Geospatial Indicators for the Evaluation of Accessibility by Flexible Mobility Services in Rural Areas

Master's Thesis of Mohammad Ezzeddine

Mentoring:

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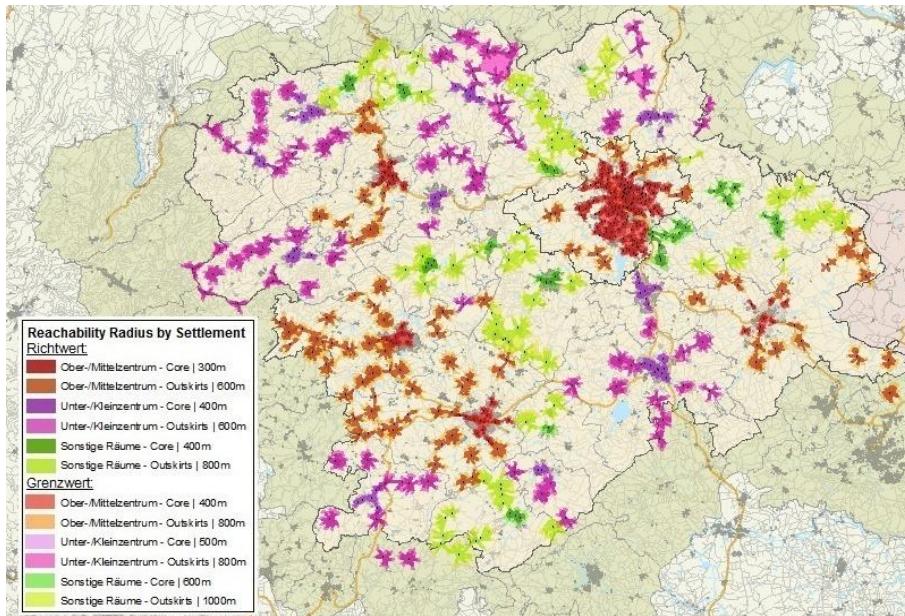
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Figure: Catchment areas of bus stations by foot in Hof District and Hof City

Accessibility to amenities by public transport as well was examined by counting the percentage of amenities within a walking distance to bus and train stations. Results showed that the vast majority of facilities fall around the same locations of public transport stations, revealing a good indicator of a healthy proportional relation on spatial level between land use and transport.

A study concerning amenities was also carried out based on the foreseen population decline. By comparing the number of residents in 2014 to 2028 in four layers of overlapping catchment areas, facilities which might be affected on a high degree by the decline where figured out and displayed. Results showed that the most affected facilities exist obviously within municipalities of high decline rate. In the event of that, the risk of private facilities closing down or taking business elsewhere will lead to further deprivation and consequently further population decline due to migration.

Hof, a rural district with declining population, was chosen as a study case to evaluate accessibility in rural areas. Catchment areas of public transport stations were computed by both foot and bike through ArcGIS. Based on densities of residential areas, the percentage of people within reachability to bus and train stations was determined. By bike, 99 % of residents could reach public transport stations; meanwhile only 75% could walk to stations, which doesn't meet the required standard. Through visualized catchment areas it is possible to spot deprivation zones. Likewise, accessibility to basic amenities, namely education, healthcare, and retail was measured. The goal was to experiment to what extent it would be possible to replace motorized mobility by walking and cycling. Results varied between different categories. Ultimately, the majority of facilities were found to be accessible by bike within the defined time intervals. That was not the case by foot however, with more than half the residents lacking access in some cases. In brief, outcome showed, discarding motorized mobility is not a convenient option.
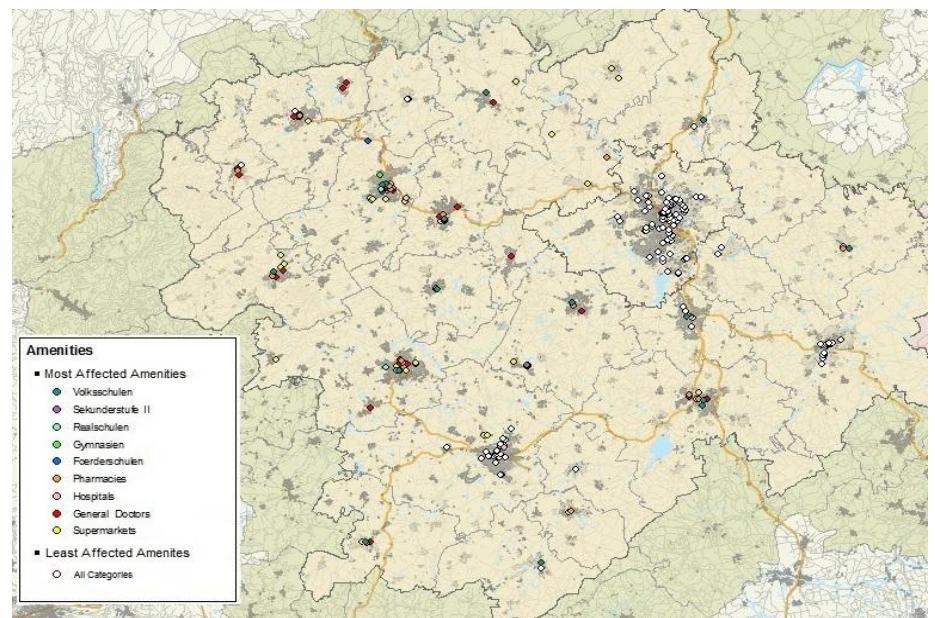

Figure: Positions of amenities with a high probability of being affected by the population decline in Hof District and Hof City between 2014 and 2028
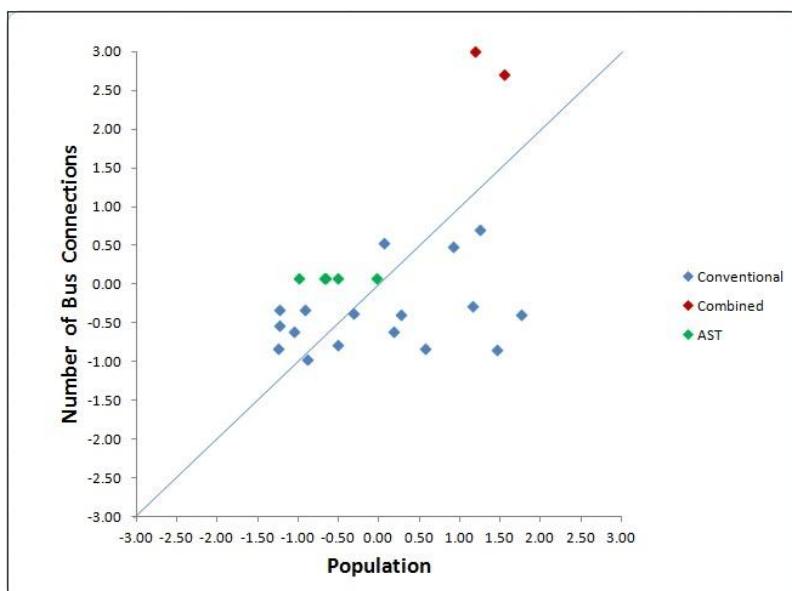
Node-place model was employed to study population decline effect on relation between transport supply and demand in future. In two municipalities in Hof, number of residents within catchment areas of bus stations and number of bus connections were collected and visualized in graphs .The graphs showed that if on the longer term transport timetable offers remained unchanged, most stations will be considered as unsustained node. Instead of cutting off a portion of conventional bus connections for the sake of lowering costs, it is recommended to promote demand-controlled services with smaller vehicles to fill in the gaps created in the timetable. In the event of that, the implementation of a very common demand-controlled service, namely Anruf-Sammel-Taxi in Hof District was overviewed. By comparing catchment areas with and without AST, it was noticed that it increased the service by 18 % with residents of small remote communities now having access. Node-place model was also applied in this case to visualize the positions of two stations combining AST and conventional bus in the graph with and without AST connections. Result showed that the two stations have the highest node value.

Figure: Node-place model results for conventional bus, Anruf-Sammel-Taxi, and combined stations in Schwarzenbach an der Saale

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