

## Circular urban rehabilitation methodology – CDW Management

### Summary

Sustainability in urban rehabilitation is urgent and a huge challenge. Activities in the construction sector present a high environmental impact, both through land use, consumption of natural resources and energy, CO<sub>2</sub> emissions, and waste production, related to the construction, operation, rehabilitation, and demolition of buildings. The large amount of construction and demolition waste (CDW) produced in rehabilitation activities is a challenge, and its valorisation is fundamental. Given the negative contribution on the environment, it is essential to develop solutions that promote sustainability and the transition to a circular economy in the sector. To this end, it is of the utmost importance to promote scientific studies in this area and develop new methodologies to optimize the flow of goods, maximize the use of natural resources and minimize the production of CDW.

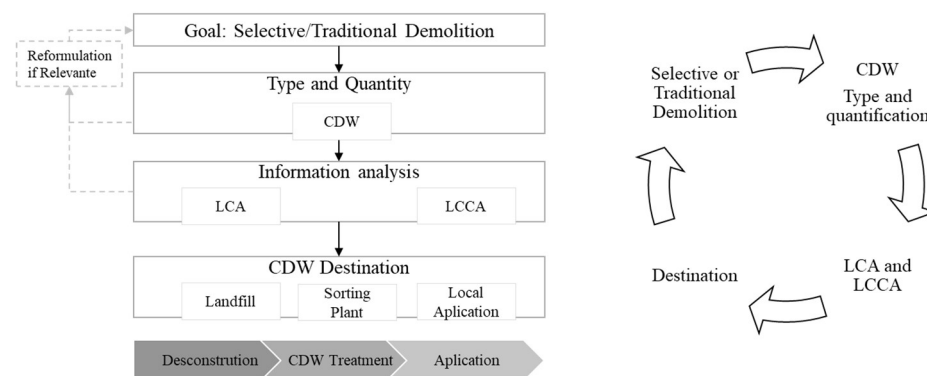
The development of the proposed circular rehabilitation methodology is based on the optimization of CDW management, promoting its recovery, if advantageous, on the spot. With this methodology, it is intended to promote more sustainable solutions through the circularity of CDW, reducing its landfill waste, the excessive exploration of natural resources, energy consumption, and CO<sub>2</sub> emissions. The work program aims to develop this strategy, taking into account the life cycle assessment (LCA) focused on the end-of-life of buildings. Through this analysis, the environmental impact associated with the different processes of valorisation of CDW from the rehabilitation works will be investigated, and several hypotheses will be considered, in order to understand which strategy provides the lowest environmental impact. This analysis also aims to understand the economic differences between the strategies studied and for this reason a life cost cycle assessment (LCCA) will be carried out. These two analyzes will be able to contribute to significant improvements in two of the three fundamental pillars of sustainable development: the environmental and the economic.

Focusing on the main objective of optimizing CDW management and consequent reduction of the environmental impact associated with the sector, it is planned to develop a CDW management platform in partnership with a company. This platform will aim to promote the circularity of CDW produced in a given municipality considering projects that are taking place simultaneously. In this way, resources can be optimized, reducing unnecessary transport to other centers and the disposal of waste with high potential for application on-site.

This study also aims to contribute to 4 of the 17 sustainable development goals (SDGs) on the 2030 agenda, namely: goal 9 on industry innovation and infrastructure; goal 11 about Sustainable Cities and Communities; goal 12 on responsible consumption and production; and goal 13 on climate action.

### Keywords

CDW, circular economy, LCA, LCCA, rehabilitation, sustainability.



Circular methodology to Sustainability Rehabilitation - CDW management analysis with LCA and LCCA.



#### PhD student

Ana Célia Henriques Antunes

#### PhD program

Civil Engineering (IST, University of Lisbon)

#### Supervisor

Eduardo Júlio (CERIS, IST, University of Lisbon)

#### Co-supervisors

Hugo Costa (ISEC, Coimbra Institute of Engineering; CERIS, IST, University of Lisbon) and Ricardo do Carmo (ISEC, Coimbra Institute of Engineering; CERIS, IST, University of Lisbon)

#### Period

2021-2024

#### Funding

FCT scholarship (2020.09276.BD)