

Design of a Building Energy Efficiency Retrofitting Program for Montenegro

The Problem

Montenegro has a long-standing history of informal building settlements. The past twenty years in particular have seen a free-for-all construction boom. According to the most recent estimates, up to one third of all buildings in Montenegro are informal — approximately 100,000 buildings in total. Informal buildings present significant environmental and economic challenges for the country and its people. The government loses tax revenue because the owners of informal buildings do not pay property taxes. Many of these buildings were built with poor construction and waste significant amounts of energy. This wasted energy costs substantial amounts of money to the building owners. High energy consumption also results in higher greenhouse gas emissions, which contribute to climate change. In Montenegro, informal residential buildings waste the most energy. Additionally, building owners do not invest in maintaining these buildings because they fear the government may demolish them due to their informal status. Owners of residential buildings, in other words, have a disincentive to improve the energy performance of their properties through better insulation and air sealing around windows and doors. In addition, the heating and cooling equipment of these buildings tends to be inefficient. Wasted energy is expensive for Montenegro's building owners and for the government. Montenegrens spend more on heating and cooling than other European countries. Households in Montenegro spend, on average, €643 per year on energy use, or the equivalent of almost one month's average salary. For the country as a whole, this wasted energy use also means relying heavily on costly fossil fuel imports.

The Opportunity

Montenegro plans to formalize its informal building stock. This planned formalization process presents a unique opportunity to improve the energy efficiency of informal buildings. Building energy efficiency can be improved through energy retrofitting, the process of modifying a building so it consumes less energy. By combining Montenegro's mandatory formalization process with a voluntary building energy retrofitting program, the country has the potential to improve the energy performance of one third of its building stock. As a result, Montenegro will save money and improve its environmental performance. A retrofitting program generally follows a distinct series of steps. First, the building owner has an energy audit conducted. The audit identifies openings that allow heat to escape and cold air to enter the building. The audit also evaluates the efficiency of the building's lighting and its mechanical systems for heating and cooling. Based on the audit, a specially trained home improvement contractor develops a retrofitting plan to improve energy efficiency. For example, the audit may indicate that insulation added below the roof would reduce heat loss. Retrofitting is often expensive initially, but it saves the building owner money in the long-term. The success of building energy retrofitting programs often hinges on the availability of subsidies or low-interest financing that make retrofitting initially more affordable for building owners. For Montenegro, there are many benefits to implementing a building energy retrofitting program. Such a program would save money for both the government and its residents in the long-term and reduce the country's demand for fossil fuel imports. Improving energy efficiency would also reduce greenhouse gas emissions, which would help Montenegro comply European Union standards. The proposed building energy retrofitting program described in this report is designed to retrofit 100,000 buildings in 10 years. Over that time, the estimated program costs to the Montenegrin government amount to €33.6M, or an annual average of €3.4m. The program design, however, accounts for new sources of revenue to fund the program costs.

Our Solution

We designed our proposed program with four essential component parts: Program Administration, Public Outreach, Workforce Development, and Funding. The program will be administered via a Central Office that will manage high-level program strategy and oversight, as well as day-to-day operations. An outreach campaign will communicate the benefits of retrofitting to building owners and persuade them to participate in the retrofitting. To do the work, construction workers will be trained in energy retrofitting best practices and certified to participate in the program. Finally, financing options that include low-interest loans and subsidized repayments will be made available to make retrofits affordable.

Methodology

To design the proposed building energy retrofitting program, we benchmarked six energy efficiency programs in the United States and Europe. In the United States, programs included those in Wisconsin, Oregon, Vermont, and the town of Babylon, in New York. We also benchmarked the national programs in Hungary and Germany. We used these programs to identify best practices in building energy retrofitting program design. We adapted the best practices to the political and legal conditions in Montenegro.

