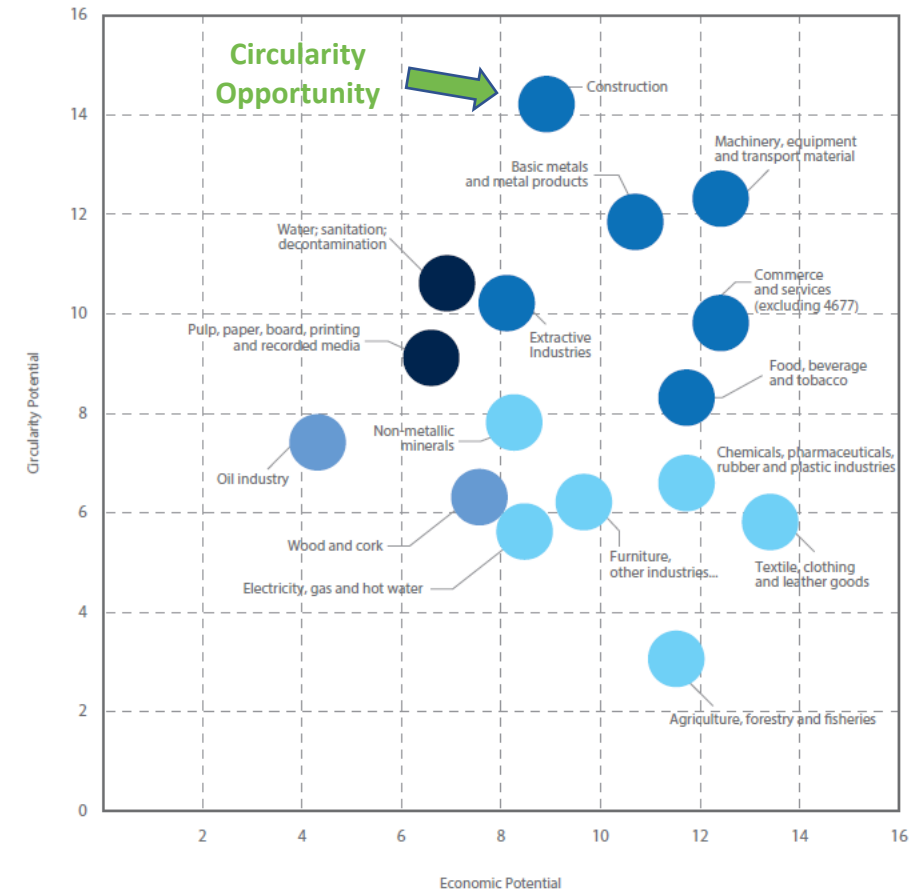




CIRCULAR BUILDINGS

Context

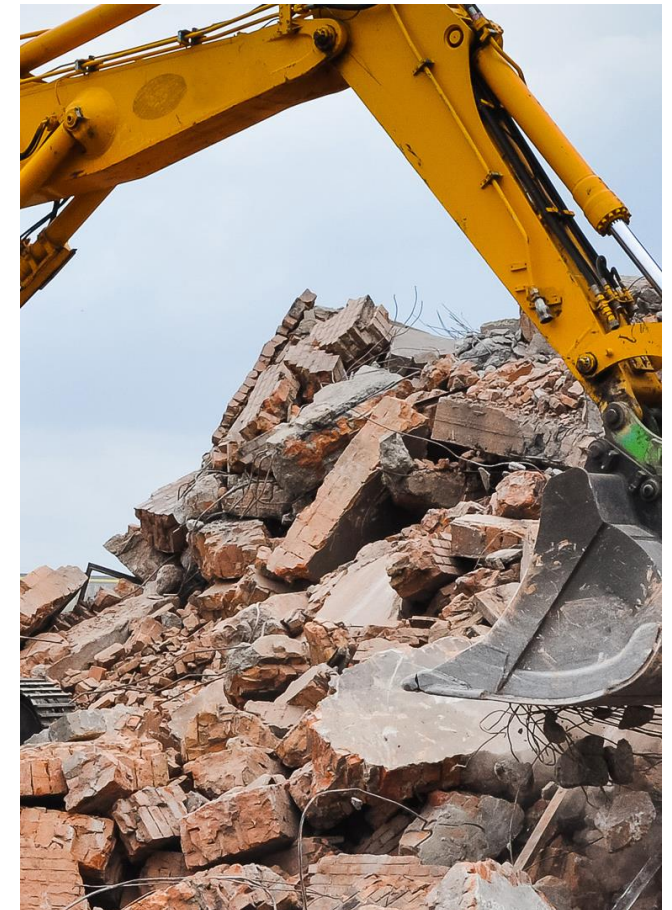
- > The **civil construction sector** and the various activities it develops result in **intensive consumption of raw materials** and in the **production of high amounts of Construction and Demolition Waste (CDW)**.
- > Smart Waste Portugal assumes the problem of CDW as one of the **major challenges** in the **waste sector** in Portugal, having identified the need for a **collaborative strategy and communication and awareness-raising** aimed at the links in the CDW value chain.



Source: EY-AM&A, based on data from Statistics Portugal (INE)

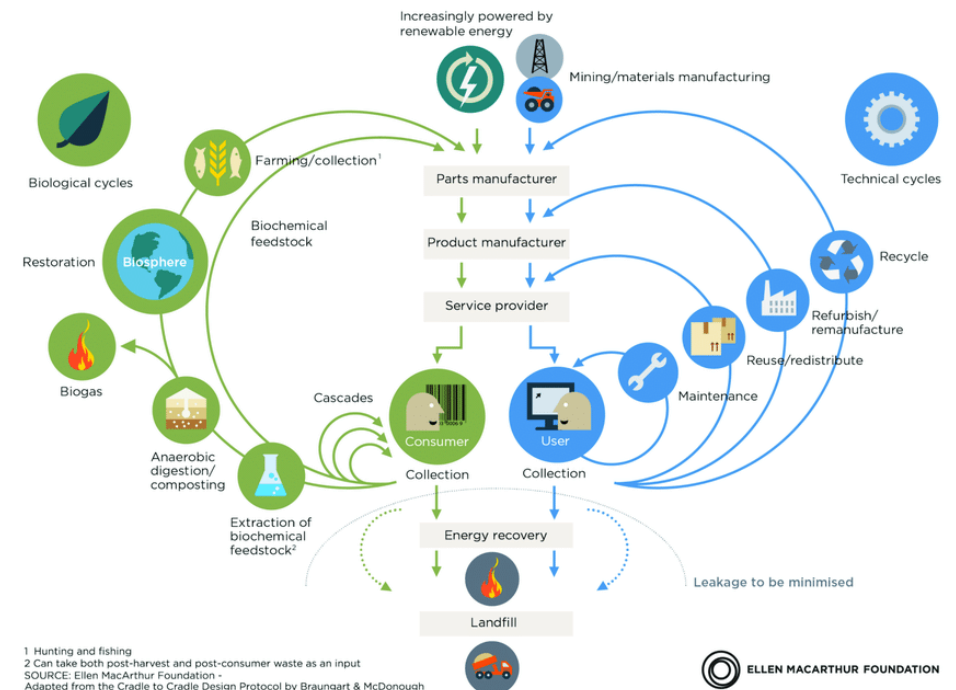
Construction and Demolition Waste

- > According to the General Waste Management Regime (Decree-Law no. 176/2008, of 5 September), Construction and Demolition Waste (CDW) is **all waste from construction, reconstruction, expansion, alteration, conservation and demolition and the collapse of buildings**.
- > The main materials present in the CDW can be classified into three major groups: Aggregates, Organic Materials, Composite Materials
- > Construction and Demolition Waste corresponds to about **1/3 of all waste produced at European and national level** (PAEC 2015).
- > The construction sector in Portugal was responsible for **73% of the extracted materials** (PAEC 2015)



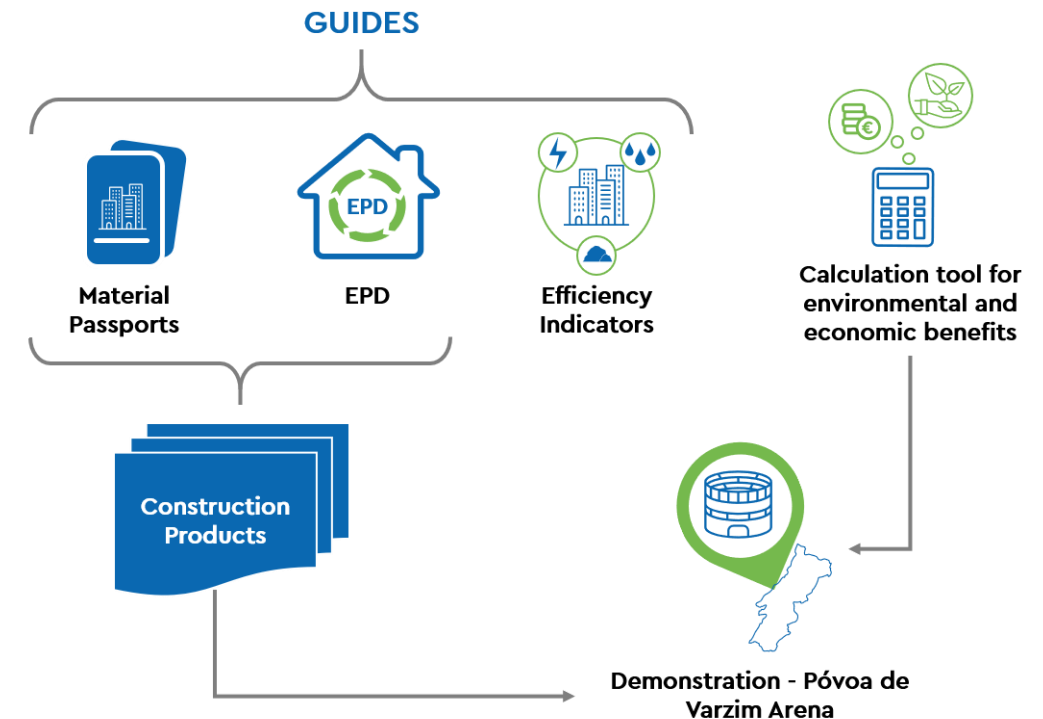
Circular Construction

- > **Circular Construction** is more than the recycling of building materials after the demolition of a building.
- > It is framed by the principles of **Circular Economy**, in which there is a **reduction** in the use of virgin raw materials and in which products and materials are **reused** whenever possible.
- > This concept applies to the **entire supply chain**, with **architects, engineers and contractors** playing **a fundamental role** in ensuring that the **design** of buildings takes into account the reuse of the materials used.



Objetives

- > The Circular Buildings project aims to develop **decision support tools for the design and construction of circular buildings.**
- > These tools will facilitate the definition of building material passports and the calculation of circularity and material, water and energy efficiency indicators. A tool for assessing the environmental and economic benefits associated with circularity in buildings will also be developed.
- > The project also foresees a demonstration project where these tools are meant to be applied.



Partners

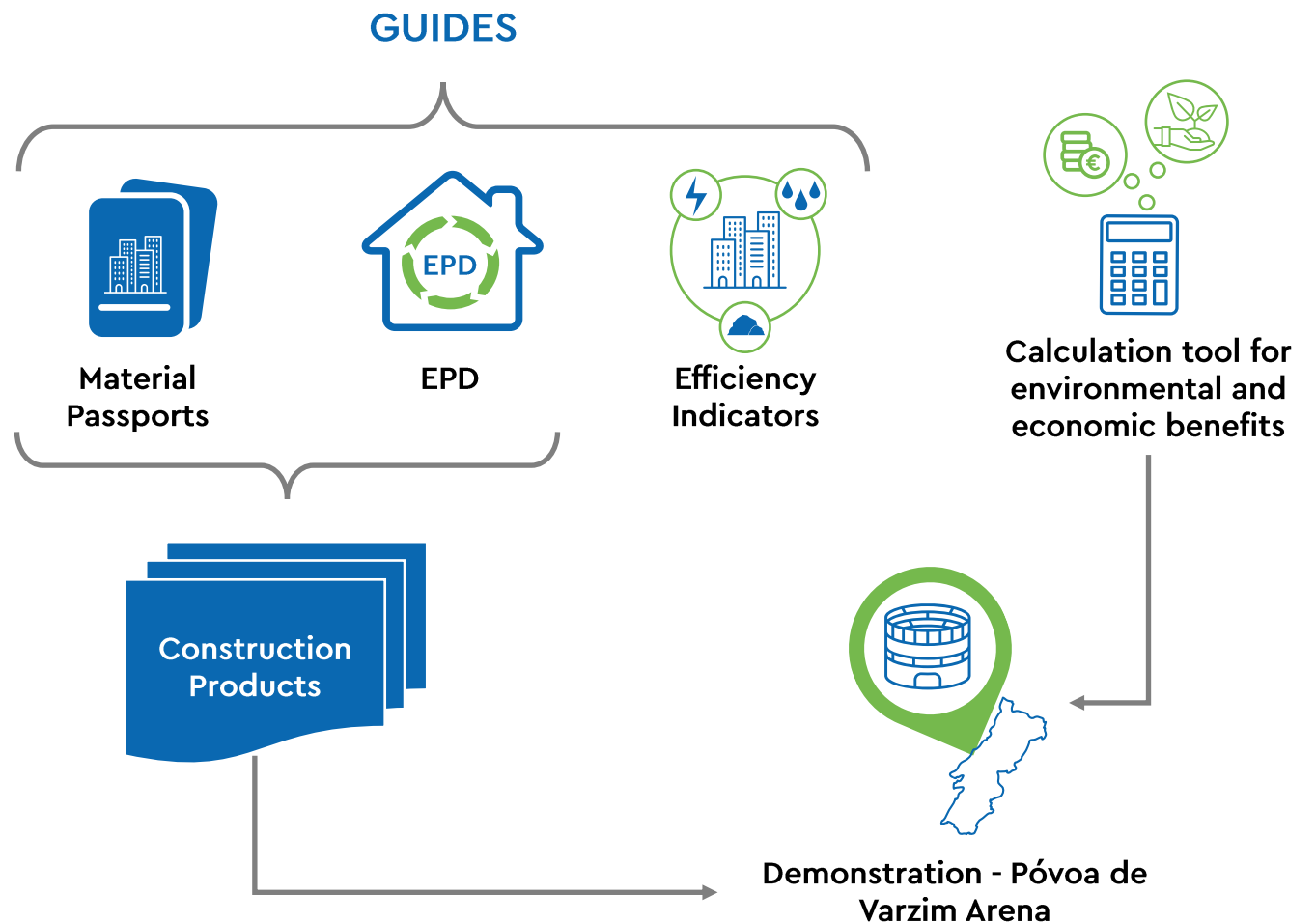
- > **Smart Waste Portugal**, as promoter of the project and association that operates throughout the value chain of the waste sector, has the role of contributing to the dissemination of the project in this sector and in the domain of the circular economy.
- > **3drivers – Engineering, Innovation and Environment** and **Faculty of Engineering of the University of Porto** are responsible for the technical development of the project, contributing with their vast knowledge and experience in the areas of sustainable construction and construction and demolition waste.
- > **Portuguese Technological Construction Platform** brings together all types of public or private entities in the Architecture, Engineering and Construction sector, thus allowing the promotion of the project throughout the entire chain of the sector. The entity will thus enhance the scalability and the multiplication of the results, either at national or international level.



Project results

Tools to support the design and construction of circular buildings:

- Guide for creating building material passports
- Good practice guide for promoting circularity in EPD
- Good practice guide for calculating building efficiency indicators
- Calculation tool for environmental and economic benefits



Guide for creating building material passports

- There is no generalized standard for the definition of material passports, preventing its implementation and use in the market by the construction sector



Guide for creating
building material
passports



- In order to promote a level-playing field, a guide is being developed for the creation of material passports in the construction sector, with a focus on assessing the circularity of the product
- The guide focuses on harmonizing general passport parameters and normalizing circularity parameters

Good practice guide for promoting circularity in EPD

PRODUCTION STAGE			CONSTRUCTION STAGE		STEP OF USE							END OF LIFE STEP				ENVIRONMENTAL BENEFITS AND LOADS BEYOND THE SYSTEM'S BORDERS
Extraction and processing of raw materials	Transportation	Production	Transportation	Construction and installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Energy use (operational)	Water use (operational)	Deconstruction and demolition	Transportation	Waste processing	Final Elimination	Potential for reuse, recycling and recovery
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D

- Module D is most of the time also excluded from LCA, and its declaration is not made in the EPD of construction products

Good practice guide for promoting circularity in EPD

- Although there is already a consolidated framework for EPD, they do not necessarily reflect the aspects associated with the circularity of materials and products.



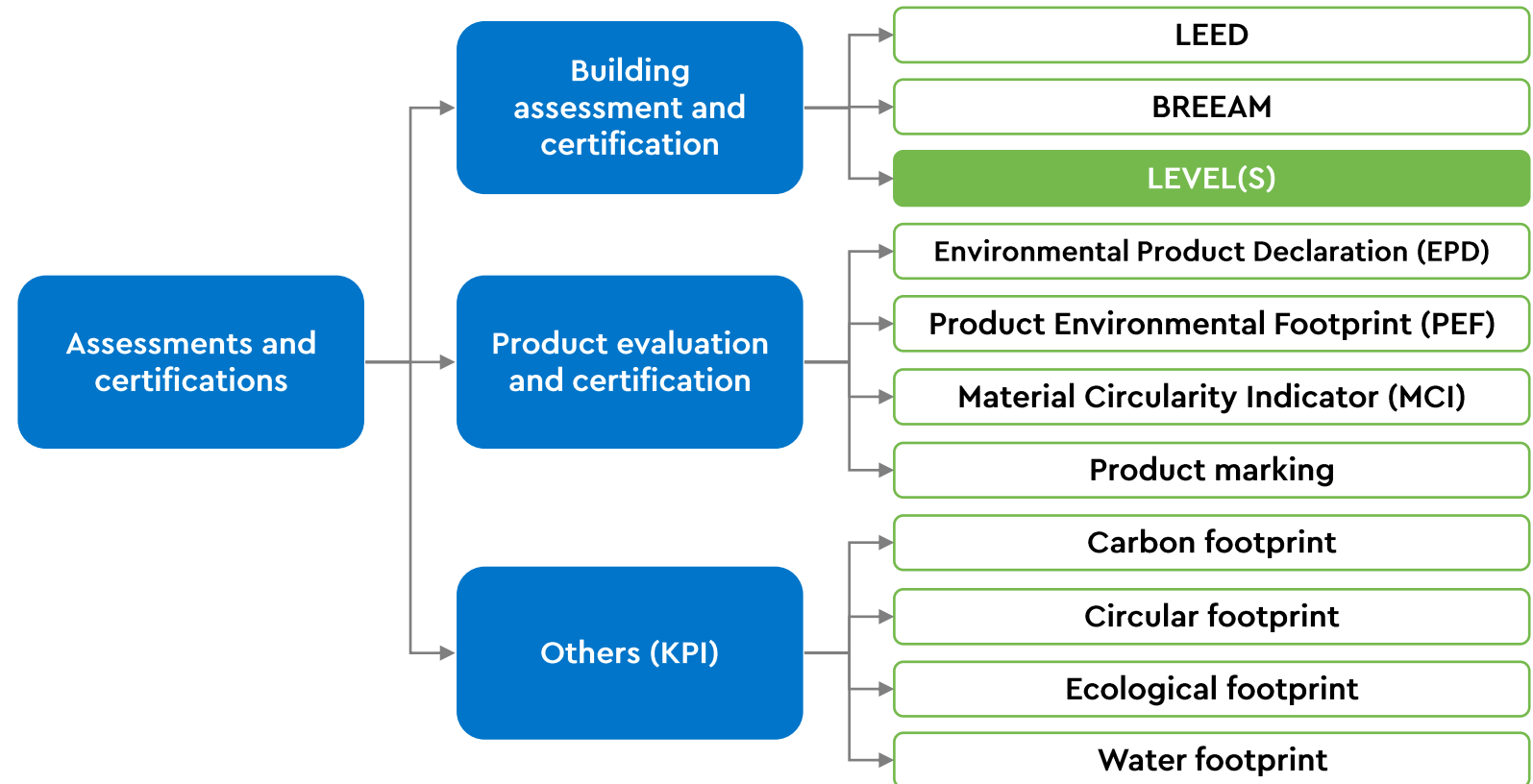
Good practice guide for
promoting circularity in
EPD



- Guide to recommendations and good practices within the scope of EPD, promoting their use to promote circularity of products

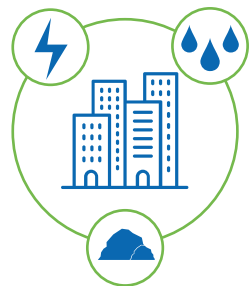
Good practice guide for calculating building efficiency indicators

- Efficiency indicators can be defined as is (product level) or integrated into building assessment systems



Good practice guide for calculating building efficiency indicators

Objective: promote a robust metric analysis of the efficiency indicators needed to promote circularity in buildings



Efficiency
indicators



- This guide defines a set of recommendations focused on the most representative construction products using practical examples and exemplifying the most common errors in the calculation of these indicators
- The guide also includes recommendations for the use of credible and robust data sources, encouraging critical analysis of their use

Assessment tool for environmental and economic benefits

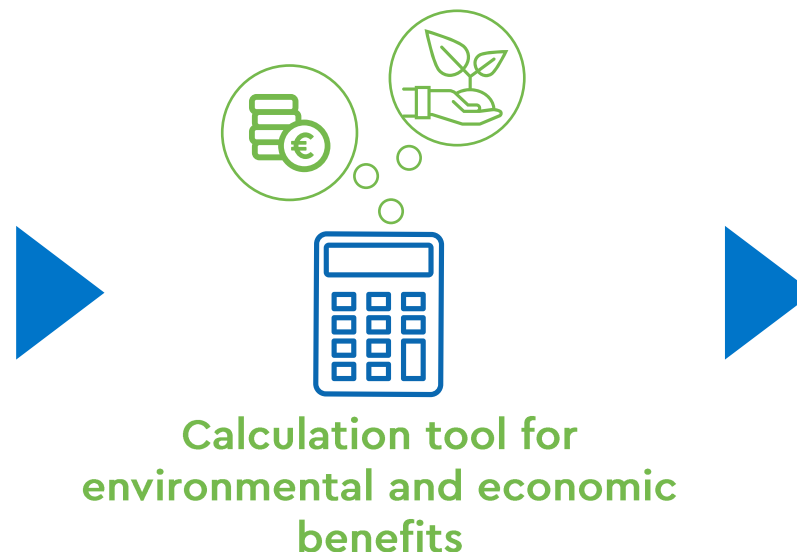
Objective: assess the environmental and economic benefits associated with circularity in buildings (eg, selective deconstruction, reuse and recycling of materials), based on the characterization of materials and unit processes associated with construction

Input:

Building characterization data

Data base:

Economic and environmental reference values for the different materials, components and processes



Users:

Entities in the construction value chain



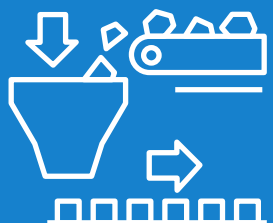
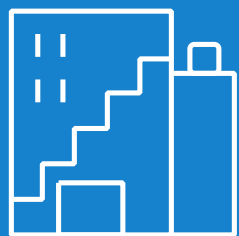
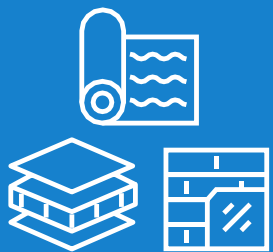
CIRCULAR BUILDINGS



Develop tools aimed at agents in the value chain that promote an increase in the reuse of materials and a reduction in waste production

Expected results

- The resulting tools allow to cover several interest groups, since they were developed to be applied to **different types of buildings**, ensuring the **scalability of the project**. The results of the project are expected to influence the business models of the construction companies, which intend to carry out the urban rehabilitation and reconstruction of buildings, planning to **transmit knowledge** related to circular construction within the local and national value chain
- **The entire value chain**, from suppliers and builders to users, **can obtain information through the project tools** (material passports, energy and material efficiency indicators, circularity indicators in EPD and environmental and economic benefits calculation tool) **to make decisions that ensure the sustainability of buildings**, allowing the choice of more sustainable products and materials and the increase of their service life and the maximization of their end-of-life value.



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