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Simulating Residential Land Use Density

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Land-use simulation is an established part of the spatial planning process in the Netherlands. Existing modelling approaches have hitherto focused on simulating urban expansion. The results are used in the process of exploring the impacts of new urban development in terms of, for instance, loss of open space and flood risk. However, other spatial policy challenges have come to the forefront, often pertaining to dynamics within the existing urban fabric. This calls for a change in land-use simulation from an essentially land-cover type of approach common to most operational land-use models to a more object-oriented, density-based methodology. Based on recent progress in explaining local housing densities, our paper proposes an approach to incorporate residential density simulation in our modelling framework.

Earlier attempts to incorporate residential density simulation at this local level have treated density change as exogenous model input. This implies that, while numerous local indicators can be derived from the resulting model output, the mechanisms driving local density change remain outside the model. In our approach, residential land use as well as the accompanying housing densities are simulated endogenously. This will at once enhance the detail of the relevant model output (i.e., local density) and improve its explanatory power, thereby greatly enhancing the potential for subsequent impacts assessment.

At the centre of our modelling framework are the Tigris XL and LandUseScanner models. Tigris XL is a land-use and transport interaction model which simulates *regional* changes in numbers of actors (households) and objects (real estate). Based on input from Tigris XL and other sector-specific models, the LandUseScanner goes on to simulate land-use patterns at the *local* level (1 ha grids). In our new approach, the specific strengths of both models are combined. The emphasis is on improving the simulation of construction and local housing stock adjustment in the LandUseScanner. At the core of our new approach is the addition to this model of a highly detailed real estate layer, containing information on: 1) households' valuation of the *structural* attributes of locations (i.e., pertaining to the different attributes of housing, including density); the (transaction) cost of demolition and construction, and; 3) discount rates of real estate value.

To allow for the visualisation of the local changes in residential density that can thus be simulated, output information will be made available at both the regional and local (100 meter grid cell) level.

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