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Simulating supply and demand of ecosystem services in support of urban planning

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Abstract: Urban planning traditionally has a focus on socio-economic development and accessibility. Although a healthy living environment is often mentioned as an important factor of quality of life, bringing this aspect into the planning phase is difficult. With a push for compacter, less sprawling cities, ensuring sufficient amounts of green spaces and vegetation is a challenge. The ability to demonstrate their importance by presenting the health-related ecosystem services they provide assists in bringing them into the decision-making process.

We present a dynamic and spatially explicit integrated land use model applied to Greater Auckland, which simulates various urban futures and assesses the impacts of urban design and vegetation planning on the supply and demand of three vegetation-related ecosystem services: air purification, urban cooling, and provision of green spaces for leisure and recreation. Future urban development is explored using an activity-based land use model that considers socio-economic growth, accessibility, physical suitability, the preference to be near or away from certain activities, as well as planning options such as zoning and infrastructure investments. By providing information on the population and employment activities per location in addition to the land use, multifunctionality of the land use can be simulated better compared to traditional land use modelling approaches that use a simple land use classification. Ecosystem service values are calculated using dedicated components that convert the greenness of locations and the amount of green space in an area into ecosystem service quantifications.

Keywords: Integrated Modelling; Land Use Change; Ecosystem Services Supply; Ecosystem Services Demand