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Industrial Symbiosis in the EU
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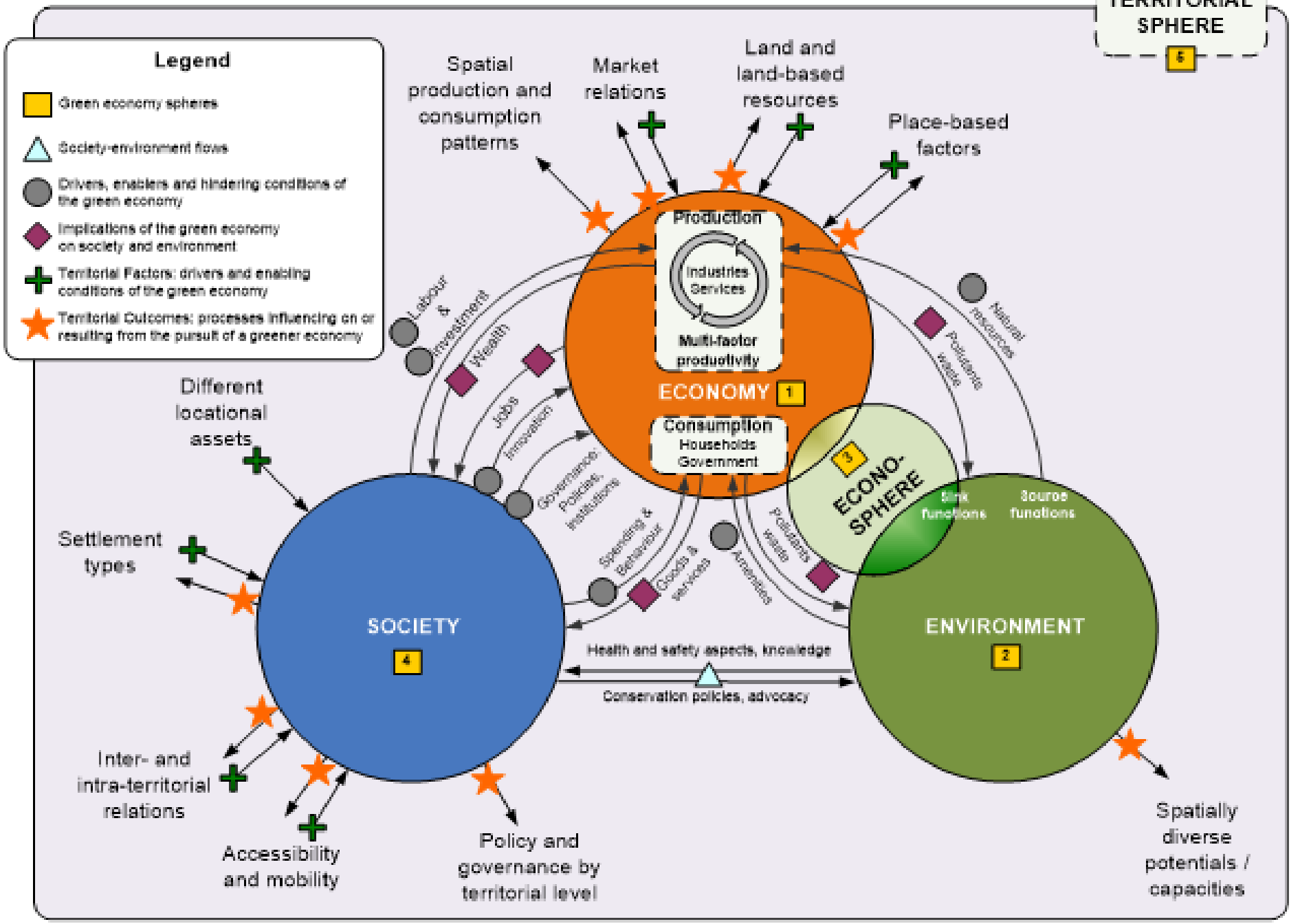
TERRITORIAL SPHERE
6
Legend
Green economy spheres
Society-environment flows
Drivers, enablers and hindering conditions of the green economy
Implications of the green economy on society and environment
Territorial Factors: drivers and enabling conditions of the green economy
Territorial Outcomes: processes influencing on or resulting from the pursuit of a greener economy
Spatial production and consumption patterns
Market relations
Land and land-based resources
Place-based factors
Production
Industries
Services
Multi-factor productivity
ECONOMY 1
Consumption
Households
Government
Labour & investment
Wealth
Jobs
Innovation
Governance, Policies, institutions
Spending & behaviour
Goods & services
Pollutants, waste
Natural resources
Amenities
ECONO-SPHERE
3
Sink functions
Source functions
Different locational assets
Settlement types
SOCIETY
4
ENVIRONMENT
2
Health and safety aspects, knowledge
Conservation policies, advocacy
Inter- and intra-territorial relations
Accessibility and mobility
Policy and governance by territorial level
Spatially diverse potentials / capacities

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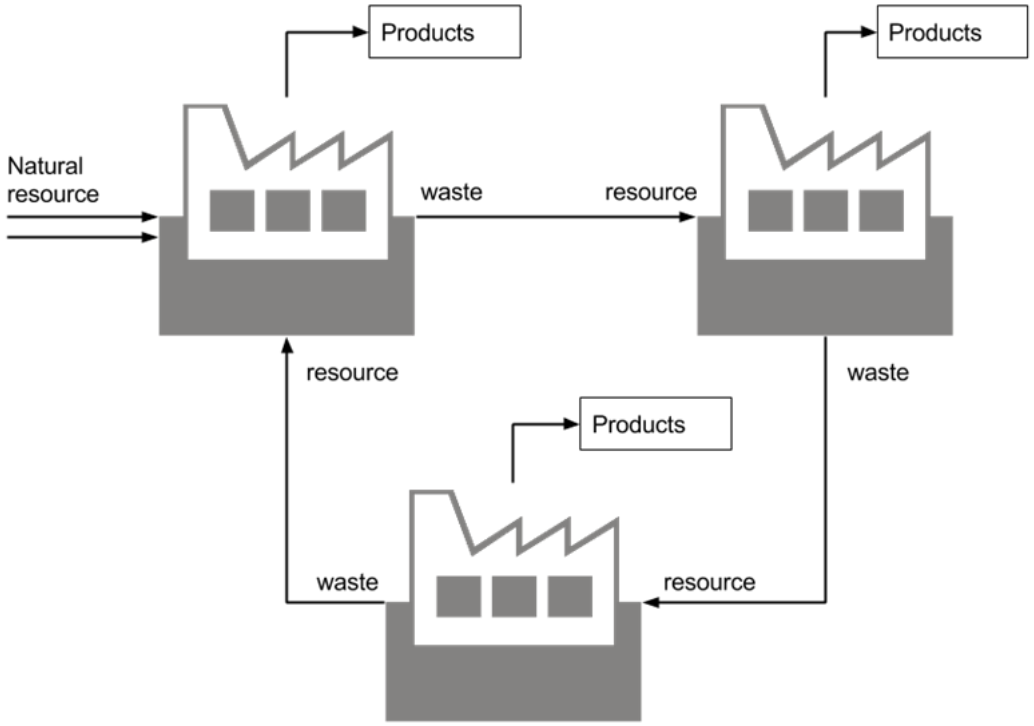
Contents

- Definition
- Illustration
- Difference between IS and Waste management/Recycling
- Typology of IS networks and models of emergence
- How does it happen?
- Type of intermediaries
- Set of support activities
- Examples of IS networks - National Industrial Symbiosis Programme (UK)
- NISP Structure
- Market failures and need for public intervention
- Case study – France
- Conclusions and lessons learned

Definition

- IS is a system approach to a more sustainable and integrated industrial system, which identifies business opportunities that leverage underutilised resources (materials, energy, water, capacity, expertise, assets etc.) (Lombardi, 2012).
- IS involves organisations operating in different sectors of activity that engage in mutually beneficial transactions to reuse waste and by-products, finding innovative ways to source inputs and optimizing the value of the residues of their processes.
- Physical exchanges tend to be at the core of IS, but aspects such as exchange of knowledge, expertise, capacity and logistics are also important in terms of economic and environmental advantages of IS. (Chertow, 2007)

Illustration of an IS network



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Difference between IS and Waste management/Recycling

- IS is not a specific approach for dealing with waste but rather a system approach that aims to understand material and energy flow in the industrial system and identify avenues for optimisation
- IS generally involves collaboration among different sectors of activity, driving technological development and innovation across sectors.
- Increasing the time the material/substance remain in the anthroposphere, before it becomes waste or is discharged to ecosystems
- Reducing the volume of waste sent to landfill or disposed of in nature, such as in the form of CO_2 emissions
- Increasing energy and material efficiency through further reuse and recycling of materials/substances/energy

Typology of IS networks and models of emergence

- **1) self-organised activity**, emerging as the result of direct interaction among industrial actors; there is a central actor
- **2) managed networks**, those that have a third party intermediary that coordinates the activity. (Baas 2011)

- 2a) facilitated networks - work with existing companies to raise awareness of IS and foster activity (coordination node)

- 2b) planned networks - networks are formed following a central plan or vision that includes attracting new businesses to purpose-built developments, offering shared infrastructures and services (generally apply to new developments).

How does it happen?

- **Self-organised networks** – 'uncovering' of IS, followed by an institutionalisation stage, that deepens collaboration, reciprocity and may lead to additional IS projects

- **Facilitated networks** - raising awareness among organisations that IS presents an opportunity. Coordinator becomes a central actor and facilitates the exchange of information and alliances

- **Three key stages in the evolution of networks**: regional efficiency, regional learning and sustainable industrial district. (Baas and Boons, 2004)

Type of intermediaries

- **Waste exchange web-based tools or portals** – very limited success

- **Hands-on support structures** –IS is supported by a team of experts or practitioners that engage with firms and other stakeholders for the purpose of the development of IS projects.

Set of support activities

- Facilitation of the exchange of knowledge between actors belonging to different sectors through a combination of methods including company waste audits, workshops, surveys and self reporting initiatives
- Provision of technical support to overcome potential technological or regulatory barriers in the implementation of IS solutions
- Promotion of inter-firm collaboration and innovation by opening up the possibilities of reuse and recycling treatments that go beyond more standard solutions
- Collection and assessment of resource data to inform opportunity identification.
- Feedback to government on potentially beneficial policy instruments that would be of assistance, reporting negative unintended consequences of regulation e.g. end-of-life definitions.

Examples of IS networks - National Industrial Symbiosis Programme (UK)

- NISP is considered the most successful facilitation structure;
- Exported to several countries in the EU;
- **Success factors:** 1) an enabling institutional framework, with well defined waste reduction targets and a combination of administrative and economic policy instruments; 2) a well-defined facilitation structure and 3) a multi-regional geographical scope.
- **Focus:**
  - *building up of information channels*
  - *analysing the potential synergies and exchanges*
  - *promotion and undertaking of pilot projects that show new potentialities*

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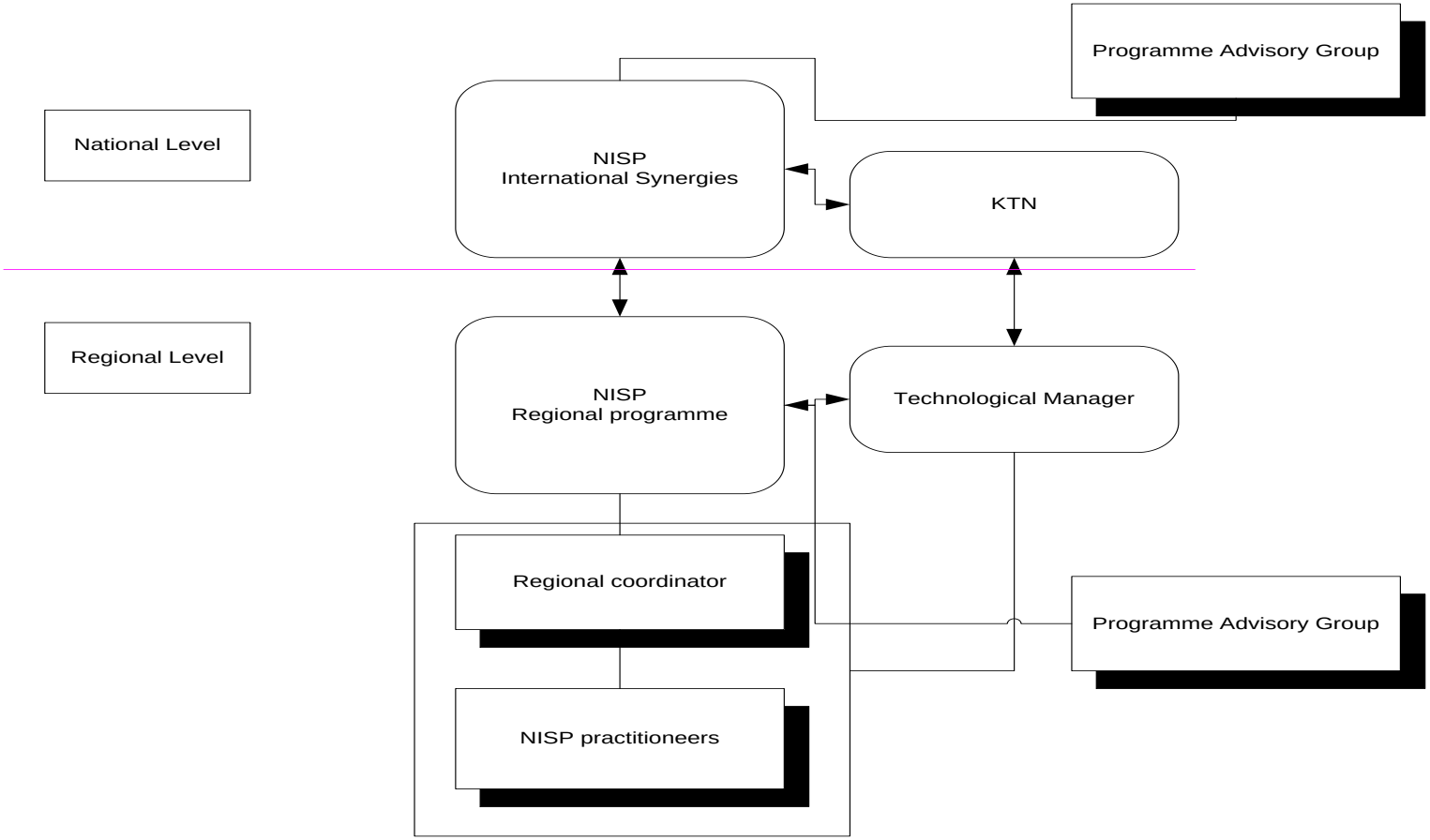
NISP Structure



Market failures and need for public intervention

- **Communicational** - lack of detailed knowledge of waste and resources produced and required by other sectors
- **Informational** - lack of personal networks to contact other potential partners
- **Economic** - landfill costs do not reflect the true cost of waste, uncertainty of the benefits derived
- **Risk** – benefits and costs difficult to determine ex-ante
- **Technological** - IS exchanges may pose some technological challenges
- **Regulatory** - obstacles to the exchange of by-products classified as waste
- **Time/space based** - transportation costs may discourage the exchange of bulky materials over long distances

Case study - France

- On the radar for many years, MoE funded actions on all levels
- **Governance** - National Industrial Symbiosis Committee
- **Main players:** regional authorities, chambers of commerce and industry, enterprises, business parks, associations
- **Tools:**
  - *Actif - allows the collection of material flows of the enterprises and the identification of potential local synergies*
  - *PNSI – bought NISP license*
  - *Comethe - a toolkit for the implementation of IS in industrial zones*
  - *Elipse - a toolkit for evaluating Industrial Symbiosis*

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Conclusions and lessons learned

- **Need for a professional local facilitator** – for a long-term sustainability there is a need to have a paid, professional facilitator
- **Local training and awareness raising -** on a territorial level, there is a need to set committees/working groups of key local IS players
- **Industrial symbiosis as a systemic approach** - not only about the exchange of wastes but also water, urban planning and transport
- **Political will and continuity** as a pre-condition for IS sustainability
- **Right to experiment.** Companies need to have the right to experiment IS approaches, test end-of-waste approaches
- **Change the mindset -** to start thinking of materials and design to move towards circularity

Thank you!