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# A spatial domestic energy framework for sub-city areas: A case study from the United Kingdom

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**Abstrat**

This study focuses on spatial domestic energy framework of sub-city areas in the United Kingdom using Newcastle upon Tyne as a case study. The framework estimates the energy end-use at the single dwelling level on three aggregate scales: district, neighbourhood and community.

The framework uses two aggregation approaches, one using an approximated prototype-cluster of similar dwellings at the district scale and the other using a novel, sub-city DEM modelling of building and its micro-cohesive energy structures in neighbourhoods and communities. The results of a property type based model are also introduced. Besides estimating energy consumption, the property type model could play an interesting role in developing strategies for energy efficiency at various scales.

The validation strategy is used to compare the modelled gas and electricity values in three representative districts against the 2009 DECC values in two aggregate hierarchical areas for electricity and gas: the DECC Medium Layer Super Output Area (MLSOA), and the Lower Layer Super Output Area (LLSOA). A collection of test samples of property type were devised and compared with statistics in the National Energy Efficiency Data set framework (NEED).

The spatially enabled energy model and rich thematic database enables integrated mapping practices, such as updating authoritative data with secondary data sets which may possibly reduce their production costs. A spatially enabled database also provides the precise spatial extent of the energy consumption in sub-city areas and enables a query procedure that allows the identification of building aggregated areas with spatial expression patterns most similar to a given parameter within the building energy profile.

Although all sources of uncertainties affect confidence in the domestic energy model estimation, this study only considers the sources that can be subject to quantitative characterization. The key uncertainties in the energy model are identified in a three dimensional taxonomy originally used in the medical field. The dimensions identify sources, issues and the nature of the uncertainties. The final objective is to extend traditional sensitivity analysis in order to deconstruct the uncertainty of inputs and uncertainty in the pathway, as uncertainty flows through the model to inform data gathering and information collection activities.