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Embodied Energy Policies to Reuse Existing Buildings

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Abstract

When dealing with the existing stock of buildings, energy strategies usually focus on the improvement of their performance by means of technical upgrading. However, taking architecture as a resource helps raising another question: to what extent the embodied energy in already built structures could be a key factor to develop sustainable strategies based on an adaptive reuse and a subsequent extension of their lifespan.

The aim of this paper is to discuss on the benefits and architectural implications of a public policy addressed to establish a protocol on reusing existing buildings in order to take advantage of their embodied energy.

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Keywords: Embodied Energy; Adaptive Reuse; Public Policies; Existing Buildings; Refurbishment.

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1. Introduction

Energy strategies to renovate existing buildings are usually focused on improving their efficiency. This technical upgrading can be regarded as a basic repair to optimize consumption and reduce emissions — even extend their lifespan reasonably — but it does not actually involve the use of the building. Providing they are in a good condition to bear a refurbishment, the genuine potential of the existing stock of constructions is to be reused once their original function is over. Although this process can be approached in different ways, the one endorsed here is an adaptive reuse aware of the cultural, social, environmental and economic value of the building. The discussion is not only about the ability of a building to adapt to new requirements but also the very program to adjust to diverse circumstances.

Built architecture can be understood as a resource in itself, expressed by means of its potential performance and the energy embedded within. This energy that was spent during construction — and is regularly increased by ordinary maintenance ¬— is not easily recoverable. Considering management and maintenance as a constant, the longer the building provides a function, the better the rate per unit of time. Consequently, a sort of *amortization* in architecture can be formulated as the quotient between the embodied energy of a certain building and its lifespan.

When a change of use applies, renovation comes into consideration and the effects of this amortization are modified. In the above-mentioned quotient, a renovation implies a new balance between a variation of the existing embodied energy — which may be conserved or diminished —, a new injection of energy, and a longer lifespan. Depending on the overall strategy, solely certain renewals are favorable to sustainability in these terms: those aware of the importance of re-programming the building in consonance with its potential and implementing strategic design measures to preserve embodied energy.

The scale in which these operations occur is also relevant, since sustainability does not depend on single initiatives but on a general outcome. Thus, refurbishment should be of a general interest. Public policies must address such processes, by establishing clear and useful criteria to evaluate transformations and boost low impact ones. Political support is definitely needed to facilitate the low carbon emissions [1]. The duty of experts is to provide background analysis and establish an operational methodology to make this possible. Taking the stock of buildings in Barcelona as a case study of adaptive reuse can help establishing a local basis for discussion that takes social, economic, environmental and technical issues into account at the appropriate scale to establish a protocol on reusing existing buildings as a basis for a public policy.

2. Adaptive reuse as a recurrent strategy

As other man-made artefacts, buildings undergo complex processes of obsolescence both as a physical phenomenon and as a function of human action and disregard that only regular reinvestments in maintenance and adaptation can modify [2]. Although being structures in a continuous transformation, buildings are rarely studied from this standpoint at a large scale and in a systematic way.

A key factor in the life cycle of a building in relation to obsolescence is a change of use that occurs when the initial function it was designed for is over. Analyzing thoroughly cases of this nature and identifying their characteristics at each stage can result in a set of general and specific guidelines about their ability to accommodate various programs over time, despite not being designed for such purpose. The ongoing research project Atlas of Architectural Reuse[1] focuses on Barcelona as a case study to provide operational information about this current yet understudied situation. If appropriately contextualized, architectural and urban processes generated systemically as a result of reuse and

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