

Re-Use Scenario of Shell-Nexorade Hybrid Timber Structure: Discussing Environmental Benefits of Reclaimed Structures

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Abstract:

In the context of urgency of environmental situation in the construction sector, there is an emergence of various design strategies and fabrication technics, that usually are focused on a single phase of the life cycle of a system. Therefore, a paradigmatic example of this tendency is the fact that today's required thickness of the insulation material in France contains more of embodied energy than the potential savings of operational energy it supposed to bring [1]. A similar paradox has been observed when the structural performance is achieved within the digital design-to-production workflow, where environmental load of the robotic fabrication is as significant as the one of construction materials [2], which brings us to a conclusion of a strong non-obviousness of legitimately sustainable design strategy.

Recently, the rise of awareness of the end-of-life phase impact of construction elements (often reduced to disposal), prompted a recourse to the re-use principle in architecture and structural design. Thus, a few academic works have already been exploring design and structural optimization technics for reclaim of structural elements [3], [4]. Several design proposals were developed in the field of structural up-cycling [5], with a particular interest to skies [6]. Lastly, some non-structural applications were established in full-scale architectural realizations, e.g. the Headquarter Council of the EU in Brussels or Circular Pavilion in Paris.

In this study we propose a re-use scenario for the shell-nexorade hybrid timber structure, also known as R2 pavilion. The structure was classified as temporary construction with a legal life-time of 10 years, which is noticeably beneath the material's duration of service as well as its actual life-time.

The purpose of the study is thus threefold: in the first place, within the established end-of-life scenario the re-use potential of the constructive system is investigated. Then a method for the structural reclaim of timber elements is proposed. Finally, the environmental benefit of the reclaimed structure is evaluated, and quantification procedures are discussed.

References:

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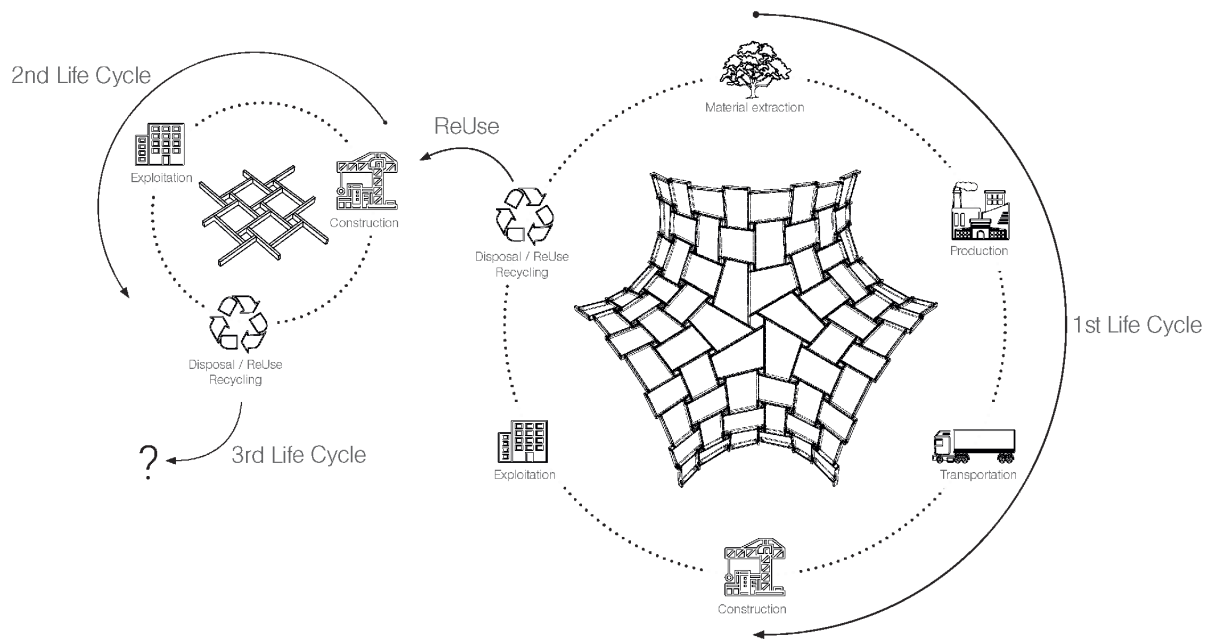


Figure 1: Scheme of the life cycle analysis methodology of the R2 pavilion including re-use scenario.