

EU-GUGLE: A Sustainable Renovation for Smarter Cities from a Pilot Project

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Abstract The European building stock is mature, and expanding cities need inclusive and innovative renovation solutions for all citizens while intensifying city densification. The European project EU-GUGLE aims to reduce primary energy consumption by 40–80 % and increase renewable energy use by 25 % through nearly zero-energy building renovation models for initiating large-scale, Europe-wide replication in cities and communities. About 200,000 m² of residential and public buildings are being refurbished by implementing a balanced mix of technical, socio-economic, and financial solutions adapted to local needs. Six EU partner cities are participating, each revitalizing an urban district: Aachen,

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Bratislava, Milan, Sestao, Tampere, and Vienna. The comprehensive integrated approach used in EU-GUGLE is in line with the European Smart City initiative, and each participating city has created nearly zero-energy Smart City master plans based upon lowest-energy thermal renovations coupled with innovative renewable energy services incorporating every aspect of smart district life. All stages of the planning, construction, and post-occupancy phases of the large-scale district renewals are being documented, monitored, and evaluated to create sustainable district renovation methodologies for “smart renovations for smart cities” to meet the objectives of the European Commission’s Smart Cities and Communities Initiative for reducing greenhouse gas emissions by 40 % within the European Union by 2020. The paper outlines the approach each city has taken and highlights case studies of the individual solutions created in three of the six cities.

Keywords Smart city · Social housing · Low-energy renovation · Renewable energies · Pilot project

1 Introduction

With the growing urbanization trend, European cities are increasingly facing challenges to cope with the demand to provide adequate living spaces for the rising number of inhabitants while ensuring a high quality of life. At the same time, climate change and limited resources provide the framework for setting ambitious climate goals for the member states of the European Union. Energy efficiency and the integration of renewable energy systems can be seen as the key elements in reducing energy demand for fossil fuels, however, in the urban context, energy is one of these key elements within a more complex structure. In a *Smart City*, the goal is the optimization of the overall system of a city, by ensuring the interaction of various sectors: energy infrastructure, the built environment, urban design, industry, and mobility must be planned together through an integrated approach. Communication technologies subsequently allow these sectors to interact, thus ideally providing an optimum in terms of the smart use of energy and resources. The involvement of stakeholders in this development process is crucial for a successful implementation, as adaptations are mostly carried out in existing cities or city quarters. Refurbishment actions play a particularly important role in the smart city context, as most of the buildings we will inhabit in the future are already being built.

The EU-GUGLE project aims to provide replicable strategies and concrete solutions for large-scale refurbishment projects across Europe. EU-GUGLE stands for “European cities serving as a Green Urban Gate towards Leadership in sustainable Energy” and is a European project taking place from 2013 to 2019 involving six partner cities in six countries: Aachen (Germany), Bratislava (Slovakia), Milan (Italy), Sestao (Spain), Tampere (Finland), and Vienna (Austria). The National Renewable Energy Centre in Spain (CENER) coordinates the project