



## **A geospatial decision-support tool to contrast energetic outcomes, CO<sub>2</sub> emissions, water management and socio-economic outcomes of urban areas**

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Decision-makers increasingly make use of models to better understand how urban sustainability could be achieved and to attain evidence about potential effects of environmental and socio-economic trade-offs in order to take informed decisions. Envision Scenario Planner (ESP) is a web-based geospatial tool which allows decision-makers the design of various built environments having in mind their potential environmental and socio-economic outcomes in order to support decision making and enable stakeholder engagement. Decision-makers can use ESP to assess energy use and generation, estimated CO<sub>2</sub> emissions and sequestration, water use and capture and operating and construction costs of urban scenarios at the building/green space and neighbourhood scale. ESP provides performance measures of different urban scenarios, delivers evidence to assist decision-making and is made easily accessible and spatially visible to stakeholders.

Based on use cases with New Zealand local councils and other urban planning stakeholders, this research adds to the debate on sustainable built environments by discussing the economic viability and the potential mitigation of environmental impacts of different development scenarios. It exposes challenges around the human-environment interaction from an urban planning perspective and explores benefits and challenges of decision-support tools like ESP.

The provision of knowledge-based support through geospatial planning tools like ESP can build understanding about the implications of single-section-based planning, low density housing and urban sprawl, and support stakeholders in planning more sustainable and community responsive built environments. The geospatial tool allows to integrate various (geospatial) information about an urban neighbourhood, model complex interactions between the built environment and environmental effects, translate planning strategies into workable and tangible scenarios, and provide evidence for decision-making on environmental and social amenities beyond a single building. Yet, the underlying complexity of the human-environment interaction and modelling environment, and the relevance of the local context for decision-support tools like ESP call for appreciation of values, taking into consideration planning strategies, scale issues, and the particular use cases.