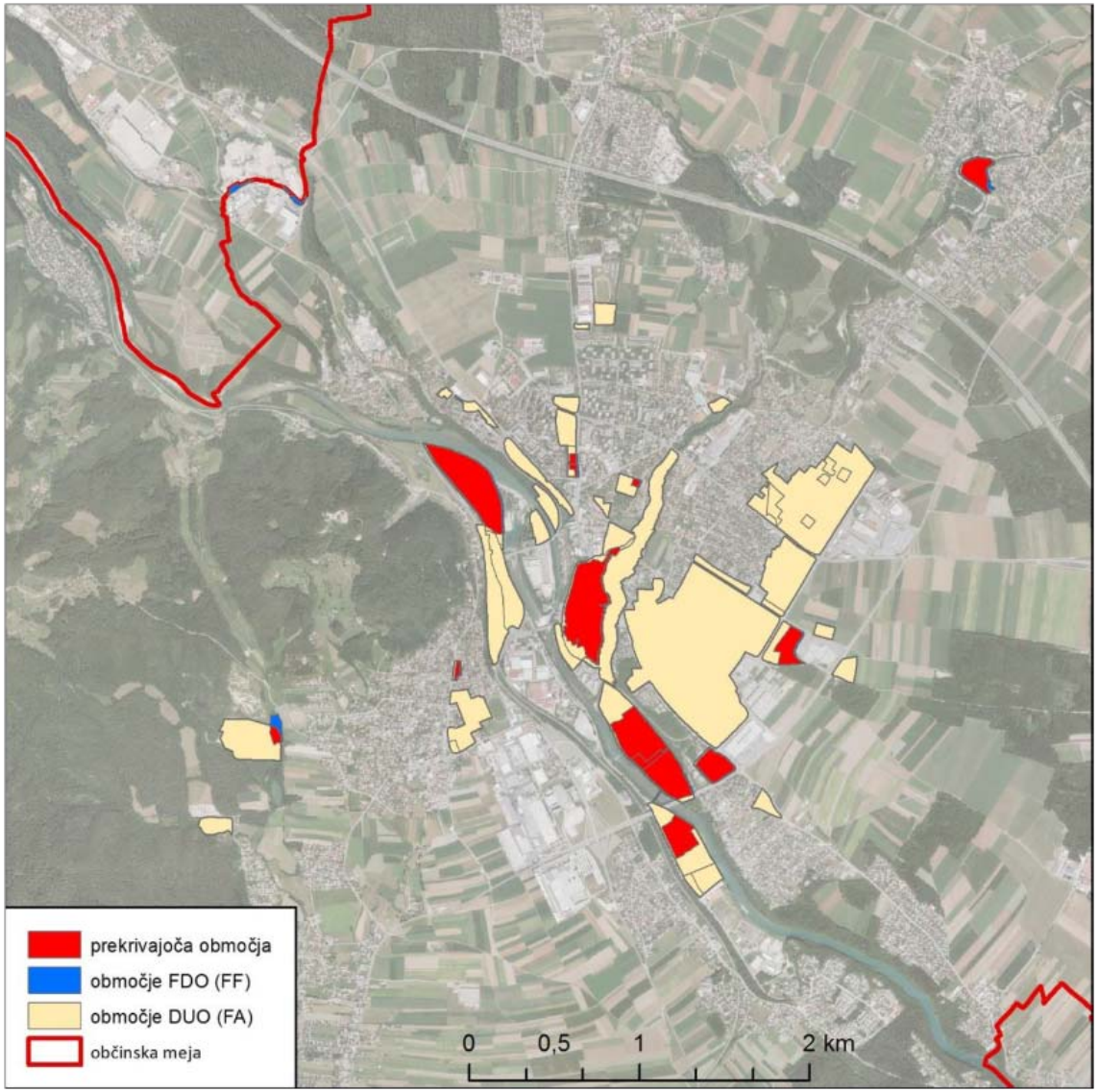
A list of major companies in the Municipality of Kranj in terms of the type and quantity of waste generated by business activities has been prepared.

	COMPANIES
WASTE PROCESSING	16
WASTE DISPOSAL	2
WASTE COLLECTORS	6
WASTE MANAGERS	5
BIOLOGICAL WASTES TO COMPOST PROCESSING	1
WASTE DEALERS	8

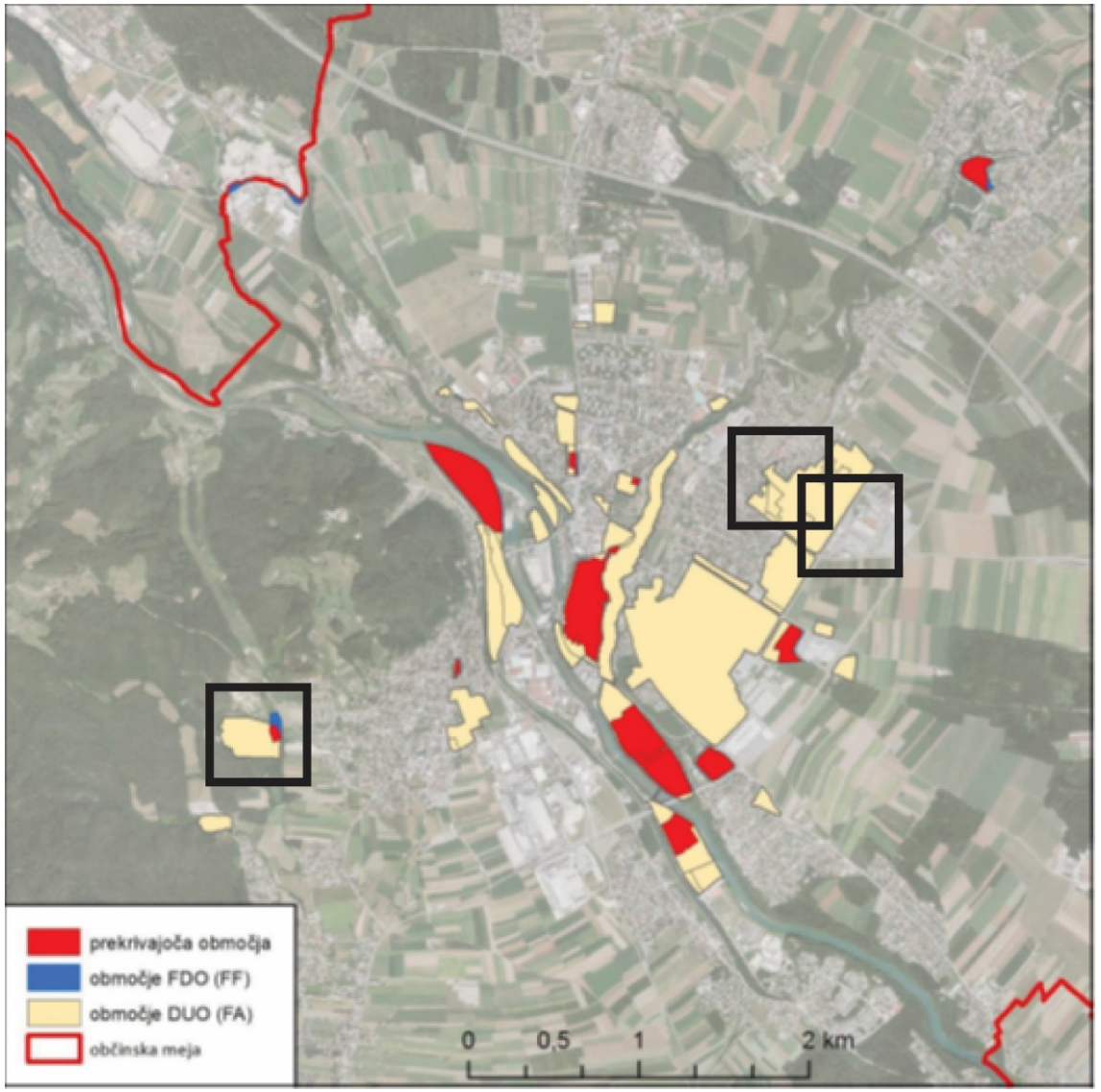


List of the main waste operators in selected municipalities, depending on the type of waste generated by undertakings in carrying out their production or service activities and waste treatment.

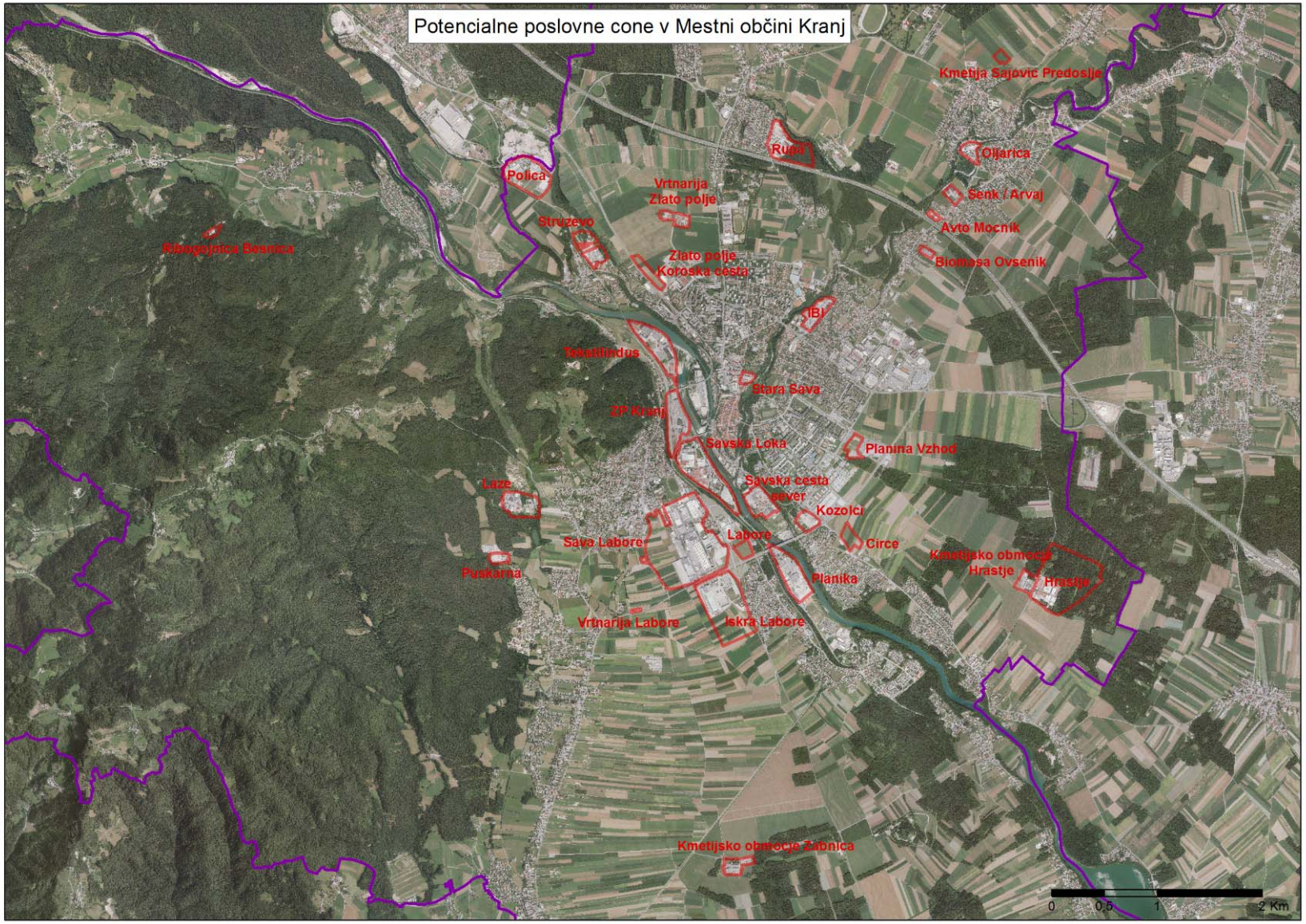
Waste	Kranj (n)	Celje (n)	Novo Mesto (n)	Nova Gorica (n)
PROCESSING	16	12	11	5
DISPOSAL	2	3	2	0
COLLECTORS	6	12	4	4
MANAGERS	5	20	5	4
DEALERS	8	21	5	8



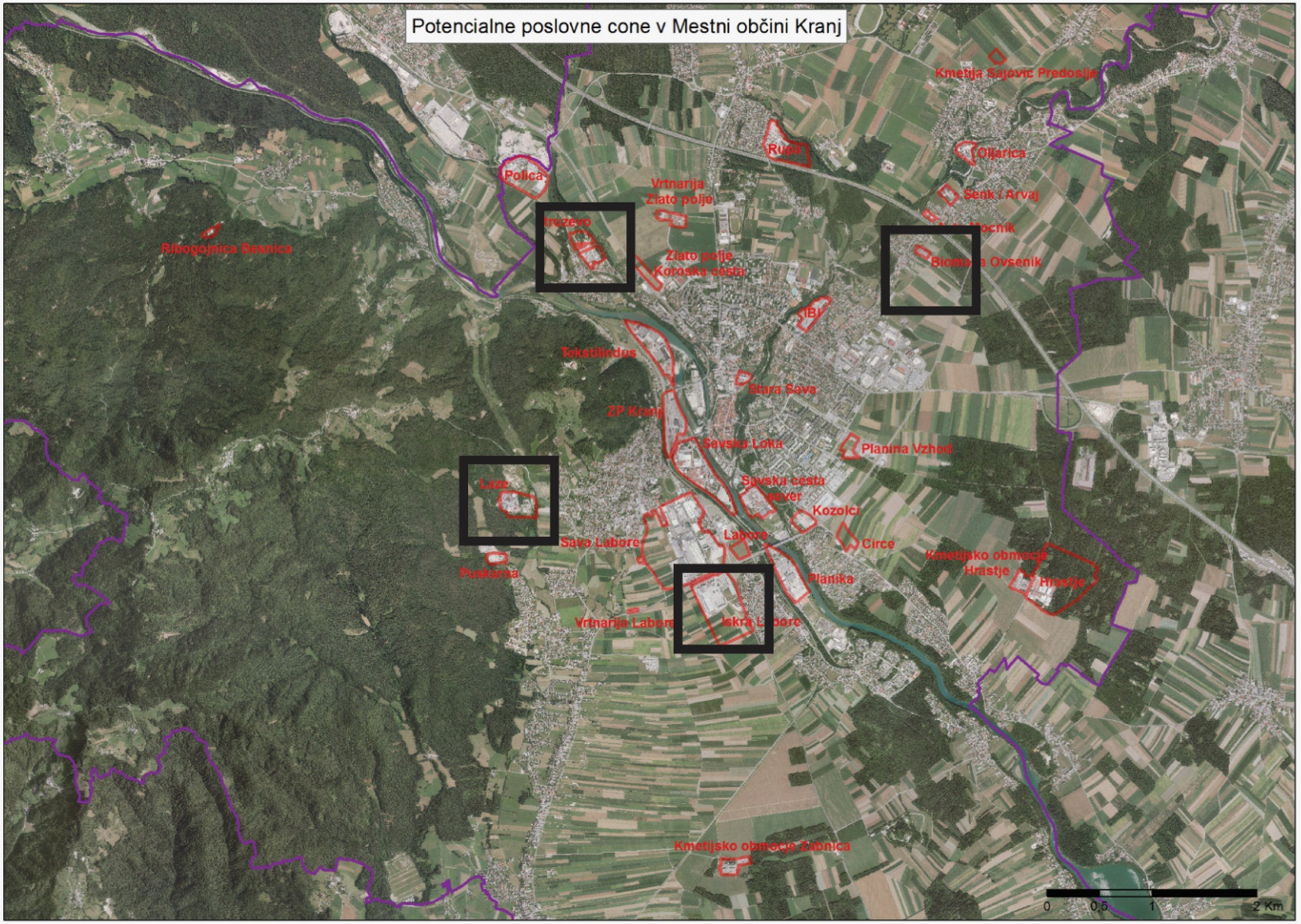
Degraded urban areas in Kranj City Municipality



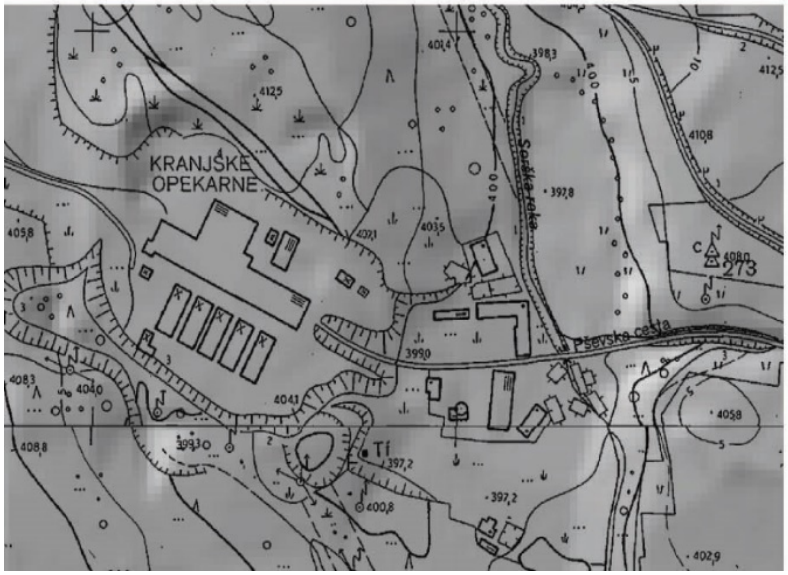
Potential sites of developing IS on degraded urban areas in Kranj City Municipality

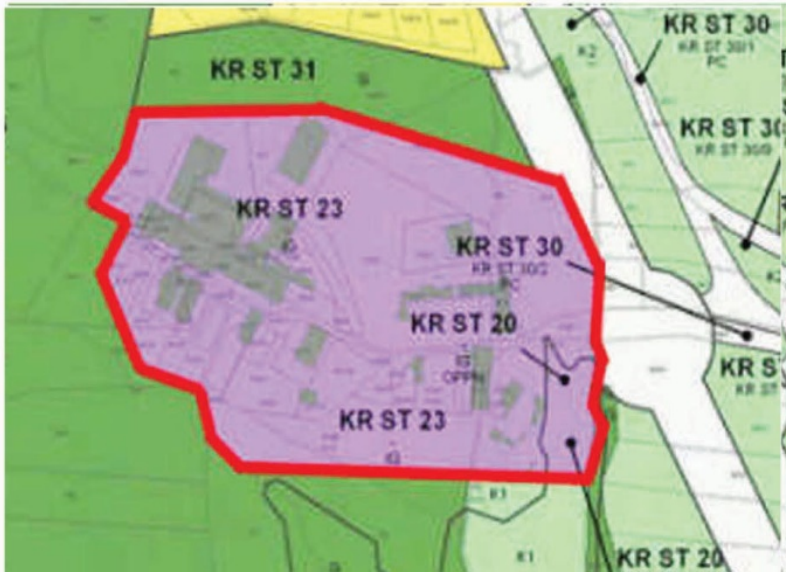


Potential business zones in Kranj City Municipality



Potential business zones with IS relevance in Kranj City Municipality





The Laze industrial zone in the western part of Kranj:
1. Orthophoto in 2006;
2. Orthophoto in 2015 and the expansion of zone facilities;
3. Industrial buildings within the zone;
4. Municipal Spatial Plan.

At the existing site in Laze in the western part of Kranj, there are up to three companies dealing with waste in various categories.

Most of the area is equipped with facilities, and the rest is uninhabited forest areas. In addition to a planned road bypass, the zone has satisfactory supply facilities, but only a few free spaces. The ST 20 area is not suitable for business development.

The east part of the area belongs to a functional degraded area of industrial activities according to the FF methodology.

According to the FA methodology, the entire zone is classified as degraded urban area for two reasons: physical and functional degradation.

ACTIVE IS COULD PREVENT THE DEFINED DEGRADATIONS

The corresponding land use, including the phenomenon of IS also defined in spatial documents, would encourage the siting of companies interested in developing this industrial activity in the area.

The synergy of the companies—all connected with recycling components and materials—could make it possible to survive and even grow.

Moreover, the distances between the companies involved in the symbiosis would remain short and consequently the costs of the byproducts would not become higher than the costs of virgin raw materials, and so the companies would maintain their competitiveness.

Model of waste exchange:

- **Internal exchange**
- **External exchange**

Model of generated co-products:

- **From internal sources**
- **From external sources**

Model of business activities of waste exchange, based on:

- **Web platforms**
- **Establishing new companies based on IS**

SYMBIOSES ARE CREATED BY A PROCESS IN PARTNERSHIPS

Industrial symbioses are an effective green growth model.

It reduces production costs and increases competitiveness and growth potential.

But it takes time to create symbioses.

It requires a lot of data, mutual trust between parties, new knowledge, a network and ongoing facilitation, and support.

https://symbiosecenter.dk/en/the-process/