

Bamboo in a temperate climate: what potential for integration and application(s) in sustainable, low-carbon, and circular architecture?

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1 Introduction

1.1. Context and background

To meet its 2050 goals for a circular, carbon-neutral economy, Europe must renovate more buildings using sustainable materials. While wood is a key biobased option, growing demand strains forest resources. Bamboo, known for its high productivity and architectural uses in South America, Asia, and Africa [1], could be a viable alternative in Europe [2,3]. However, its cultivation in temperate European climates and use in construction remain underexplored [3]. As demand for thermal insulation increases, there is a strategic opportunity to expand bamboo use in construction, especially given its wood-like properties [4] already valued in insulation applications.

1.2. Goal of the research

The research aims to (1) demonstrate the sustainable cultivation of bamboo in temperate climates, with a focus on Wallonia (Belgium), and (2) show that these “adapted” species can contribute to European goals for sustainable and circular renovation, particularly in insulation applications that utilize all parts of the plant in various forms.

3. Preliminary studies and early findings

The study focuses on the *Phyllostachys* genus, known for its ability to adapt to temperate climates. Three promising species have been identified: *P. edulis*, *P. iridescens*, and *P. makinoi*. Northwest Wallonia offers favorable conditions (Figure 2), where bamboo could also help address environmental issues [1]. However, uncertainties remain regarding species behavior and morphological traits under local conditions [5].

Species	Height [m]	Diameter [cm]	Wall thickness [mm]
<i>P. edulis</i>	20	20	Ca. 10
<i>P. iridescens</i>	6-12	4-7	6-7
<i>P. makinoi</i>	10-20	3-8	To 10

Figure 1: Pre-selected species. – Source : J.Y. Shi et al. (2020).

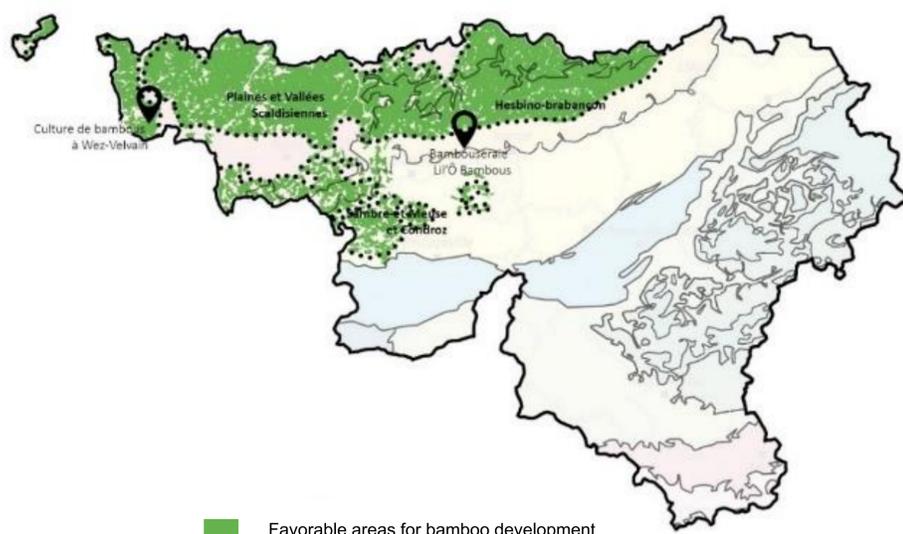


Figure 2: Favorable areas for bamboo development in Wallonia – Source: A. Romboux

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2 Methodology

The research follows four complementary steps, currently focusing on **assessing bamboo species' adaptability to temperate climates**. This first phase will guide species selection for future testing and help anticipate regional supply and processing challenges.

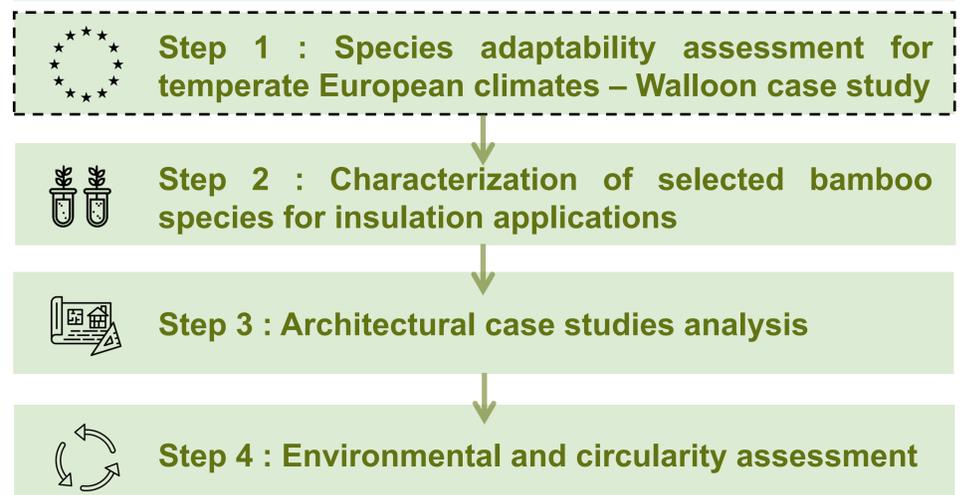


Figure 3: Methodological steps of the research project. – Source: A. Romboux

4 Ongoing work

To support the responsible use of bamboo in construction, in-depth studies are underway on the selected species. These include species-specific data sheets (ecology, climate sensitivity, local morphology) and a standardized protocol (based on ISO 19624) to assess architectural-relevant traits. Local characterization is key, as dimensions may differ from those in native habitats.

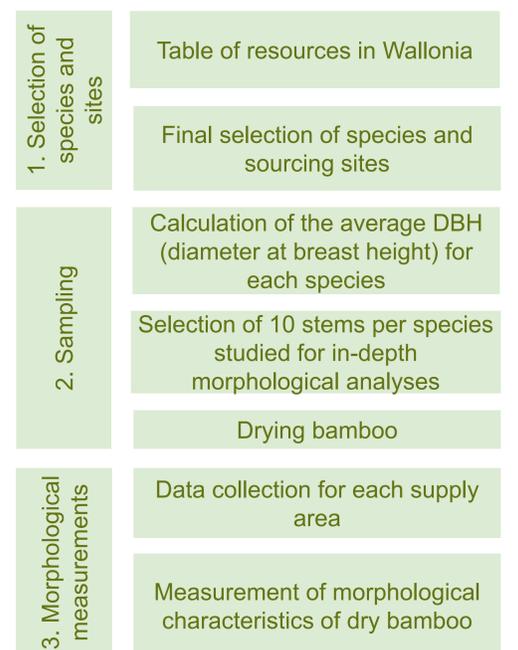


Figure 4: Development of a measurement protocol. – Source: A. Romboux

5 References

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