

Chapter 15

Economic Potentials of Energy-Efficient Residential Building Envelope Retrofitting in Turkey

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ABSTRACT

The amount of energy consumption in the residential buildings has a very significant share with nearly 30 percent in the total amount of energy consumption. Therefore, residential sector is identified in this chapter as being one of the areas with a large potential for energy savings. Inefficient dwelling construction and design methods are widely used in Turkey and only about five percent of residential buildings are insulated. Concerning the importance and immediate need in Turkey for energy-efficient residential building retrofitting, this chapter identifies economic benefits of such retrofitting by particularly focusing on heat transfers by conductivity, where the rate can be determined by surface size, thermal resistance of the building materials and their thickness.

1. INTRODUCTION

The International Energy Agency (IEA) estimates that residential, commercial, and public buildings account for 30 to 40 percent of the world's energy consumption. The sector's contribution to current world CO₂ emissions is estimated by various sources at 25 to 35 percent (UNEP, 2007; UNDP, 2009). Improving energy efficiency is one of the most cost-effective ways of reducing CO₂ emissions, reducing air pollution, increasing security of energy supply. According to the Intergovernmental Panel on Climate Change (IPCC), retrofitting and replacing equipment in buildings has the largest potential for reducing greenhouse gases (IPCC, 2007, p. 389). Since vast majority of the buildings are residential, this chapter restricts itself with the residential sector only for energy savings.

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Implementing energy saving options in buildings is associated with a wide range of co-benefits. Economic co-benefits include the creation of jobs,¹ increased economic competitiveness, and business opportunities. Other co-benefits include social welfare benefits for low-income households, improved indoor and outdoor air quality, as well as increased comfort, health and quality of life. However, to turn these opportunities into reality, multiple barriers must be removed.

These barriers include lack of proper incentives (e.g., between landlords who would pay for efficiency and tenants who realize the benefits), limitations in access to financing, high costs of gathering reliable information on energy efficiency measures, subsidies on energy prices, as well as the fragmentation of the building industry and the design process into many professions. These barriers are especially strong and diverse in the residential and commercial sectors; therefore, overcoming them is only possible through a diverse portfolio of policy instruments (IPCC, 2007).

Many different instruments are or have been employed to increase energy efficiency. They include typically “positive” financial measures (incentives), such as subsidies, grants, low interest loans and tax exemption or reduction for energy efficiency interventions, or “negative” financial measures (disincentives) such as energy or CO₂ emission taxes, taxation on less efficient devices, user charges and product taxes; legal or regulatory measures ranging from energy consumption or emission standards for appliances, vehicles, buildings and specific technologies, labelling of appliances, equipment, and installations to codes for the management of land and other resources; organizational measures, including, in particular, negotiated or voluntary agreements; and finally to market-based “cap and trade” or “target and trade” measures. Procurement policies (such as purchases of high efficiency devices, systems and buildings) by public bodies may also play an important role in creating a leading market (Farinelli *et al.*, 2005, p. 1017).

There is a large potential for improving energy efficiency of existing buildings. But the development of effective strategies for retrofitting existing buildings is a great challenge.

It is obvious that drastic energy savings in dwellings cannot be achieved without strong retrofitting programmes. Building envelope retrofitting is considered as a key action for retrofitting programs (Laurent, Osso, & Cayre, 2007).

There is a broad array of accessible and cost-effective technologies and know-how that have not as yet been widely adopted, which can save energy and abate GHG emissions in buildings to a significant extent. These include passive solar design, high-efficiency lighting and appliances, highly efficient ventilation and cooling systems, solar water heaters, insulation materials and techniques, high-reflectivity building materials and multiple glazing. However, due to the long lifetime of buildings and their equipment, as well as the strong and numerous market barriers prevailing in this sector, many buildings do not apply these basic technologies to the level life-cycle cost minimisation would warrant (IPCC, 2007).

Our focus in this chapter will be on heat transfers by conductivity, where the rate can be determined by surface size, thermal resistance of the building materials and their thickness. The chapter is organized as follows. The second section will draw energy consumption levels and energy saving potentials for residences and provide examples of thermal isolation applications which are even more efficient compared to other solutions in terms of energy efficiency. Ranking of retrofitting actions and influence of chosen indicators are also discussed. The fourth section will cover energy efficiency policy like taxes and subsidies as well as non-economic instruments like direct regulations (including building codes) and information campaigns. The last section is reserved for the possible new governmental politics concerning energy efficiency of dwellings.

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