

ENERGY USE MODELLING

Finding the most efficient block

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The design of city blocks has been shown to be an important determinant of urban energy consumption efficiency, both in the building and transportation sectors. However, these correlations, for instance between urban density and energy efficiency, which is derived typically from city level modelling exercises, often cannot be used to inform choice of urban block design during planning. Dimitra Tsirigoti and Katerina Tsikaloudaki at Aristotle University of Thessaloniki, Greece, now present a regression model that can predict the heating and cooling loads of urban blocks based on the block design and local climate.

Using a 3D building model, they calculate the heating and cooling loads for 28 different block designs in two cities in Greece, based on differences in block and building parameters such as surface-to-volume ratio and inner court perimeter. The researchers find that minor climatic differences between the cities significantly affect thermal loads of buildings. They then develop a regression model correlating these modelled heating and cooling loads in both cities to four urban block design parameters. The regression model is verified by using the 3D model to calculate loads for three new block types and it is found that the regression model predicts these loads accurately. This means that the regression model can be used to predict the total thermal load of a proposed urban block design in a given climate and may therefore be useful in planning applications. More generally, the work emphasizes the need for and provides a method to incorporate local climatic conditions into city level urban form and energy efficiency studies.

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