

Development of optimized compressed earth blocks based on the circular economy



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Introduction

With the growing concern in adopting more sustainable technical solutions, the interest in earth as a construction material has been renewed. This work has as main objective to optimize the thermal behavior of compressed earth blocks (CEBs) by incorporating waste and industrial by-products, without neglecting the optimization of its mechanical and structural performance. In addition, the incorporation of construction and demolition waste (CDW) will also be studied, contributing to the implementation of the circular economy in the construction sector.

- ✓ The desired products will represent more economical solutions, with reduced environmental impact, in a perspective of contribution to sustainable development.
- ✓ The results of the study will assist professionals who intervene in the rehabilitation and conception of new buildings using earthen construction techniques.

Earth Construction: The solution on the path to sustainability involves reincorporating traditional building habits and techniques, improving them based on current technical and scientific knowledge

Earth-based construction has lower environmental impact (low processing technology, less energy consumption and 100% reusable local material) and contributes to the passive performance of buildings: its thermal inertia is suitable for warm and temperate climates.



Objectives

Develop optimized earth mixtures by the incorporation of materials with sustainable potential	Assess the state of the art of earth construction products	Identify sustainable materials with the greatest potential to improve the thermal insulation of CEBs
Characterize the thermophysical properties of commercial CEBs	Improve the thermal properties of CEBs by incorporating sustainable materials, without compromising its mechanical behavior	Characterize the contribution of CEB optimization to reduce environmental impact
	Evaluate the incorporation of CDW in the optimization of CEBs	

Challenge

Insufficient thermal performance of earthen construction materials in colder climates requires additional insulation. However, conventional insulation materials have low earth compatibility.

Compressed Earth Block: Most accepted earth building technique in modern society

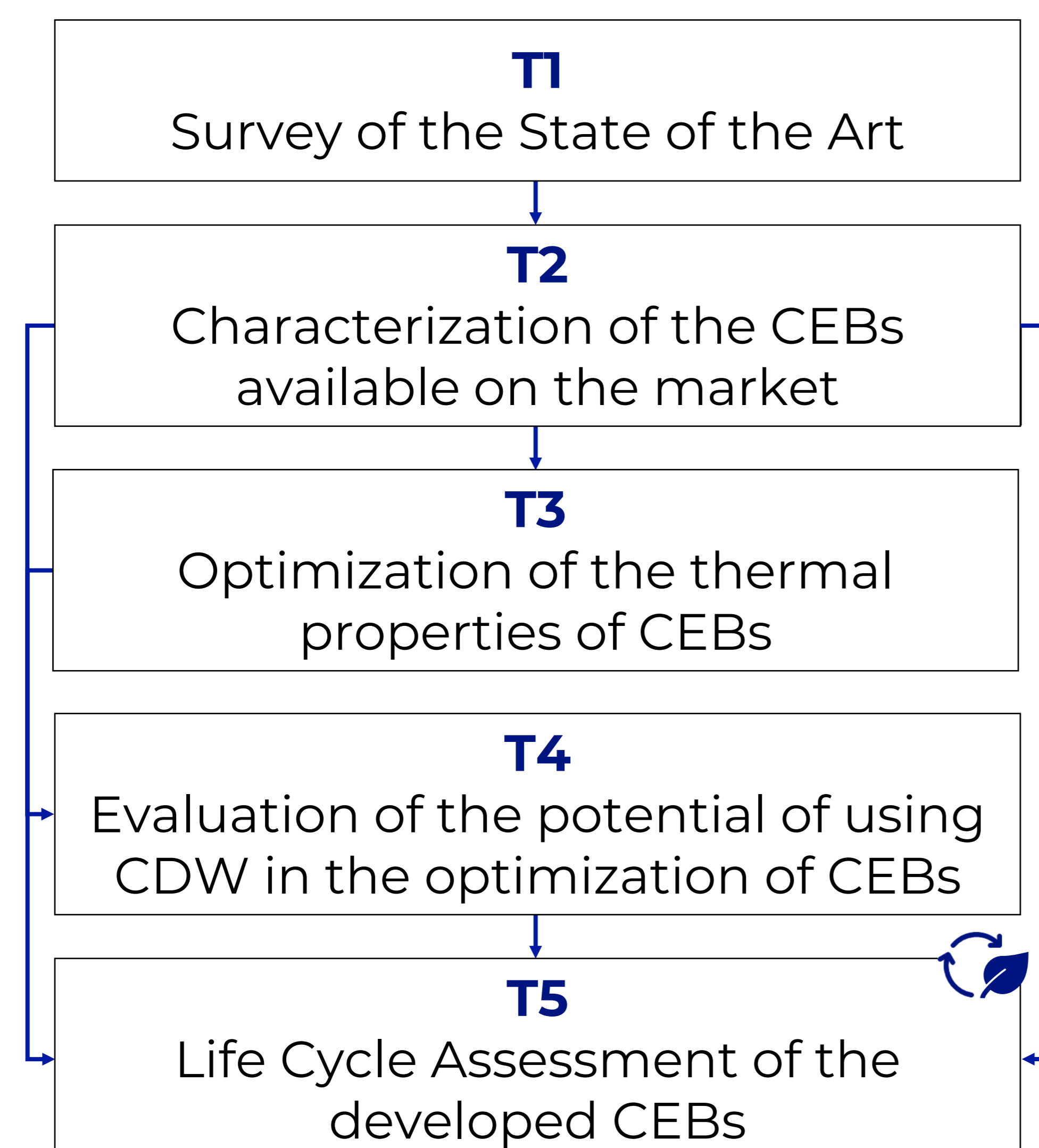


- ✓ Better production control and the consequent
- ✓ Improvement of mechanical and durability properties

Expected outcomes

- ✓ Identification of the current state-of-the-art about optimized CEBs with alternative incorporations;
- ✓ Compilation of database with properties of CEBs currently available on the construction market;
- ✓ Development of thermally optimized CEBs for use in building envelopes;
- ✓ Development of CEBs with CDW for use in the internal walls of buildings;
- ✓ Obtaining an evaluation of the economic and environmental performance of the life cycle of CEBs optimized by the incorporation of sustainable materials.

Workflow of the main Tasks



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