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## A Scenario-Based Approach for Assessing the Energy Performance of Urban Development Pathways

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### Highlights

- A spatially-explicit neural network model is applied as a decision-support tool
- The model predicts energy demand given urban form features at block scale
- The energy performance of urban development alternatives was assessed
- Urban planning has a relevant role in determining energy conservation in cities
- In Porto, transit-oriented and infill development are sensible urban alternatives

### Abstract

This paper draws on an innovative methodological framework to assess the energy performance of a set of urban development alternatives, using the city of Porto (Portugal) as a case study. The methodology combines the advantages of a spatially-explicit analysis with the prediction accuracy of neural networks to estimate the energy demand (for space heating, space cooling and mobility) resulting from the physical configuration of urban areas.

The urban alternatives under assessment reflect a number of development strategies taking place in different locations within the city. These correspond to well-known urban development approaches (infill development, consolidated development, modern development, multi-family housing, transit-oriented development and green infrastructure).

The results for the city of Porto show that the transit-oriented development, the urban infill and the consolidated development are the urban alternatives yielding the most relevant energy savings, especially

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