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HOW TO BUILD AND USE SUSTAINABLE COOPERATIVE HOUSING UNDER CONTROLLED COSTS IN PORTUGAL

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KEYWORDS

Sustainable construction, cooperative housing sector, energy efficiency, indoor comfort, life cycle assessment, inhabitants' engagement.

ABSTRACT

The present research work considers housing as economically, socially and environmentally feasible and sustainable for the Portuguese families with medium and medium-low income who seek, through cooperative housing, a solution for their housing problem. Adapting the criteria of sustainable construction and use of sustainable housing to the rules of the cooperative sector, based on the controlled costs legislation, it is aim of this work to assess the performance of cooperative buildings already built under these sustainable rules, to quantify the obtained benefits and to write a manual with full guidance to build and use sustainable cooperative housing. It is also an objective of this work to demonstrate the influence of sustainable construction in the inhabitants' quality of life and in the reduction of the environmental impact of the built patrimony. Starting with the concept of "Sustainable Construction", and based on the literature read, this work will identify and assess the criteria of sustainable construction for cooperative housing. There also will be a reflection about the triple baseline of the concept, through the financial, social and environmental approaches of sustainable construction. There will also be identified the research methodology, the actions needed to perform the work and the expected results, scheduling the main activities that will lead to the doctoral thesis.

Adapting the criteria of sustainable construction to the use of sustainable cooperative housing

The challenge of the twenty-first century requires that we make a transition to a new order of things that can be sustained within the limits of natural systems. Sustainable housing is one of the most important advances for decrease of needs for energy, of emissions

of carbon dioxide to the atmosphere and of saving natural resources (Halliday 2009; Roaf et al. 2007). So, it is important, in this research work, to evaluate and describe new methods and technologies for sustainable cooperative construction (Norbiceta 2007) and to elaborate a manual of good practice of design, use and maintenance for these purposes. The main objectives of sustainable cooperative housing are:

- Developing an integrated approach aimed at making sustainable housing the rule and reducing the distance between what we know is needed for more sustainable lives, buildings and cities and what is normally done;
- Improving energy and environment performance in social housing and the quality of urban life and supplying citizens with a healthy, sustainable environment;
- Keep the costs of construction and the costs of purchasing sustainable cooperative housing under the maximum costs allowed by Portuguese controlled costs rules and laws;
- Disseminate sustainable cooperative housing in national, regional and local policies, increasing awareness of the various players in urban development to questions of sustainability, especially with respect to global costs and direct and indirect gains from construction sustainable buildings.

The main objectives of this research work are:

- To prove that the criteria above are economically, socially and environmentally feasible and sustainable for the Portuguese families with medium and medium-low income;
- To calculate the savings of the average family living in sustainable cooperative housing comparing to the average family living in non-sustainable cooperative housing;
- To verify in what measure the environmental indoor and outdoor comfort increases in sustainable cooperative housing comparing to the average family living in non-sustainable cooperative housing;



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- To analyse which design and construction solutions suit best for new sustainable cooperative housing projects;
- To elaborate a Manual with basic and advanced guidance for the construction, use and maintenance of sustainable cooperative housing.

So, in the project it will be considered a detailed study of three cooperative developments, regarding i) readings of monthly consumptions of gas, electricity and water, on the monitored dwellings; ii) thermal analysis of façades in winter; iii) internal lighting analysis; iv) analysis of the impact of sources of outside noise in the dwelling. Therefore, this research work intends to assure an integrated approach in the concept of sustainability, promoting the idea that the initiative of developing sustainable construction is not merely adding certain characteristics to current building practices. On the contrary, it should involve new methods of design. So, sustainable construction should be thought right at the beginning of the process of development by considering, for example, a detailed analysis of all the construction steps (Kibert 2008). In that way, a sustainable development can be designed, that respects the characteristics of the land, but also enhances its potential as well. The location analysis before construction is extremely important, since it means the neighbouring area and the characteristics of the surrounding buildings can be analysed. It also means that the path of the sun, the direction of the predominant wind, the local microclimate, soil characteristics, the green spaces, the biodiversity and access to transport should be taken into account. The study and analysis of these factors make up a tool of enormous importance as an input into drawing up the future project. Besides being integrated harmoniously in the neighbourhood, sustainable construction enriches the space and gives it more aesthetic value (Halliday 2009). The new construction should also preserve the soil and assure the permeability of the subsoil, while reducing the infiltration of rainwater by using capturing and plumbing systems. Moreover, the decrease in environmental impact of construction necessarily includes the minimisation water consumption in the building (Kibert 2008). The separation and recycling of waste resulting from construction (wood, paper, metal) and separating domestic waste (glass, paper, organic, packaging, plastic) into different recipients emphasises the extreme importance of decreasing the impact of the building on the location and in assuming the life cycle concept (Mateus and Bragança

2006). The reduction in CO₂ emissions depends largely on natural or mechanical ventilation systems used, as well as installing low energy consumption heating and cooling systems. It also depends on a high degree of thermal insulation, passive cooling techniques and active and passive solar systems (Halliday, 2009; Mateus and Bragança 2006). This means that an integrated energy management of the whole building is required. Besides the thermal comfort, it is necessary to achieve, throughout the entire building, an environmental comfort which also depends on managing the natural light, ventilation and acoustic comfort in each apartment. It is the purpose of this research work to try out if cooperative housing built under these sustainable rules and under controlled costs defined by Portuguese legislation can obtain a high sustainable performance. This performance and its possible benefits for the cooperative inhabitants will be quantified. Finally, a manual will be written with guidance to build and use sustainable cooperative housing.

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