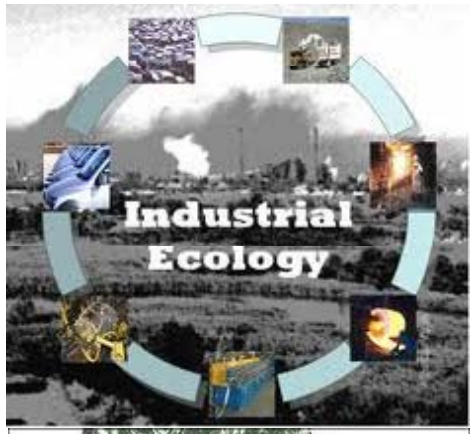
Evolution of Mediterranean Industrial Areas: status and perspectives

Mediterranean Eco-Industrial Development

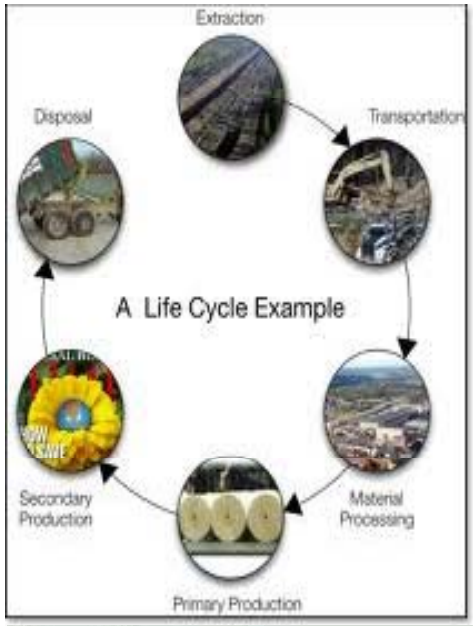
Industrial Ecosystem

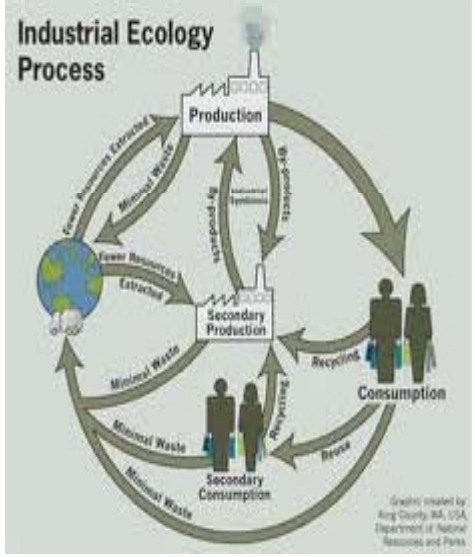
- **Industrial Ecosystem—Robert Frosch and Nicholas Gallopoulos** (1989) provide the following definition "… the traditional model of industrial activity—in which individual manufacturing processes take in raw materials and generate products to be sold plus waste to be disposed of—should be transformed into a more integrated model: an industrial ecosystem. In such a system the consumption of energy and materials is optimized, waste generation is minimized and the effluents of one process serve as the raw material for another process."



Industrial Ecosystem

- An industrial ecosystem demonstrates the systematic approach to business that IE represents.
- The interactions among companies resemble the dynamics of natural ecosystems, where all materials are continually recycled.
- Industrial Ecosystem suggests that the designers of industrial systems can learn from the principles and dynamics of natural systems to better adapt their designs to ecological constraints and needs.



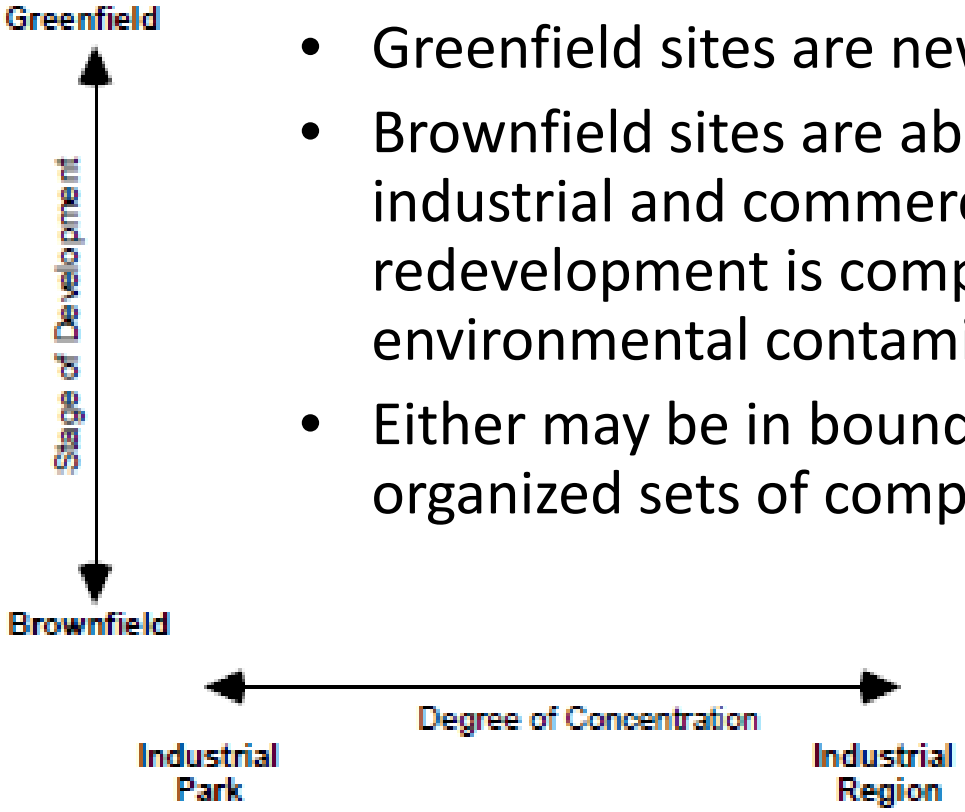


Industrial Park

- **Industrial Park—The term "industrial park" generally has a** restricted meaning in terms of geography and (usually) ownership,
- In general, is an area zoned and planned for the purpose of industrial development

Eco-Industrial Park

- Eco-Industrial Parks may be applied to local development initiatives across two dimensions: degrees of concentration of business and stage of development. Two critical dimensions for introducing the concept of industrial ecosystems exist.



  - Greenfield sites are new industrial developments.
  - Brownfield sites are abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination (EPA, 1995).
  - Either may be in bounded industrial parks or less organized sets of companies in an area/region (figure).

Eco-Industrial Park (EIP)

Benefits of EIPs

Communities embracing the EIP concept are seeking benefits for all public and private stakeholders.

- Business derives cost savings and new revenues; shared services; reduced regulatory burden; and increased competitiveness.
- The community enjoys a cleaner, healthier environment; business and job development; an attraction for recruitment; and an end to conflict between the economy and the environment.
- Government receives increased tax revenues; reduced enforcement burden; reduced costs of environmental and health damage; and reduced demand on municipal infrastructure.
- For the environment there is reduced demand on finite resources; decreased local and global pollution; increased use of renewable energy and materials; and an overall renewal of natural systems.

Eco-Industrial Park (EIP)

Strategies for Designing an Eco-Industrial Park

Several basic strategies are fundamental to developing an EIP or industrial ecosystem. Individually, each adds value; together they form a whole greater than the sum of its parts.

- *Integration into Natural Systems*
  - Design the EIP in harmony with the characteristics and constraints of local ecosystems; Minimize contributions to global environmental impacts, i.e. greenhouse gas emissions.
- *Energy Systems*
  - Maximize energy efficiency through facility design or rehabilitation, co-generation (the capture and use of otherwise wasted heat from the electrical generating process), and energy cascading (the use of residual heat in liquids or steam from a primary process to provide heating or cooling to a later process: steam from a power plant, for example, is used in a district heating system); Achieve higher efficiency through inter-plant energy flows; and Use renewable sources extensively.
- *Materials Flows and "Waste" Management for the Whole Site*
  - Emphasize pollution prevention, especially with toxics; Ensure maximum re-use and recycling of materials among EIP businesses; Reduce toxic materials risks through integrated site-level waste treatment; and Link the EIP to companies in the surrounding region as consumers and generators of usable byproducts via resource exchanges and recycling networks.

Eco-Industrial Park (EIP)

- *Water*
  - Design water flows to conserve resources and reduce pollution through strategies similar to those described for energy and materials.
- *Effective EIP Management*

  In addition to standard park service, recruitment, and maintenance functions, park management does the following:
  - Maintains the mix of companies needed to best use each others' by-products as companies change;
  - Supports improvement in environmental performance for individual companies and the park as a whole;
  - Operates a site-wide information system that supports inter-company communications, informs members of local environmental conditions, and provides feedback on EIP performance.
- *Construction/Rehabilitation*
  - New construction or rehabilitation of existing buildings follows best environmental practices in materials selection and building technology. These include recycling or reuse of materials and consideration of lifecycle environmental implications of materials and technologies.

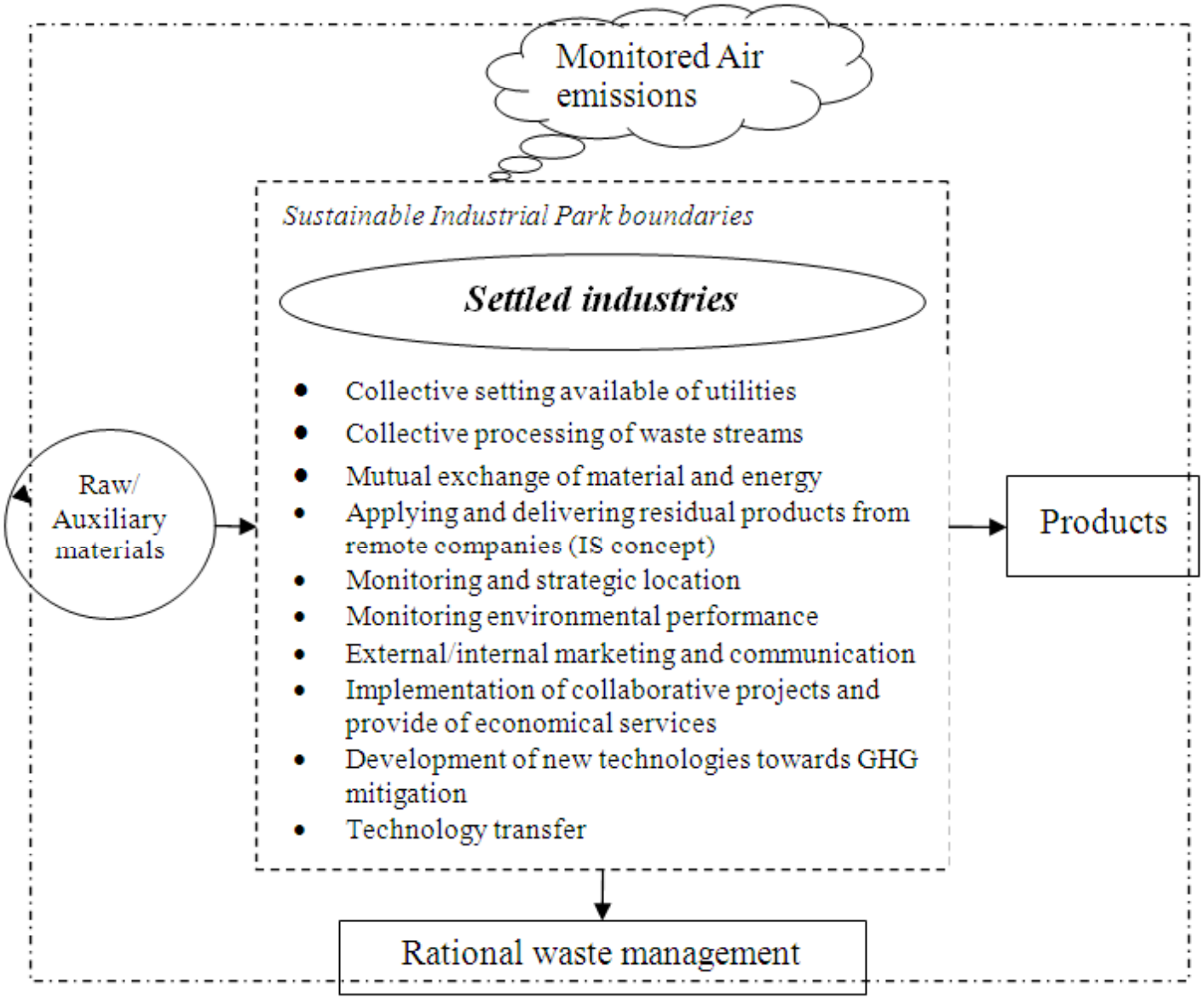
Eco-Industrial Park (EIP)

- **Themes for EIP development**

  A variety of eco-industrial parks organized around particular industrial themes. These include:

  – A resource recovery EIP
  – An agro-EIP
  – A renewable energy EIP
  – A petrochemical EIP
  – An EIP build around a coal-fired power plant

Industrial Symbiosis



Sustainable development

- Sustainable development is applied in three aspects:
  - Social
  - Economical
  - Environmental
- Sustainable development in *Industrial Sector* may be measured by various indicators.

Aspect	Environmental	Social	Economic
Measures	Greenhouses Gases Energy Requirements	Employment rate (classification according to education level) Services provided to employees	Economic services provided to settled enterprises Trade benefits
Indicators	kg CO_2/capita Energy Consumption/GDP	Employment growth (%) in the field area (Employees served)/(total IAs employees)	(Number of enterprises served)/Total number of enterprises) Benefits/capita
Actions	Investment in Clean Energy/new advanced technologies	IAs provide more social services	Implementation and compilation of financial improvement plans

Steps towards sustainability

- Sustainability could be built in Industrial Parks through four different paths by applying measures hierarchically.

Infrastructure and centralized services	1. Centralized infrastructure must ensure the reduction of costs 2. The settled enterprises must participate at the centralized environmental on a mandatory basis 3. Innovative support services to enterprises
Environmental and architectural quality of the buildings	1. Innovation in design 2. Materials, water and energy conservation\ 3. Indoor environment quality and occupational health 4. Mobility and transports

Steps towards sustainability

	Required steps
Management and organisational structure	1. Managing infrastructure 2. Commit enterprises to respect sustainability norms 3. Compilation of an environmental improvement plan 4. MC provides helpful services/infrastructure on a mandatory/voluntary basis 5. Sharing in the planning and management phase 6. Sharing the improvement objectives
Environmental Management of the Industrial Areas	1. Monitoring procedures 2. Environmental improvement plan 3. Environmental protection and prevention 4. Sustainability policy 5. Compilation of guidelines towards industrial symbiosis among settled industries

Industrial Sustainability

- Mediterranean area:
  - The existence of environmental services, social and economical services are still rather weak.
  - Italian and French IAs have already established internal guidelines towards sustainability, while implementation of sustainability principles in IAs in Greece, Malta, Bosnia and Herzegovina and Spain is still considered as a weak aspect.

Country	IA number	Region
Malta	7	Malta
Bosnia and Herzegovina	4	Municipality Žepče Tešanj Maglaj
Italy		Entire Padova area
Spain	15	Valencia
France	20	PACA region
Greece	15	Central and Northern Greece

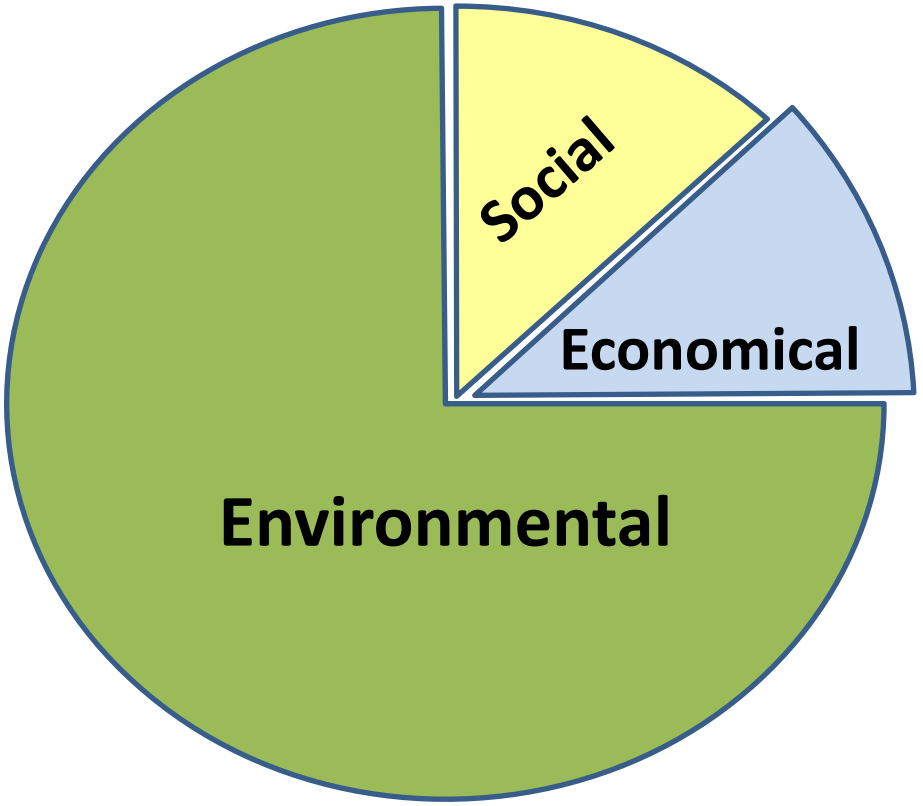
Results

- *Sections*
  - *i. Legislation*
  - *ii. Rules for IA planning*
  - *iii. Environmental management of IA*
  - *iv. Infrastructure and centralized services*
  - *v. Environmental and architectural quality of the buildings*

Sections	France	Italy	Greece	Bosnia	Malta	Spain
i.	Grenelle law	Bassanini law	Lack of sustainable norms	Federal Law 33/03 and 38/09	Malta Environment and Planning Authority	National law 38/1999
ii.	Local authorities	National law	National organizations	Local authorities	Cooperation of private and public sector	National General Urban Act
iii.	Managing Companies (MC) of areas are responsible for the environmental management; MC do not impose penalties			Municipal authorities	Weak issue	MC is responsible
iv.	Existence of Waste Water Treatment Plants, water management systems and individual plants for electricity generation from renewable sources (i.e. solar panels, biomass) Waste collection schemes					
v.	The environmental and architectural quality of the industrial buildings is still a very weak aspect.					

Next steps…

- In general, a lot of activities should be implemented in social and economical sectors.
- SMEs can have more benefits in terms of fostering eco-innovation, competitiveness and transnational cooperation.



Recommendations