

# Designing the Supply Chains of the future: scaling-up the use of new sustainable materials in the construction industry

## Problem statement:

Construction is an industry with big impact on the environment due to high levels of energy and resource consumption, as well as on society given the number of employed people in this sector and the importance of building and space design for social interactions, working environments, and well-being in general.

From an environmental perspective, material research has created, during the last years, innovative and promising materials that can revolutionize the construction industry. Moreover, the demand for sustainable buildings is steadily increasing. However, many problems can hinder the wide use of these new materials in the industry. First, the resistance to innovation, which is typical in the sector, can make the introduction of innovative, not tested before, materials difficult. Second, companies should be able to monetize innovation through new scalable business models, a capability that companies in the sector do not necessarily possess. Third, companies would need to design new supply chains that deliver products to the market, although some actors in the supply chain may not have enough capabilities to accommodate and scale-up the production of the new materials. Fourth, the introduction of new materials should be preceded by intensive testing activities, permissions from governmental institutions, and standardization efforts that can be time-consuming, thus extending the time-to-market.

## Focus of the study

The study will focus on “**Bio-based materials**”, i.e. materials that are derived by living organisms, e.g. as fungi (e.g. mycelium) or plants (e.g. scraps of coffee).

These materials seem promising in their use in the buildings, both for interior and exterior. They have good properties in terms of insulation, soundproofing, on top of the lower environmental impact than traditional building materials, like concrete. In fact, these materials are less polluting in both production and disposal.

Despite the interest of consumers in these materials, and the fact that some companies are already selling these products (Eg. MOGU <https://mogu.bio/>, Ecocon <https://ecococon.eu/it/>), there are still many hurdles against mass production and diffusion of these materials among potential users.

These hurdles are due to many reasons:

1. The materials are difficult to certify because they are not produced by machines, their characteristics are not “standard” and not easy to control. Moreover, they have low resistance to fire, therefore they are less safe inside buildings. These characteristics can be improved by covering them with synthetic materials. This, however, can reduce their environmental benefits.
2. Since these materials are degradable by nature, they should be replaced frequently (more than traditional materials).
3. The materials are natural. Consequently, the surfaces or the appearance is not standard. This could seem a sign of low quality in the eye of the customer.

## Objectives of the research:

To address the above-mentioned problems, this research project aims to answer the following question:

- What are the requirements on innovative materials that fit best our future living and working?

The two master theses will have different focus: (1) one thesis focusing on Market research, in other words, most promising materials, potential barriers and uses, clients who can be interested and (2) one thesis focusing on possible transformation of value creation, in particular supply chains and business models.

## Methodology:

To provide an answer to the research questions, the following methodologies are adequate:

- Focus groups/industry workshops to map the construction supply chain and identify the requirements on sustainable materials
- Expert interviews/Case studies to investigate how barriers to sustainable innovation could be overcome and to study the impact of sustainable innovation on the construction supply chain and new (promising) business models
- Conceptual development of methods and tools to support supply chain and business model in the construction industry
- Action research to “test” the new methods