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

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Abstract

Many examples of symbiosis processes studied by industrial research could be applied in Italian productive system, so as to make related environmental improvement an attractive process for industrial stakeholders.
At the current state, Industrial Symbiosis is not applied systematically because of some difficulties mainly related to regulations.
The aim of this paper is to evaluate the opportunities existing on the Emilia Romagna territory and useful experiences realized in this area for purposes of development of a regional system intended to apply industrial symbiosis.
Pilot projects, undertaken or in progress in the region, targeted to study the potential for application of circular economy by closing of production cycles are described and analyzed.
The regulatory framework at national and regional level is analyzed, in order to identify critical points and obstacles to the diffusion of an industrial symbiosis system.
The paper analysis method also includes the study of the opportunities resulting from European funding programs and from national strategies.
From this study on different levels –background experiences, regulatory framework and strategic opportunities-territorial guidelines, useful to the Emilia Romagna institutions to approach industrial symbiosis methodology are derived as results. This method was also suggested within the waste plan of Emilia Romagna region as "useful to the reduction of special wastes quantity".
As a conclusion, symbiosis proved to be a quite effective tool: regional and national policies, together with technical experts and entrepreneurs, must work towards the completion of cycles within the production system, in order to foster Circular Economy.

Introduction

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 (1) resulting from the new rules and legislation governing the next round of EU Cohesion Policy investment for 2014-2020.

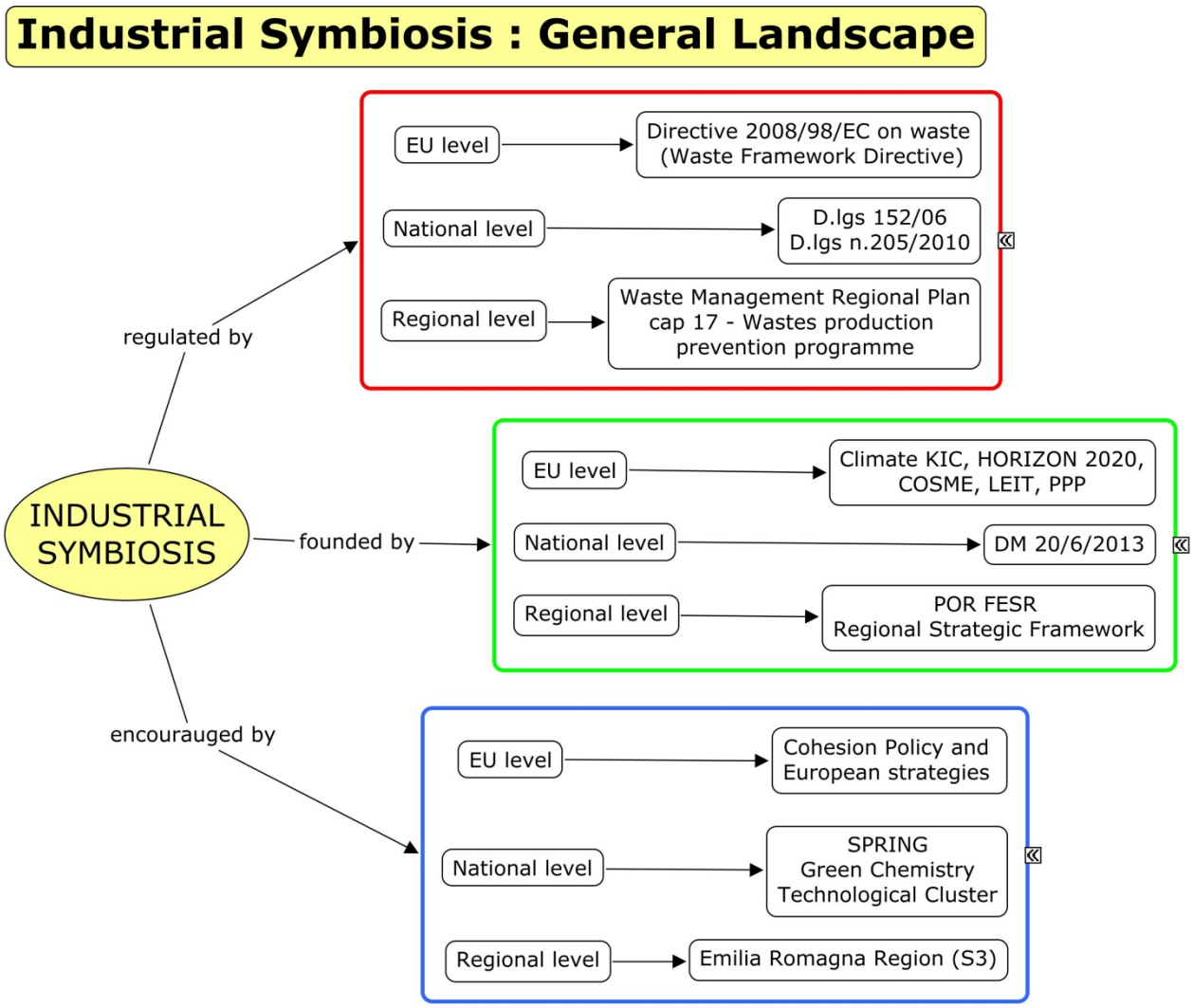

Fig. 1 Opportunities for Industrial Symbiosis (2,3)

Industrial symbiosis, as an exchange of resources, materials as byproducts or wastes but also energy surplus, services and expertise between two or more different companies, is a process which has been deeply studied.
At international level, symbiosis gave concrete results in terms of business, lowering of CO_2 emission and social cohesion.
In Italy a lot of feasibility studies has been verified at an applicative or demonstrative level, but less frequently in our country we can find industrial application cases.
Which is the reason why in Italy it is difficult to make a technology transfer of technically applicable processes? There are different answers:
− The regulatory framework is inadequate, and this limits licenses to industrial processes.
− Lack of collaboration between different companies and different production chains.
− Resistance to share sensitive data about internal waste fluxes.
− Lack or wrong communication towards companies and lack of a coach/leader authority.

The aim of this work is to describe the efforts developed in Emilia Romagna Region to increase the application of industrial symbiosis, in order to solve every obstacle and to facilitate the application of successful processes in our industrial system.

Analysis of Emilia Romagna Industrial Symbiosis experiences and projects

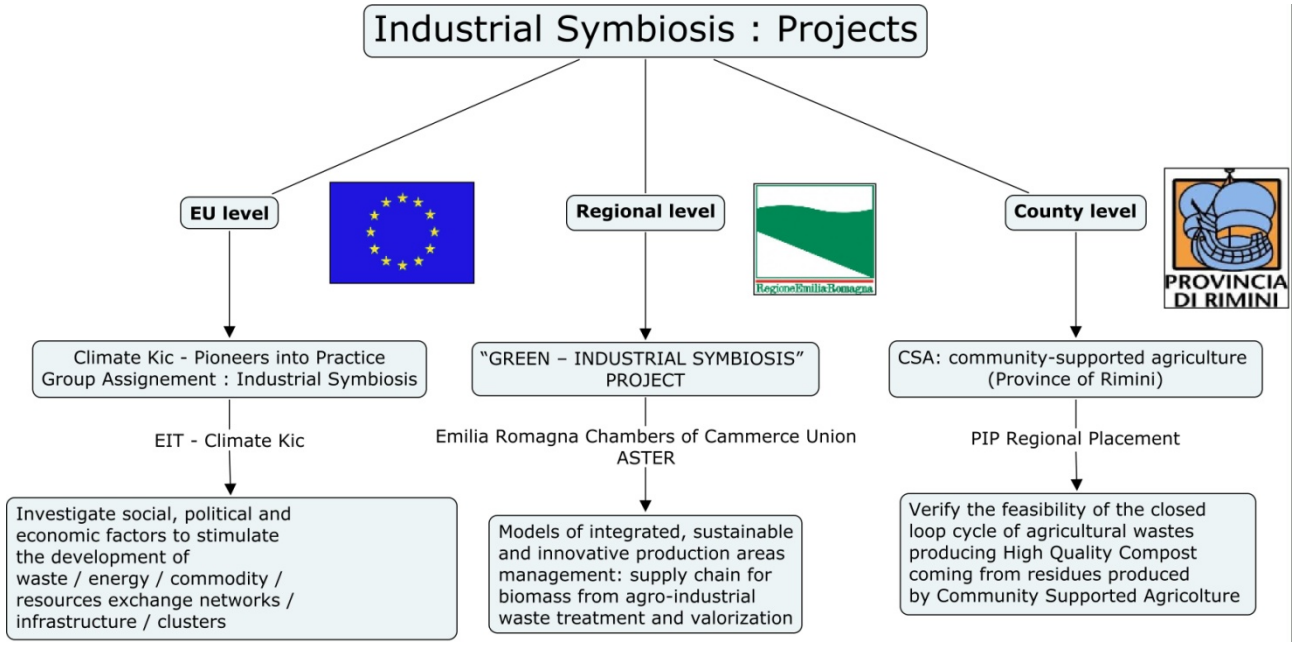

Fig. 2 Projects on Industrial Symbiosis in Emilia Romagna

EU Level: Climate Kic - PIP project

The project wants to define which are the social, political and economic factors able to stimulate the development of waste / energy / commodity / resources exchange networks / infrastructure / clusters.

It is focused on the demand for biobased products, high added value products from waste streams, in Emilia Romagna Region

The main steps of the work are:
1) Scan existing experiments and projects in the region:
connect with the involved actors and draw the success and hindering factors of their specific experience, main bottlenecks as well. Which projects had a follow on, why and how; conversely, which were not able to continue after the project end and why.
Start drawing information regarding the sectors and type of good where an Industrial Symbiosis network could most likely be rolled out or further developed.
2) Identify policies and programmes, regulations or laws, measures at regional level that are supportive of circular economy concepts and, more specifically, of the creation of a network/cluster or infrastructure for the exchange of energy/material or goods.
Private initiatives might be scanned as well (e.g. sponsored by industrial associations or chambers of commerce).
3) Identify a specific area of interest for the region on which to draft a business case.

Regional Level: "GREEN – Industrial Symbiosis" Project: models of integrated, sustainable and innovative production areas management - Supply chain for biomass from agro-industrial waste treatment and valorization

Project Purpose
The "Green – Industrial Symbiosis" project (4) was 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 [5], 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.

Activities have been carried out with particular attention to the supply chain of biomass (resulting from agro-industrial waste) treatment, with a focus on the production of high-added-value materials (e.g. biopolymers, resins, solvents, building blocks).
The project has included also activities developed with the support of research system pertaining to the "Emilia Romagna High Technology Network".
The goals were:
- to obtain competitive advantage for productive system by means of physical exchange of materials, energy, water and/or by-products.
- to enhance the know-how of research centers and to promote the creation of innovation paths between local companies and laboratories.

Project methodology
The project was developed through successive steps:
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".
In this activities was involved a selected working group of companies belonging to traditionally separate productive sectors (as final beneficiaries of the services, that will make available their material flows in input and/or output), and researchers with the expertise to define and suggest possible interaction and develop new methodology for reuse of resources.
2. Visits to Emilia Romagna High Technology Network laboratories: Assisted visits dedicated to companies, carried out at 4 laboratories pertaining to the Emilia Romagna High Technology Network (Agrifood and Energy-Environment platform).
The laboratories (Siteia.Parma, Cipack, CIRI Agroalimentare, CIRI Energia Ambiente) were involved in the initiatives described above by reason of their skills.
3. Industrial Symbiosis exercise: Organization and management of an experimental initiative aimed at identifying possible interactions; a working group consisting of companies related to traditionally separate productive sectors is involved.
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: Final event aimed at the 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.

Project results
The first result of the project was to aware the productive system of Emilia Romagna region to the issue of industrial symbiosis. In particular, due to "Green" Project, the industrial symbiosis instrument was added to the Waste Management Plan of Emilia Romagna Region, as instrument for the reduction of special wastes.
Several quantitative results were also obtained:
- 13 companies involved through all duration of project
- 10 laboratories involved
- 49 possible georeferenced Industrial Symbiosis paths
- 90 potential synergies
- Two institutional agencies involved during the Focus Group and the Industrial Symbiosis Exercise
- 5 staff exchanges between project participants realized with the support of Pioneers Into Practice programme.

County Level: CSA (Community Supported Agriculture) Project – Study on the waste cycle

The work is a part of the project "Sportello Rete CSA" (6) , in order to verify the feasibility of the closed loop cycle of agricultural wastes producing High Quality Compost coming from wastes produced by Community Supported Agriculture.

The aim of project is to improve recycling and valorization of bio organic waste and introduce closed productive cycles in industrial symbiosis within the primary sector of the economy.
Field of activity
- Technical landscape: verify the role of compost as a soil amendment in organic coltures and in soil protection, evaluating humic balance in soil. The aim is to understand if it is possible to create a virtuous cycle, in which compost is produced only from organic residues, in order to totally avoid the presence of agrochemicals in the compost used as a soil improving compost in the CSA farms.
- Administrative regime: administrative rules concerning the different steps (waste recovery, compost production and compost delivery) in the CSA has to be deepened. In fact this process is regulated by different regulations about the quality of compost and fertilizers and about waste transportation.

Results and discussion

The aim of this paper was to evaluate the opportunities existing on the Emilia Romagna territory and useful experiences realized in this area for purposes of development of a regional system intended to apply industrial symbiosis.
This feasibility study gave some preliminary indications about the existing situation in Emilia Romagna territory and about potential arising from persecution of this strategy.
The complexity of the regulatory landscape brought the industrial actors to slow down the change into new processes which would be advantageous both from an economic and an environmental point of view.

Conclusion

In conclusion, even to help enterprises to overcome the economic crisis, it is necessary to work in order to simplify Italian regulation in matter of wastes and environment.
This is starting to happen in different regions in Italy, and this work wants to be a suggestion to the regional policies to work together with researchers and enterprises to improve the industrial system as the EU is asking for the next decades.

Acknowledgements

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