Feasibility of Industrial Symbiosis in Italy as an opportunity for economic development: Critical Success Factor analysis, impact and constraints of the specific Italian regulations

SYMBIOSIS International Conference 2014

Context: EMILIA-ROMAGNA HIGH TECHNOLOGY NETWORK

The **Ciri Energia e Ambiente (Interdepartmental Centre for the Industrial Research on Energy and Environment - Bologna University)** represents one of the most ambitious projects developed by Regione Emilia Romagna as part of the "High-technology Emilia Romagna network".

Emilia-Romagna Region, Universities of Bologna, Ferrara, Modena and Reggio Emilia and Parma, the National Research Council (CNR), the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), the Università Cattolica del Sacro Cuore and the Politecnico di Milano in Piacenza Campus have signed a framework agreement for the establishment of the regional High Technology Network based on the set-up created by Axis 1 Activity 1.1 within the ROP ERDF 2007-2013. The Network activities are coordinate by Aster consortium.

It includes industrial research laboratories and technology transfer and innovation centres, with the aim to create a qualified industrial research offer and provide practical solutions to meet business development needs (innovative products, more efficient processes, new technologies and skills)

EMILIA-ROMAGNA HIGH TECHNOLOGY NETWORK

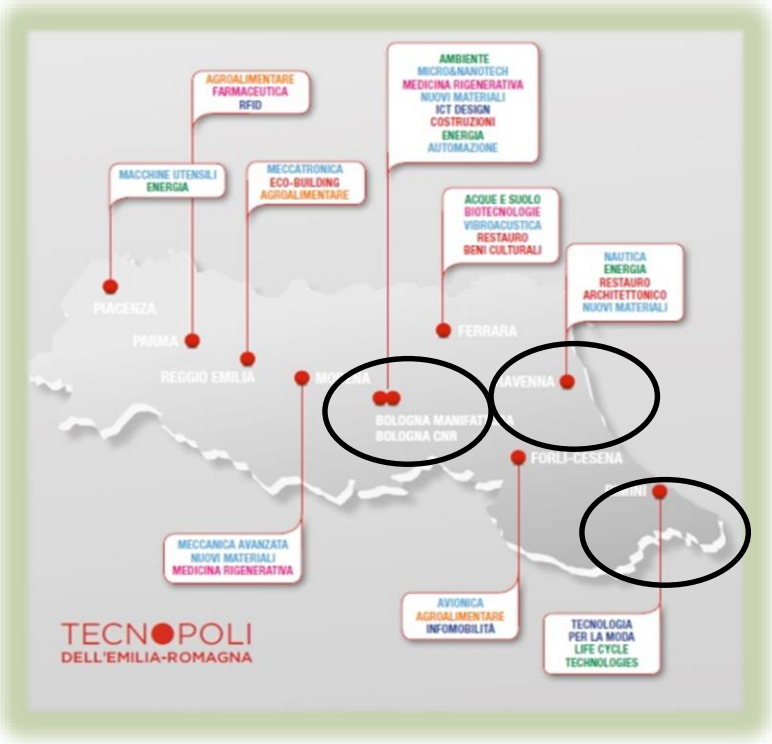
The **Thematic Platforms** of the High Technology Network have been created with the aim to provide a research offer capable of addressing the needs for innovation expressed by companies and for augmenting their competitiveness.
The Thematic Platforms are organized according to a model, which favours the matching between the business sector and the Network research skills, and stimulates the regional production system competitiveness based upon innovation.

It is organized in 6 Thematic Platforms involving the entire economic value chain and providing that the knowledge generated by research is readily converted into technologies and processes, and thus into commercially viable products and services for the enterprises.

EMILIA-ROMAGNA HIGH TECHNOLOGY NETWORK

The High Technology Network laboratories and centres have combined into the **Technopoles** contributing with their assets of scientific skills and human resources but also with incubators and enterprises, which form the regional productive system.

It is coordinated by **ASTER**, the Consortium linking the Emilia-Romagna Regional Government, all the Universities located in the region, the national research bodies operating throughout the territory – CNR and ENEA, the Regional Union of Chambers of Commerce and regional business associations.



ASTER

ENERGY and ENVIRONMENT PLATFORM

The sustainability of the production system and environmental monitoring are the main research objectives related to the Energy and Environment Platform.

Focused topics

- innovative methods and technologies for environmental quality monitoring;
- natural resource management;
- development of systems using renewable energy sources;
- optimization of the use and recovery of energy and materials

The **Ciri Energia e Ambiente** can count on a very solid background of skills and experiences, gathered over decades of activities.

4 Operating Units

Bioenergy: Environmental technology and renewable energies: catalytic processes for the biofuels, hydrogen, synthesis gas production and use of greenhouse gases; low temperature fuel cells. Biorefinery and chemical production from renewables; photovoltaic plant; environmental impact reduction and energy efficiency improvement in renewable energy power plants. Dedicated Energy crops and residual biomass in agriculture.

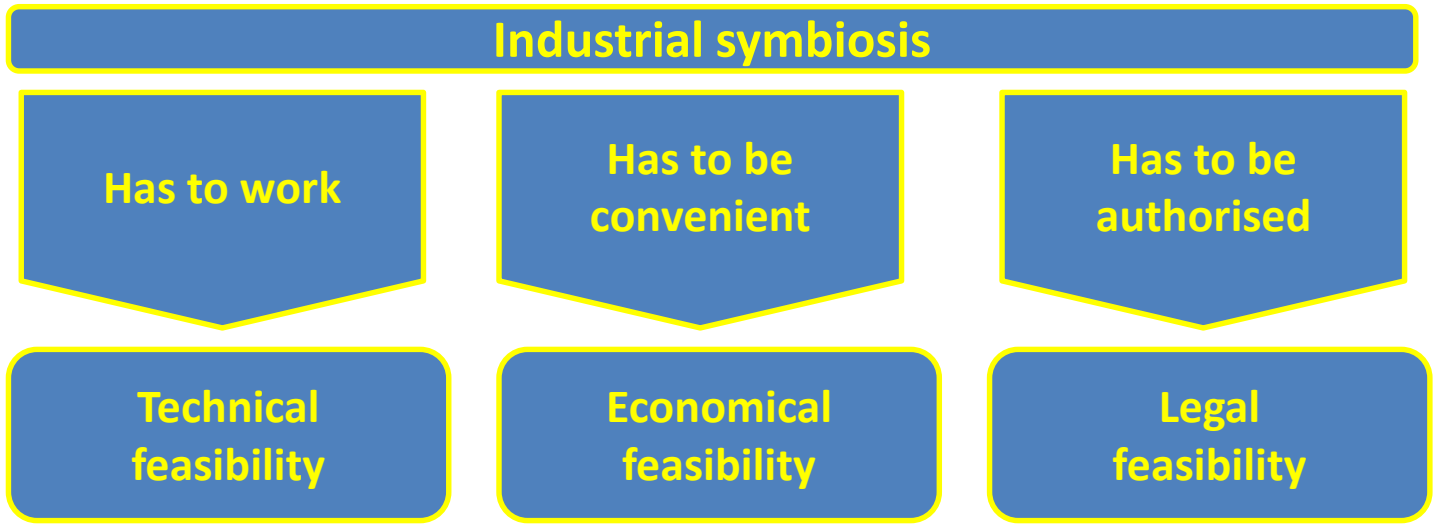
Biomasses: biomass pyrolysis for liquid and gaseous biofuels, Anaerobic digestion of organic matrixes (algal biomass), biotechnological processes for the production of algal biomass in microcosms

Industrial Ecology: Ecoefficiency, Industrial Ecology and Industrial Symbiosis; NMR Charachterization, "Soil Washing" techniques, Wastes LCA; Evaluation fo the sustainability of the processes , Chemicals from biomasses (biorefineries); Energy microproduction at local scale and energy optimization for industries

REACH: Chemical and (eco)toxicological research on harmful substances in the context of REACH legislation; Synthesis of alternative products following "Green Chemistry" principles; Ecotoxicological and chemical analysis on substances of interest for industry

Industrial Symbiosis

Industrial symbiosis is not a new concept: it has been applied for centuries.
The aim of industrial research is to standardize knowledge, defining a method able to connect different skills and productive chains, which have to collaborate to make processes profitable and replicable.
The goal is to create an exchange network which can saturate resources in social, environmental and economic contests.



Industrial Symbiosis

Technical feasibility

In a scientific context, many cases of technical feasibility studies of industrial symbiosis are known.
They have been performed at different levels of TRL (Techology Readiness Level), but, in many cases, there is no evidence of a real industrial application of the process.

Industrial application

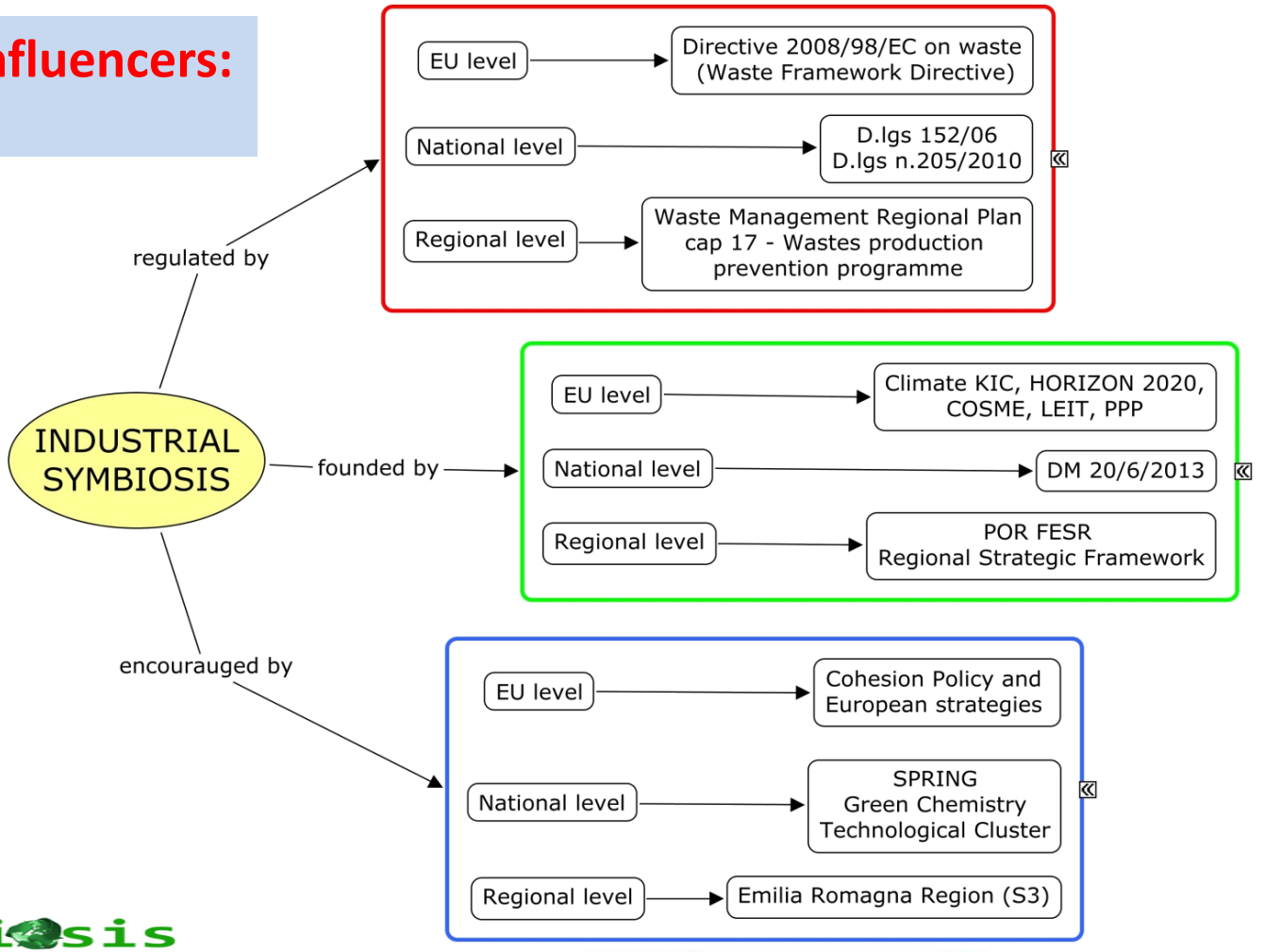
Why , in Italy, the industrialization of processes technically applicable is not developed?

Different causes:

- Economic convenience
- Complexity of the regulatory framework, and, as a result, authorizative problems
- Lack or wrong communication towards enterprises
- Lack of a strong coordination plan from a leader institution
- Lack of collaboration between different enterprises and different production chains
- Resistance to spread sensitive data about waste fluxes

Industrial Symbiosis : General Landscape

Different influencers:



Even if the application of industrial symbiosis is **not expressly requested by Italian Regulation**, but it could be a good tool to plan new or recovered industrial areas. Industrial symbiosis is strongly encouraged in all documents regarding the EU Cohesion Policy and the European strategies (e.g. Horizon 2020) and, recently, also in the Italian Regional Policies (e.g. S3 Emilia Romagna Regional Policies).

As an Industrial Research Center, we decided to investigate **non only on scientific and technical processes**, but on the **landscape which influences the decision makers**. Together with public and private partners we decided to participate to the projects which are evaluating the situation, **in Emilia Romagna**, about the **applicability of industrial symbiosis.**

Three projects, with different aims and tools will be **briefly described** in this presentation.

Industrial Symbiosis : Projects

EU level

Climate Kic - Pioneers into Practice
Group Assignement : Industrial Symbiosis

EIT - Climate Kic

Investigate social, political and economic factors to stimulate the development of waste / energy / commodity / resources exchange networks / infrastructure / clusters

Regional level

"GREEN – INDUSTRIAL SYMBIOSIS" PROJECT

Emilia Romagna Chambers of Cammerce Union
ASTER

Models of integrated, sustainable and innovative production areas management: supply chain for biomass from agro-industrial waste treatment and valorization

County level

CSA: community-supported agriculture (Province of Rimini)

PIP Regional Placement

Verify the feasibility of the closed loop cycle of agricultural wastes producing High Quality Compost coming from residues produced by Community Supported Agricolture

Climate Kic - PIP project

Climate-KIC Pioneers into Practice
At the cutting edge of climate change innovation in Europe

Developed by Climate Kic – Pioneers into Practice Programme (Group Assignment : Industrial Symbiosis).
We are **evaluating different case studies** to verify the productive industrial fabric, the regulatory framework and the attitude of the entrepreneurs towards technological innovation. The project It is focused on the demand for **biobased products**, high added value products from waste streams, in Emilia Romagna Region.

3 main steps:
1) Scan **existing** experiments and projects in the region: to understand **how they started** and which **technology readiness level** they reached and if the project has an **industrial application.**
2) Identify policies and programmes, regulations or laws, measures at regional level or private initiatives which **encourage Industrial Symbiosis** and the principles of circular economy.
3) Identify **specific areas** of interest for the region to plan a business case.

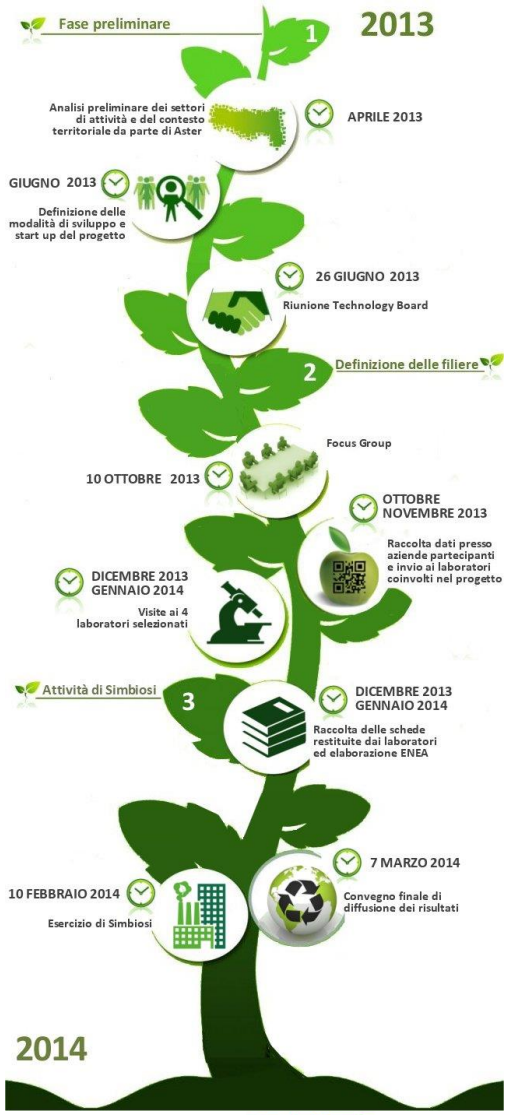
ASTER "GREEN – Industrial Symbiosis" Project

Developed by Unioncamere Emilia Romagna and Aster S. Cons. P.A. , with the scientific support of ENEA UTTAMB, which coordinated the first Industrial Symbiosis platform in Italy and the collaboration of "Emilia Romagna High Technology Network".
The project has been aimed at the **dissemination of an industrial symbiosis culture** in Emilia Romagna, involving traditionally separate industries in a collective approach.

GRAPHICS BY ASTER

1. **Focus Groups**: guided collective discussion by a selected working group (companies, researchers and regional institutions) on the topic "Supply chains constitution for biomass from agro-industrial residues treatment and reuse".

2.Visits to Emilia Romagna High Technology Network laboratories: Assisted visits dedicated to companies. 4 laboratories pertaining to the Emilia Romagna HTN (Agrifood and Energy-Environment platform).

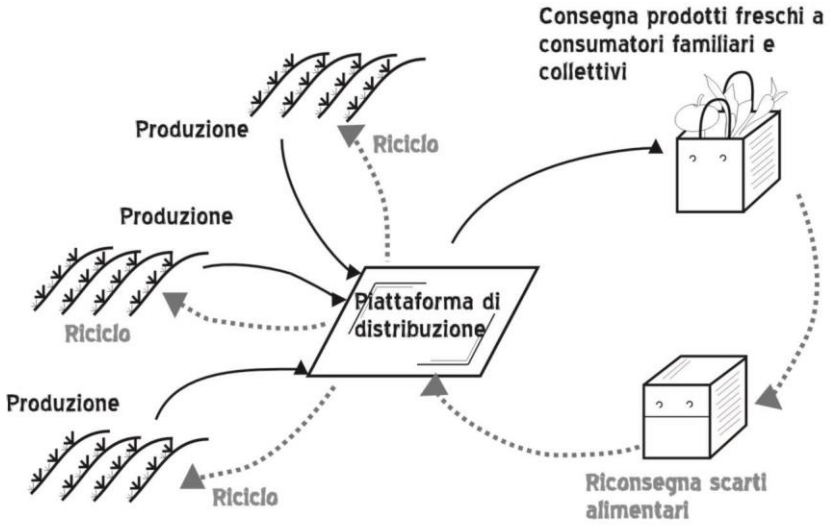


3.Industrial Symbiosis exercise to identify possible interactions. The goal is to set up networks of exchange in which the byproduct of a company acts as a raw material for one (or more) of the regional network industries.

4. **Final dissemination event**: dissemination of project results and activities. The goal was to lay the foundations for further collaborations and stimulate the debate on Industrial Symbiosis theme in Emilia Romagna.

CSA Project – Study on the waste cycle

Community-supported agriculture is an alternative, locally-based economic model of agriculture and food distribution.
Verify the feasibility of the **closed loop cycle** of agricultural wastes producing High Quality Compost coming from wastes produced by Community Supported Agriculture.



Technical landscape: planning all the activities concerning analysis of compost and soil, and concerning the composting process.

Regulatory regime: administrative rules concerning the different steps (waste recovery, compost production and compost delivery) in the CSA has to be deepened (regulations about the quality of compost and fertilizers and about waste transportation).

Results

The most important result, coming from interviews with private companies and public administrators, is that the **regulatory framework seems to be more severe and complex** in Italy than in the rest of Europe. That's why it is difficult to apply industrial symbiosis to real processes.

The Climate Kic - PIP project is still running and it is focused on the demand for biobased products, high added value products from waste streams, in Emilia Romagna Region. It's scanning technical case studies, policies and programmes in order to identify an area of interest for the region.

The **Green –Industrial Symbiosis Project** showed that, Emilia Romagna is a good substrate to start a network of Companies involved in Industrial Symbiosis processes, with some resistance due to the authorization processes and the sharing of internal data.

The **Community Supported Agriculture Project** showed that, in agriculture, symbiosis processes are quite easy to be applied, and the main problem is to **define logistic rules for transportation and location** of the treatment. The stakeholders showed to be positively involved in this activity.

Conclusions

Industrial researchers have to learn to consider also **economic and legal landscapes** of the technical problems they are facing. This means that it is necessary to start planning industrial research involving, from the beginning, **different professional skills** (economic, legal, project management) and the end-users of the process.

Entrepreneurs in Emilia Romagna would be interested to invest new processes of waste recover, but they **need to be assisted** not only in the technical process, but also in the **authorization process** and the economic first evaluations.

It is necessary to work to **connect different production chains**, because producers of the same chain don't need help to connect themselves. Italy is a territory of production districts, used to work together on the same value chain. Industrial symbiosis give more opportunities in different chains.

The most important action to plan is the **stimulation of awareness of national policies on simplification of the regulatory framework.** This would permit to private companies to start applying Industrial Symbiosis, with economic, environmental , and social benefits for all the stakeholders.

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