

PhD Project: Characterizing and incorporating intra-city spatial heterogeneity into urban sustainability assessments (working title)

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Motivation: With the more and more of the global population living in cities, there is a growing demand for tools to assess the development and sustainability of urban systems. These tools should consider ecological, economic and social perspectives, and provide support for evidence-based urban planning and sustainable development. One key aspect to consider in such sustainability assessment tools is spatial heterogeneity within urban systems. In a city, different neighbourhoods and boundary conditions, serving different typologies of inhabitants, could exist. Thus, it is important to acknowledge these differences and their effects when assessing sustainability.

Goal: The goal of this project is to develop a spatially-explicit tool for assessing the sustainability of urban systems by considering different spatial constellations within cities. The tool will combine different sets of data, in order to come up with typologies of neighbourhoods and their respective inhabitants. Interactive optimization to analyse trade-offs between the different dimensions of sustainability is envisioned, and results elicited will be used to develop policy recommendations and support urban planning.

Approach: The project can be divided into four phases. The first part looks at defining neighbourhood boundaries, and subsequently typologies in the target city. It will largely be based on the sustainability assessment indicators already worked on in the HERUS lab, but specific focus will be placed on quality of life and environmental sustainability.

In the second step, a spatial database/web GIS application will be developed from the typology results, as well as other relevant indicator data. Examples of indicator layers that will be developed include urban green/blue areas, air quality, and building density

The third phase essentially expands on the spatial database developed in the previous step. Here, a crowdsourcing project or survey will be introduced, targeting the inhabitants across the neighbourhoods identified in the first step. The key questions to be addressed are: (i) where is your neighbourhood? and (ii) what are your perceptions regarding quality of life in your neighbourhood? The development of interactive, participatory tools is envisioned to facilitate the crowdsourcing/survey process. These results will then be translated to spatial layers—giving an indication of inhabitant satisfaction and perceived neighbourhood boundaries—and incorporated into the database from the second phase.

In the last stage, trade-offs between (environmental) sustainability, quality of life, and perceived satisfaction will be analysed and policy recommendations derived to guide urban planning and development. To this end, a spatially-explicit multi-criteria decision support system will be conceived. Inclusion of interactive optimization features are expected in order to facilitate the use of the tool by relevant actors and stakeholders.

Expected outcomes: Based on the described phases, the deliverables at the end of the project include the—

1. Neighbourhood typology of the target city
2. Spatially-explicit database integrating environmental, quality of life, and inhabitant perception indicators.
3. Interactive multi-criteria spatial decision support system for stakeholders