FISSAC

FOSTERING INDUSTRIAL SYMBIOSIS FOR A SUSTAINABLE RESOURCE INTENSIVE INDUSTRY ACROSS THE EXTENDED CONSTRUCTION VALUE CHAIN

Non-technological barriers analysis and mitigation mechanisms

Executive summary

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The construction sector is the largest consumer of raw materials in the EU.

Construction and demolition activities also account for about 33% of waste generated annually (EEA 2010). Clearly, there is an environmental incentive to revamp the resource-intensive and wasteful construction sector: reducing resource use and re-using waste more effectively would significantly reduce the total material requirement of European societies. A large proportion of different waste streams have the potential to be reused or recycled within the construction sector, thus contributing to save natural resources and energy.

The revised legislative proposals on waste set clear targets for waste reduction and establish an ambitious and credible long-term path for waste management and recycling. Key elements of the revised waste proposal include concrete measures to promote re-use and stimulate industrial symbiosis (IS) - turning one industry's by-product into another industry's raw material. To reach this aim, innovative reuse and recycling strategies are needed.

The FISSAC project studied the extent of obstacles and failures affecting the functioning of the secondary raw material (SRM) market with the aim of identifying the critical barriers and opportunities and to formulate improved strategies which could increase the use of those materials.

The study was conducted collecting literature research studies, using interviews with stakeholders involved in the construction sector and research centres including designers, construction companies, demolition enterprises, waste management companies, reuse agents, and authorities.

Methodology and approach

The identification of possible barriers and their mitigation measures was based on the methodology proposed in the European Commission's waste market report[i]. The main steps include:

- Collection of available documentation regarding barriers and drivers from specialized literature on Circular Economy and Industrial Symbiosis through literature research.
- Identification of real and perceived barriers among FISSAC partners and stakeholders without including any evaluation, by means of personal interviews and conversations.
- Assessment of the impact of these barriers on the IS models for each case study and potential drivers and tools to minimize it.

Literature research

Different documentation including peer-reviewed research papers, reports from previous studies and projects at several levels about policy and legislation, as well as other data sources on the topic were compiled in order to obtain an overview of the context where Circular Economy is hampered by constraints of any nature.

The literature research firstly focused on proposing a classification of the different types of barriers and their general characteristics. Then, the most common non-technological barriers were identified within the previously defined groups in a general way. Lastly, a specific compilation was performed for the case studies included in the FISSAC project.

Stakeholder interviews

Once the barriers structure was clearly categorized and the general constraints were identified, different personal interviews were conducted among the industrial FISSAC partners and final users. Then, the personal interviews were extended to other stakeholders covering the whole value chain of the different Circular Economy models, including waste generators, waste managers and final users. The objective was to identify constraints along the value chain, trying to allocate the barriers in their corresponding position.

The interviews were conducted following a previously defined script, but only as a reference, trying to keep an informal and close interview where the respondent could feel comfortable and free to express their concerns about the topic. This method also allowed to adapt the questions to each respondent according to their activity and position within the value chain as well as to include more questions as the interview was going on. The starter questions for all interviews were:

1. Dou you have — or have you had — any experience on valorising waste or recycled materials in your product portfolio? Which was the reason to start?
2. What is your impression from the commercial point of view?
3. From the commercial point of view, did they take the market up?
4. What kind of economic drawbacks did you get by using recycled/waste materials? (Supply reliability, productivity losses, increased transportation/management costs…)
5. How could these economic problems be solved?
6. From the legal point of view, was it easy to implement the new product line? What type of barriers did you find?

7. Regarding your internal organisation, was it easy to implement the use of waste/recycled materials within your organisation? Did you perceive resistance, scepticism…? Did you need to change many production processes or management structures?
8. Did you have any kind of support from outside your organisation? (Economic, finance, technical, legal, public awareness, public procurement).

Assessment of barriers' impact and potential mitigation measures

Once the barriers are structured according to the previously defined classification and the most common ones are described along the value chain, these barriers are analysed according to a risk matrix where the frequency and impact is assessed. This exercise is developed for each waste stream and for each FISSAC industrial symbiosis scenario.

Data obtained from the interviews play a relevant role to assess the importance of each barrier and the impact that this barrier represent for each IS model.

After that, some potential mitigation measures are proposed for each constraint according to both data from interviews and bibliographic references.

The scope of the study is aimed to obstacles and regulatory failures affecting the functioning of waste markets in the EU, thus preventing the implementation of a circular economy. These obstacles were addressed according to the previously described classification, including four main groups: Economic, Regulatory, Social perception, and Structural at company/society level.

The barrier analysis was performed for each waste-generating sector discussed in the FISSAC scenario, in such a way, steel slag, aluminium slag, marble slurry, ceramic waste, glass waste, and wood/plastic/rubber were considered. Additionally, each waste was assessed taking into consideration the industrial framework where the valorisation takes place, namely, cement and concrete industry, ceramic industry, and wood plastic composites. This assessment considers both the barriers and the potential drivers to overcome them.

Each waste stream was analysed separately in chapters describing the different industrial scenarios. The approach was based on the comparison of the referenced barriers and drivers and the results of the face-to face meetings, interviews and questionnaires. As a result, the report provides a direct view of all the stakeholders existing around each value chain, waste generators, waste managers, final users or manufacturers and regulators.

The analysis does not only consider both, barriers and drivers, but it puts everything in their place, thus considering the scale factor and the moment of appearance of the different obstacles, trying to give a complete view of the problem. Other parameters were also taken into account, such as the severity of the consequences generated by the barrier. In many cases, the descriptions include examples provided by the interested parties during the fieldwork.

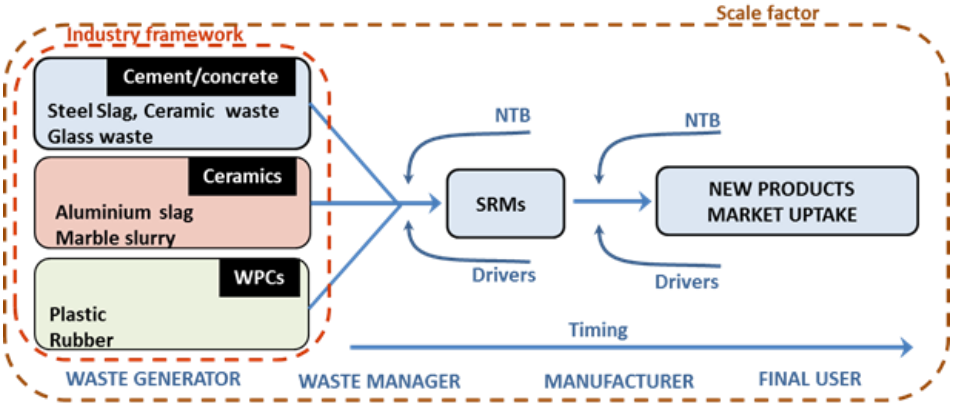

Figure 1 – Scope of the barrier analysis. NTB: Non-Technological Barriers

Conclusion

Technological barriers have been demonstrated to be surmountable but obstacles still exist for many secondary raw materials (SRMs) to reach the market despite its proved value. These obstacles have been extensively studied the last few years and several classifications have been proposed. This report distinguished the non-technological barriers into four large groups; Economic, Regulatory, Social Perception, and Structural.

An Industrial Symbiosis scenario can be seen as a learning process where the non-technological barriers appear at different stages and levels. Firstly, they affect internally the organization which is thinking about trying new options for their waste streams (waste generator). In an incipient stage, once several actors are involved, it affects several organizations and waste managers, and finally, when the strategy is replicated at sectorial level, several barriers appear hampering the market uptake of the SRMs, affecting mainly at end-user level.

The whole system is controlled by economic criteria; consequently, economic factors are a key point in the valorization process. Some constraints such as the low cost of primary raw materials or the high costs of transportation or processing of SRMs are among of the main barriers. Some recycling systems are unprofitable at certain point of the value chain, producing the so-called "losers" of the system. This barrier could be removed internally, by adjusting the revenues of all actors, or externally, by means of the regulatory framework. In this sense, one of the main drivers identified is the landfill fee, which acts as a motivating factor for industrial symbiosis, introducing some budget in the system that can be rerouted to the "looser of the value chain".

Accordingly, the policy makers play a fundamental role in guaranteeing the value chain, fostering landfill fees and taxes on disposal to make the SRM market profitable in the first stage of the Industrial Symbiosis. Public support on R&D activities would help the system to be more feasible and to reduce the technological gap, making the market less dependent on external grants. The waste consideration and the bureaucracy to get the End-of-Waste consideration also hinder the process.

Society tends to see SRMs as low-quality materials and frequently are associated to risk of pollution. Moreover, the potential environmental benefits of recycled materials are confused within a wide variety of eco-labels. The rules on products should be amended to make it easier for consumers to choose recycled and resource-efficient products.

Finally, the structure of the organizations can be an internal constraint for the setup of symbiosis scenarios. The rigid structure in certain key departments, such as supplies may hinder the process. Some very well established logistic structures are also a barrier to changes and provokes a kind of technology lock-in that may impede the evolution once the SRM is really close to reach the market. Any activity aimed at ensuring visibility of success stories, large-scale demonstrators as well as standards may positively contribute to overcome these barriers.

Further analysis of non-technological barriers and drivers of the various represented industries in FISSAC will be carried out in Task 7.2. to create industrial symbiosis and lay path for a circular economy model of the given industries.

[i] **European Commission. 2016.** The efficient functioning of waste markets in the European Union - Legislative and Policy options. *European Commission DG Environment.* [Online] 2016. ec.europa.eu/environment/waste/studies/pdf/waste_market_study.pdf.