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Applications of an Integrated Design Methodology for Regenerative Process of the Existing Buildings

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Abstract

The building sector has been identified as one of the key sectors to achieve the 20/20/20 targets of the EU. In particular, the existing buildings are considered as one of most potential sub-sectors to reach energy and raw materials savings.

This research is integrated in this European context and the main goal is to look for solutions that can be fully integrated in the building system and that can optimize all the sustainable future aspects. A global approach is proposed to generate a comprehensive framework for the building renovation process. It's an "action guide" of the entire regenerative process already applied to different types of buildings. A summary of the results obtained in the buildings regeneration projects are presented.

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1. Introduction

In the recent past, human actions have been responsible for "climate change" and nowadays we have to deal with that [1]. We must change the way we live and work in order to avoid the point of no return of our Planet. The building sector has been identified as one of the key sectors to achieve the 20/20/20 targets of the EU [2]. Beyond these targets for the sustainable develop, Europe also aims to obtain a drastic reductions of greenhouse gas emission in the building

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sector (88-91% reductions from the 1990 to the 2050). So all the experts of this sector are called to change the design methods, taking into account a future where resources (energy, economic, ...) will be increasingly limited [3].

One of the main actions is the urban renovation. The aim is to build on the built, without a complete demolition of the existing buildings, in order to minimize the use of resources and the production of waste [4]. The goal is to look for solutions that can be fully integrated in the building system and that can optimize the three different aspects of a sustainable future (environmental, economic and social aspects) [5].

In the presented work, an integrated approach is proposed in order to include all the stakeholders involved in a project and to create a “guide” for the building renovation process.

2. Methodology for regenerative projects

The global methodology for regenerative projects is developed and tested on several projects for the renovation of existing buildings and on the European project called “Renovation of Residential urban spaces: Towards nearly zero energy CITIES (R2CITIES)” (EEB.ENERGY.2012.8.8.3: “Demonstration of nearly Zero Energy Building Renovation for cities and districts”). The methodology focuses on establishing a guide through the renovation process. The aim is to provide the recommendations for integrating the stakeholders, to suggest the tools and methods to use in each stage. In particular it suggests a decision-making method to choose the best alternatives considering a sustainable approach, that it can be define an “optimization methodology” applied to the renovation process.

The methodology consider two key aspects (see Fig. 1):

- The project organization based on the IPD principles (Integrated Project Delivery®) develop by the ®The American Institute of Architects (AIA National/AIA California Council). This aspect assures the correct involvement of the stakeholders through the process and their communications flows in each phases and assures to improve the collaborative work.
- The project key phases ensures that the design solutions accomplish with the sustainability goals and that all the stakeholder’s expectations are met.

All the process is developed by four parallel approaches: management, technical framework, BIM platform and District Sustainability Indicators (DSIs). These aspects are used to perform each phase of the complex requalification process: the Diagnosis phase, the Design phase and the Evaluation phase.

In the following sections a detailed description of the phases are presented, with particular attention to the technical aspects.

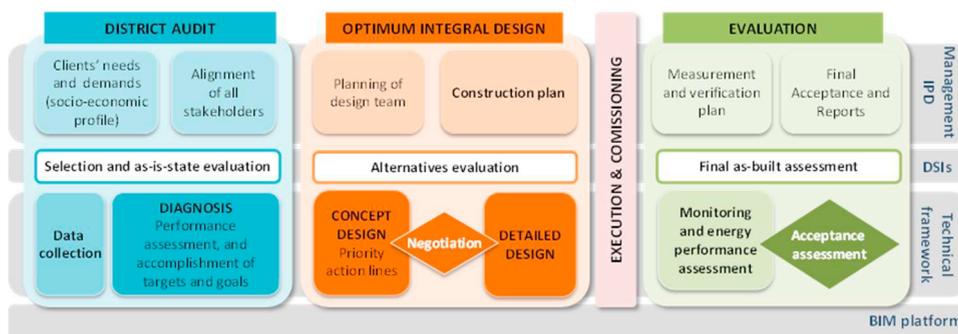


Fig. 1. Structure of the R2CITIES Methodology for requalification project.

2.1. The Diagnosis Phase

The main goal of the diagnosis phase (see Fig. 2) is to set project baseline and clients’ needs and demands, to determine the building performance and to identify the main barriers [6].

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