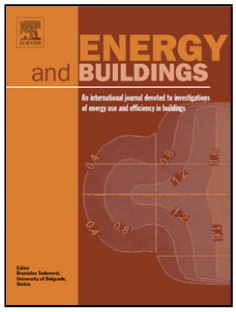

Title: Cost-benefit analysis of changes in energy in building technology in Southeast Spain

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Cost-benefit analysis of changes in energy in building technology in Southeast Spain

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ABSTRACT

The changes in Spanish legislation on energy efficiency seek to set the basis for achieving European energy and climate goals, especially insofar as decreasing primary energy consumption and reducing CO_2 emissions. This has led to positive changes in energy in the building sector from traditional construction methods which did not consider energy efficiency (e.g., did not include envelope insulation). This study analysed 342 residential buildings built from 1981 to 2015 and characterised their parameters (areas, orientation, number of stories, etc.), envelopes, domestic hot water, and heating and air-conditioning systems. Based on this characterisation, a model single-family dwelling and another model multifamily dwelling were designed to evaluate their energy efficiency as a function of changes in construction and their cost in southeast Spain. The main results were that recently built buildings (built after 2006) have included domestic hot water from solar sources, insulating materials in their envelopes and have considerably improved construction systems, due to the requirements of current legislation. Fruit of these improvements is a drop in CO_2 emissions of up to 82%, according to calculations done with official programmes. From an economic perspective, these changes have raised construction costs by 11% in multifamily dwellings and 17% in single-family dwellings.

HIGHLIGHTS
- We examined changes in the construction methods in the last 34 years.
- We modelled single and multifamily dwellings based on the parameters of 342 dwellings.
- We observed that until 2008, residential building envelopes had no insulation.
- Improvements in construction methods increased the construction cost by around 11-17%.

Keywords: Energy savings; Construction costs; Evolution of construction methods; Building energy regulations; Building parameters; Residential buildings

1. INTRODUCTION

Energy is a basic component of economic development in any country because of the close relationship between energy consumption and economic growth [1,2]. EU promotion of energy efficiency contributes directly to the reduction of greenhouse gas emissions, mitigation of climate change, energy security management, consumer energy