



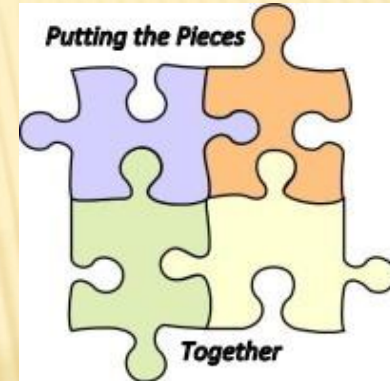
MUNICIPAL SOLID WASTE MANAGEMENT IN THE CONTEXT OF INDUSTRIAL ECOLOGY: THE CASE STUDY OF ATHENS - GREECE

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Outline of the presentation



- ❖ The context of Industrial Ecology (IE)
 - IE: definition and principles
 - Eco-Industrial Parks (EIP) and industrial symbiosis
 - Natural ecosystems vs industrial ecosystems
- ❖ Connecting the integrated Municipal Solid Waste (MSW) management to IE
 - Waste Framework Directive and IE
 - Municipalities, MSW management and IE
- ❖ Conclusions and discussion

The context of IE (1/3)

In general terms IE proposes:

- a) industrial systems to mimic biological ecosystems and
- b) to transform entire industrial production from a linear path to a circular one.

All definitions agree more or less on three basic elements:

- ✓ the systems' view
- ✓ b) the study of the energy and matter flows (except the economic ones) in the industrial system and
- ✓ c) the relation between IE and technological dynamic.

BUT...



(implementation gap)

The context of IE (2/3)

An EIP is defined as: "a community of businesses that co-operate with each other and with the local community to efficiently share resources (information, materials, water, energy, infrastructure and natural habitat), leading to economic gains, gains in environmental quality and equitable enhancement of human resources for business and local community"

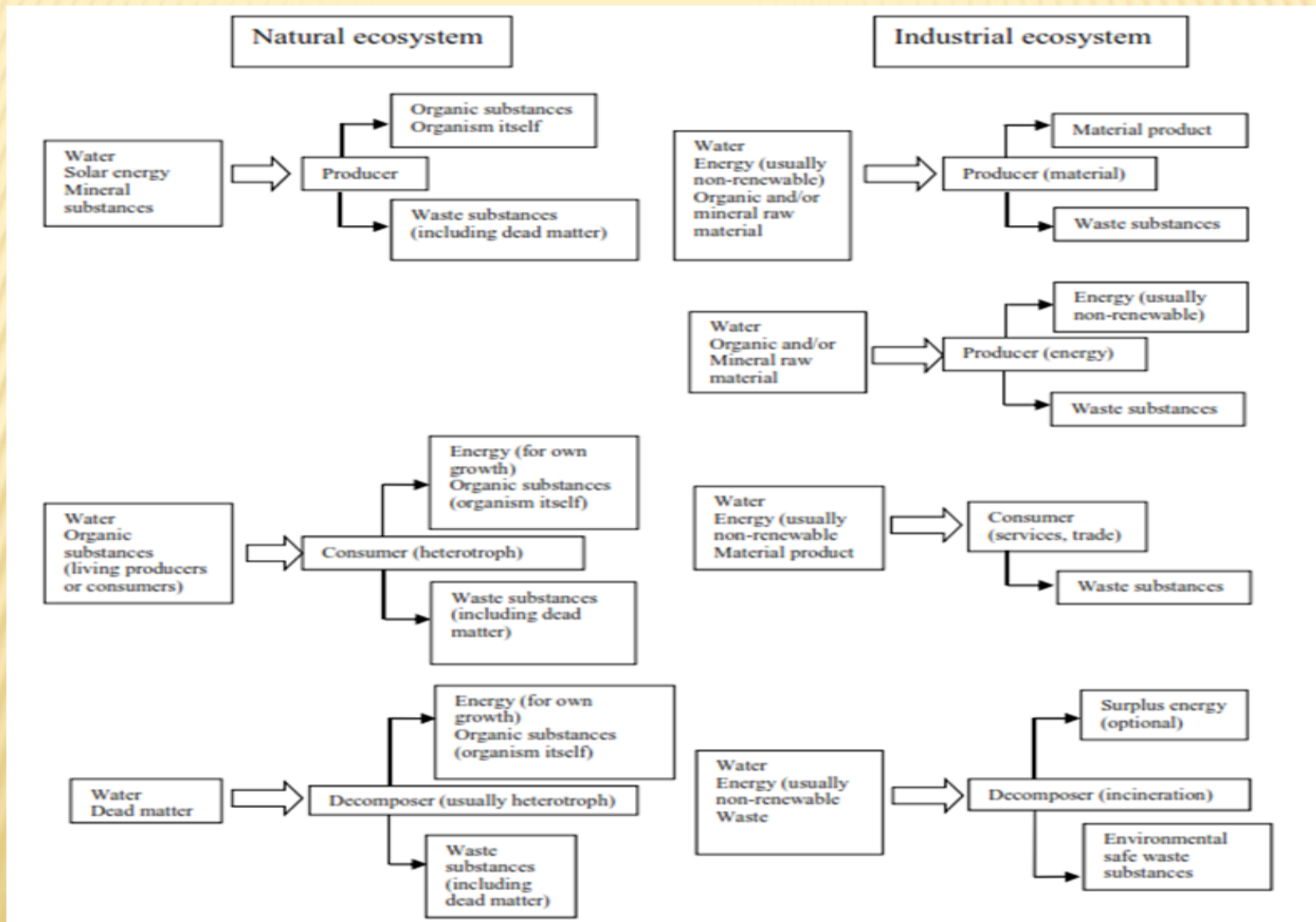


Natural and industrial ecosystem principles

- ✓ Roundput
- ✓ Diversity
- ✓ Locality
- ✓ Gradual change

The context of IE (3/3)

Activities of producers, consumers and decomposers in the natural ecosystems vs industrial ecosystems regarding material and energy flows



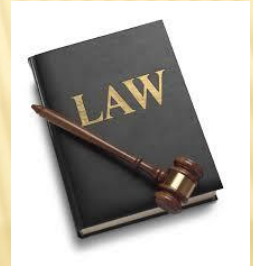
Connecting the integrated MSW management to IE (1/2)



The term "industrial" as part of "industrial ecology", is referred to all human activities of modern society and includes activities such as tourism, manufacturing, household, medical services, transport, agriculture and waste management.

In this context MSW facilities can be regarded as any other industrial plant, possibly in a higher complexity context, as the waste will be produced anyway necessitating some type of treatment.

Connecting the integrated MSW management to IE (2/2)



The articles of **Waste Framework Directive (2008/98/EU)**, in line with the conceptual framework of IE are:

Article 5. Clear distinction between waste and by-products. This distinction is crucial for the transportation and use of materials recovered from waste (e.g. dry recyclables, RDF, compost), as these products can move freely within the EU, while waste are subject to strict regulations.

Article 6. End of waste status. Certain specified waste shall cease to be waste when it has undergone a recovery, including recycling, operation and complies with specific criteria to be developed in accordance specific conditions.

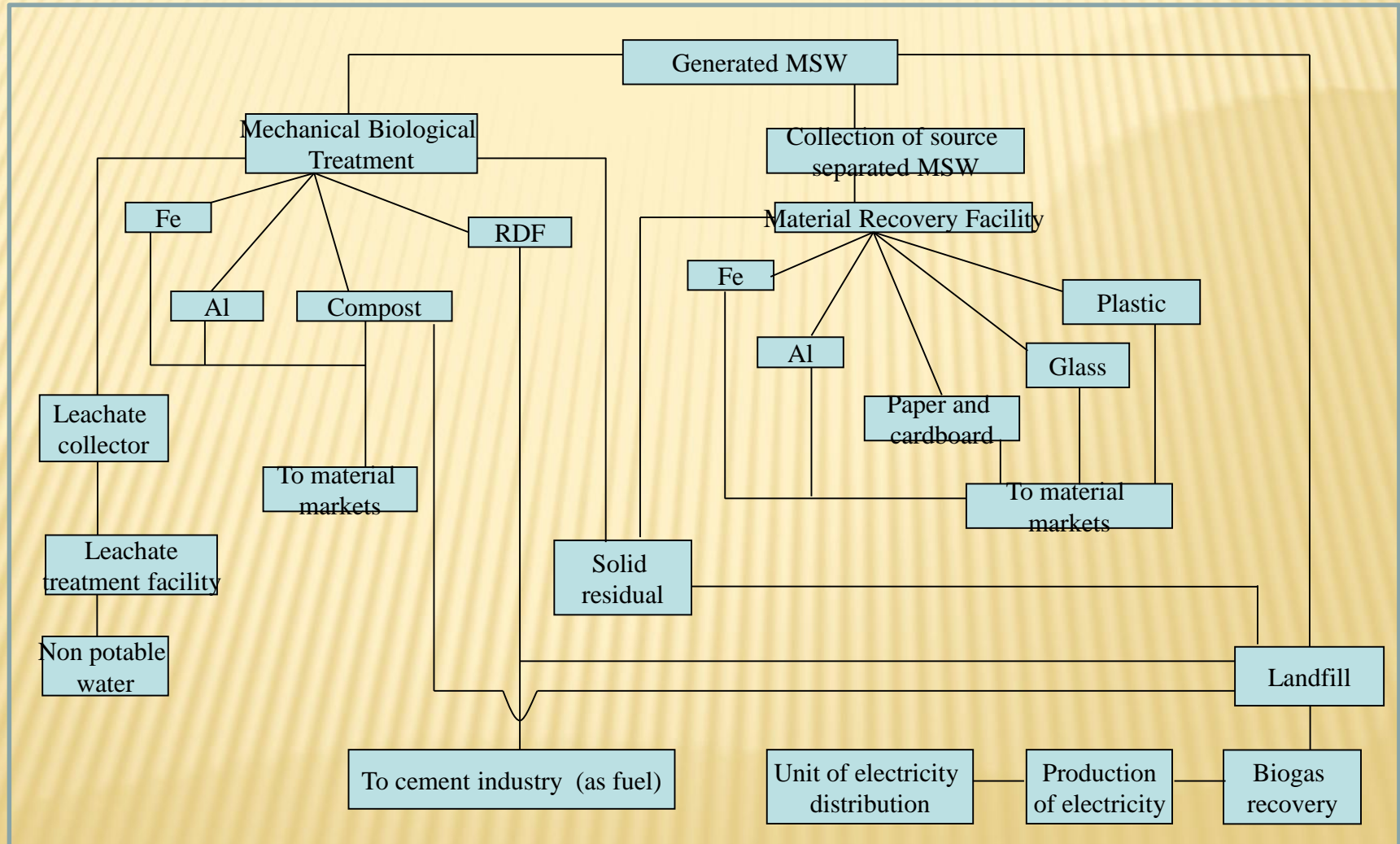
Article 8. Extended producer responsibility.

Article 16. Principles of self-sufficiency and proximity.

Article 38 (and 16). Interpretation and adaptation to technical progress.

Articles 7, 23, 26, 28, 34, 35 (Indicatively). Requirements for a complete recording system, record keeping and monitoring of the physical flow of waste by establishing specific management plans

Flow chart of MSW management in Greater Area of Athens - Greece



Some remarks



- ✓ These installations could act as a core of an EIP that operates exchanging by-products (waste), coming by urban metabolism or by a waste facility that is located in a close distance.
- ✓ The existing material and energy “pipelines” are not sufficiently operate.
- ✓ There is need to establish more interconnecting material and energy “pipelines” between neighboring facilities, enterprises and urban web.
- ✓ The theoretical context of IE includes this kind of EIP under the name “Integrated Resources Recovery Parks”.
- ✓ The construction of an EIP of any kind, relatively close to a city, represents a positive development because it helps to improve urban energy efficiency and sustainability.

The crucial question

which key factor will take the responsibility to inform stakeholders about the establishment and operation of an EIP, the possible co-operations and possible mutual benefits?



Local authorities...

could fulfill this role. Ideally, they can:

- ✓ provide institutional, political and decision-making support
- ✓ educate the stakeholders
- ✓ establish and coordinate a database concerning material, energy and information flows and
- ✓ act in a sustainable way thinking in terms of environmental protection, economic profit and social acceptance.

This is a task that is difficult to be accomplished by a private company which usually focuses on profit besides the fact the competitors will not trust it.

AND THE
WINNERS ARE ...



Conclusions and discussion (1/2)



Proportions between MSW management and IE concept

MSW management	IE concept
Urban area, municipal organizations that are responsible for collection, treatment e.t.c.	Industrial consumer or Physical anchor tenant
Local authorities	Institutional anchor tenant
MBT + MRF+ landfill site + products of treatment	EIP
MSW	waste

Conclusions and discussion (2/2)



- ✓ The redefinition of the waste lends economic value, while until now were viewed as worthless and burdened the companies with the disposal costs.
- ✓ Reducing the waste stream means reducing their environmental impact, management costs and cost of compliance to the strict legislative framework.
- ✓ The cooperating enterprises can create new jobs and promote their pro-environmental image.
- ✓ If the industrial symbiosis proved successful and socially accepted, would reduce the need for strict separation of integrated MSW management facilities and urban areas and the fuel consumption associated with transport of MSW management system.



Thank you for your attention

