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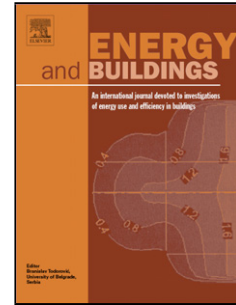
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Comprehensive Cost-Benefit Analysis of Energy Efficiency in Social Housing. Case Study: Northwest Mexico.

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Abstract

This article proposes a methodology, via a case study, to address the principles of Cost Benefit Analysis (CBA), applied to energy efficiency in social housing. In Northwest Mexico (NWM), comfort in Summer cannot be achieved without mechanical cooling; the hot-dry climate, combined with poorly designed dwellings, results in large cooling loads. Having demonstrated in a previous research work that passive cooling can be effective for reducing internal temperatures, it was necessary to investigate whether strategies proposed were affordable for householders and still profitable for developers. A typical social dwelling was set as reference case to assess the remedial measures applied, resulting in two new forms of new build and one for retrofit; the analysis included the two types of mechanical cooling commonly used in NWM, the vapour compression-based air conditioning and evaporative cooling. Using the Net Present Value (NPV) as comparison parameter, results showed that investing in low-energy design or energy-efficiency upgrade is always profitable in terms of reduced energy consumption, but the payback period varies depending on the type and source of financing. For example, when using single room air-conditioning devices in a new dwelling, the additional cost of the passive features was paid for, via reduced energy bills, in six years.

Keywords: Cost Benefit Analysis; Net Present Value; Low-Energy Building; Passive Thermal Design.

Highlights:

- The Net Present Value of a typical social dwelling using mechanical cooling in a hot-dry region was compared to those of three energy-efficient alternative projects.
- Investing in upgrading social dwellings for energy-efficiency is worthwhile.
- The payback period depends on the source of financing and type of mechanical cooling used.
- Investing to improve energy efficiency of dwellings to end up using evaporative cooling does not bring additional economic benefits, but improves thermal comfort.

1. Introduction

Nowadays, the world is facing the challenge of addressing climate change, while pursuing economic growth and an equitable distribution of wealth. The role played by the energy sector is crucial for the economic and social development of any country. Although growth in energy-related CO₂ emissions stalled

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