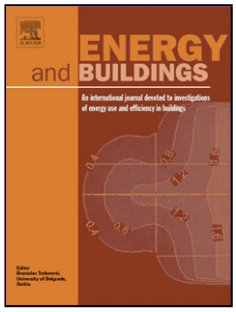

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New 3D model based urban energy simulation for climate protection concepts

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1 Abstract

Climate protection concepts for cities and regions are designed to establish CO_2 emission baselines and develop measures for climate change mitigation. Up to now such concepts were based on aggregated consumption and emission data and only qualitative estimations of the effect of measures were possible. To better quantify the impact of mitigation measures, a large amount of data on the building stock is needed. Very powerful analysis possibilities for an energetic and economic evaluation of scenarios arise, if continuously growing data stock organized in geographical information systems are combined with simulation models of buildings and energy systems. In this work, 3D data models in CityGML format of the entire building stock of Ludwigsburg, a German county with 34 municipalities, were used and enriched with building's year of construction and its function to allow an automatized quantifying the climate protection indicators. In this regard, the heating demand of each individual building in the region in the current state and after two refurbishment scenarios are calculated. In addition, the local solar photovoltaic potential is determined, as the exact size and orientation of each building surface is in the 3D model available. Besides, some new methodologies are described to better quantify the costs and benefits of CO_2 mitigation strategies on a local or regional level and to support decision making.

Keywords: Climate protection concepts, Urban energy simulation, 3D city model, CityGML, Photovoltaic analysis, Decision making

2 Nomenclature

El.	Electricity
GIS	Geographic information system
ICT	Information and communication technology
ITCS	industry, trade, commerce and services
PV	Photovoltaic