

STRATEGY TOWARDS A CIRCULAR ECONOMY IN PORTS OF THE VALENCIA REGION

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1. BACKGROUND

The current social and legislative context of the European Union and its Member States highlights the need to move from a linear (throwaway) economy, implemented in most activities, to a circular economy (optimising the use of resources and avoiding and/or minimising waste generation). To do so, different European strategies have been defined [1],[2]. The action plan published in 2015 [1] establishes measures for "closing

the loop” of the product life cycle: from production and consumption to waste management and a secondary raw materials market. The Commission report published in 2017 [2] sets out concrete actions in fields such as food waste, eco-design, organic fertilisers, consumer goods guarantees, innovation, and investment. The principles of the circular economy must be gradually integrated into industrial best practices, ecological public contracting, use of cohesion policy funds, and implemented in new initiatives in construction and water sectors.

In this sense, one of the perspectives enabling this transition towards the circular economy in the context of industry to be driven is industrial symbiosis, which is simply sharing resources among companies in a sustainable way. The first and most widely known example of the establishment of symbiotic networks lies in northern Europe, in the municipality of Kalundborg (Denmark) [3].

In February 2018, Spain published the document “Spain 2030. Spanish strategy for a circular economy” (currently in the draft stage pending the inclusion of comments after the public information period) [4]. This document lays out the *modus operandi* required to achieve a circular economy in Spain and includes specific policies, objectives, instruments, and action plans for its development. In particular, it mentions industrial symbiosis, together with other mechanisms (eco-labels, regulatory updates, support for new production and business approaches, and incentives for sustainable design) as actions to foster development towards the circular system.

On a regional level, some Spanish Autonomous Regions have already developed their own actions or identified strategies to be pursued in addressing this great challenge. These Autonomous Regions are as follows: Andalusia, Canary Islands, Castilla Leon, Castilla-La Mancha, Catalonia, Galicia, Extremadura, Madrid, Murcia, Navarre and the Basque Country. The Autonomous Government of Valencia currently has no solid regional strategy relating to the circular economy, though it has put forward some initiatives. Given the importance of the industrial fabric in the Valencia Region and the notable role that industry has in this transition process towards the circular economy, the introduction of industrial symbiosis in this region emerges as an element of great potential in improving efficiency in the use of natural resources that will allow the current development and growth model to evolve towards a circular economy-based model.

2. SIMVAL PROJECT: STRATEGY TOWARDS A CIRCULAR ECONOMY IN THE VALENCIA REGION THROUGH A PLATFORM FOSTERING INDUSTRIAL SYMBIOSIS

In the project's first year (2018), industrial areas or hubs, whose impact in regard to use of resources and waste generation in the Valencia Region was significant, were identified with a view to prioritising actions on industrial symbiosis. To do so, basic information was analysed on resource consumption and waste generation, as was information obtained in other previous studies: Industrial by-products exchange (at present in disuse) and Strategic Plan for the Valencia Industry 2017 [5]. Finally, additional information was compiled through questionnaires, visits, literature searches, among others.

In 2019, workshops devoted to synergy searches were organised in two wholly different industrial-economic scenarios: an industrial estate with companies from different industrial sectors and the Valenciaport community, which includes the commercial ports of Valencia, Sagunto, and Gandía. These activities were dynamised with the help of a globally renowned organisation in dynamising symbiosis actions on a regional scale. The methodology, based on facilitation actions and led by experts, allows company information to be compiled, evaluations to be carried out, and synergy opportunities to be subsequently identified and facilitated for realising these, directly pushing a collaborative economy and restorative policies.

The actions with the greatest potential were selected from the ideas that emerged in those sessions and they are being monitored to detect weaknesses and strengths for prospective implementation. Another action taken into account this year has been that of publicising the project among the different stakeholders and organising specific dissemination sessions, to be held after the workshops in order to be able to better tangibilise the results obtained for the interested organisations. In addition, as had been done in the first year, meetings are being held with organisations of interest for the continuity and implementation on a real scale of the project, such as the Valencian Business Confederation (CEV) and different Regional Government Authorities (Environment, Economy, and Innovation).

The most noteworthy results obtained in the Valenciaport community, one of the studied scenarios, are set out below.

3. CASE STUDY: PORT OF VALENCIA

The synergy search workshop for the promotion of industrial symbiosis actions was held at the Port of Valencia on 19 June 2019. About 50 people attended, representing 18 users or actors in the port ecosystem, and 77 potential synergies or matches were identified. The feasibility of implementing each of these synergies was calculated.

To do so, a multi-criterion and multi-expert evaluation was carried out in which two experts in the environment and an expert in port management participated. Once the criteria and sub-criteria to be used in the evaluation had been established and agreed by consensus (Table 1), the experts individually rated each of the detected 77 synergies. Every synergy was given a point score from 1 to 10 as a function of the degree to which it met the different sub-criteria. Feasibility in each criterion was calculated by averaging the scores awarded to each sub-criterion.

The final score resulted from averaging the scores obtained in each criterion. To reach a consensus on the scores, three rounds were conducted until the standard deviation of the scores awarded by the experts was below 1.5 in all cases.

REDUCTION OF ENVIRONMENTAL IMPACT	TECHNICAL FEASIBILITY
Reduction of CO ₂ emissions	Required specific knowledge
Alteration of the environment	Availability of materials and equipment
Cost/benefit ratio	Implementation capability
ECONOMIC FEASIBILITY	BARRIERS TO IMPLEMENTATION
Necessary investment for implementation	Required specific knowledge
Return on investment	Availability of materials and equipment

Table 1. Evaluation criteria and sub-criteria.

Figure 1 provides a simplified view of the groups of main detected synergies.

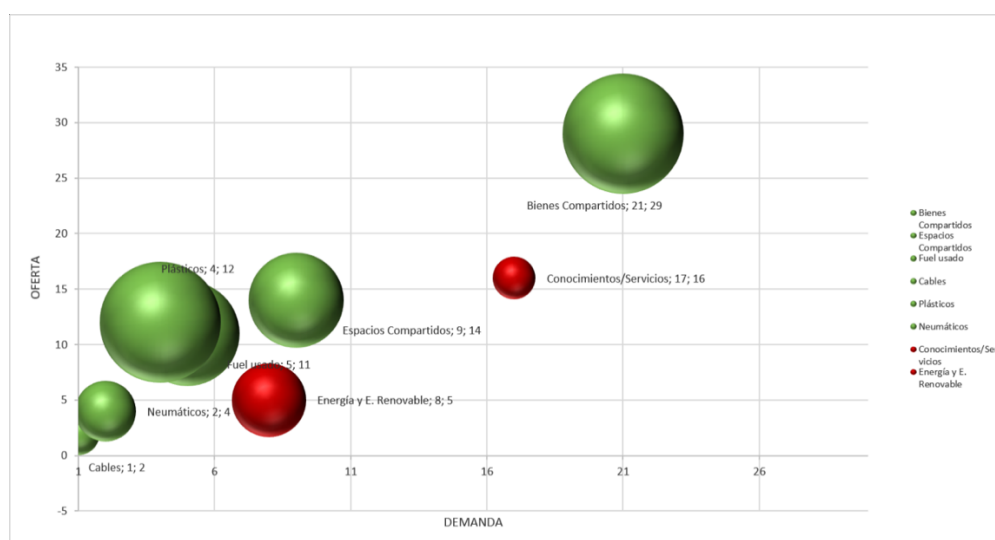


Figure 1. Summary of the synergies found (NOTE: The size of the ball is the result of subtracting what I have from what I want, and the resources displayed in red are those that had greater demand than supply).

4. CONCLUSIONS

The SIMVAL project seeks to define strategies for the implementation of industrial symbiosis in the Valencia Region, as a means of improving efficiency in the use of natural resources to enable the current development and growth model to evolve towards a circular economy-based model.

The massive participation of companies in the workshop, the variety of resources and services to be shared, and the total number of detected possible synergies highlight the great industrial symbiosis potential existing in the Valenciaport community. The multi-criterion and multi-expert evaluation of this potential has allowed a synergies implementation hierarchy to be established, this being headed by the exchange of packagings, goods, and spaces, followed by the exchange of services and *know-how* among the parties; energy and financing exchanges were the least feasible in the short and middle term.

It became clear that, for the start-up of the detected synergies, in some cases the definition of new business models was required and, specifically, in most cases it was necessary to establish simple administrative mechanisms that favoured the exchange of resources and encouraged the different stakeholders to implement them.

5. REFERENCES

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