

# A GIS-based Ontology for Representing the Surrounding Environment of Buildings to Support Building Renovation

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**Abstract.** This research focuses on developing an ontology for representing knowledge about the surrounding environment of a building in an urban context, considering the geospatial objects and processes such as built environment, vegetation, population and so on. The ontology can be useful to create a knowledge management system for different experts involved in the process of the building renovation, to extend the information and stretch the domain from the individual building to the environment. Knowledge about what entities and attributes to select is captured based on literature and investigating the pilot demonstration sites. Such an ontology can help to structure the surrounding data to support processes in different stages of the renovation. The final goal is to support planners in decision making process namely in site planning and pre-data collection phase, energy modeling, comfort analysis and so on to control cost and quality. Moreover, it can be valuable in further studies of integrating data of various sources for construction purposes.

**Keywords:** Ontology, Surrounding environment, residential building renovation.

## 1 Introduction

A rapid transition of urban areas towards energy efficiency is required mainly because of the challenges that climate change creates [1]. Geospatial solutions and strategies for energy monitoring management are needed to increase renewable energy usage in urban areas. Core geographical data, thematic maps of environmental data and administrative data such as planning regulations are required to depict the building's environment. Energy-efficient building renovation is an inter-disciplinary task that covers domains with different ontological outsets [2]. This research focuses on developing an ontology for the surrounding environment in the building renovation process. The intention is to provide a schema for surrounding data to extend the information and stretch the domain from the individual building to its surrounding environment.

The focus in the building renovation process is usually on the individual building and all the data collected are directly connected to the building or within a small radius of the building. Geospatial science, on the other hand, focuses on all phenomena

























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