STELLA
Standortfindungsmodell für elektrische Ladeinfrastruktur

ISB Lehrstuhl und Institut für Stadtbauwesen und Stadtverkehr

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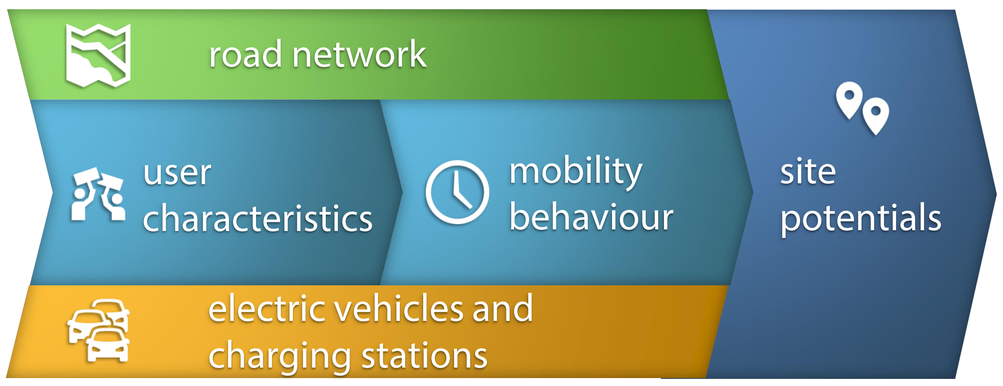
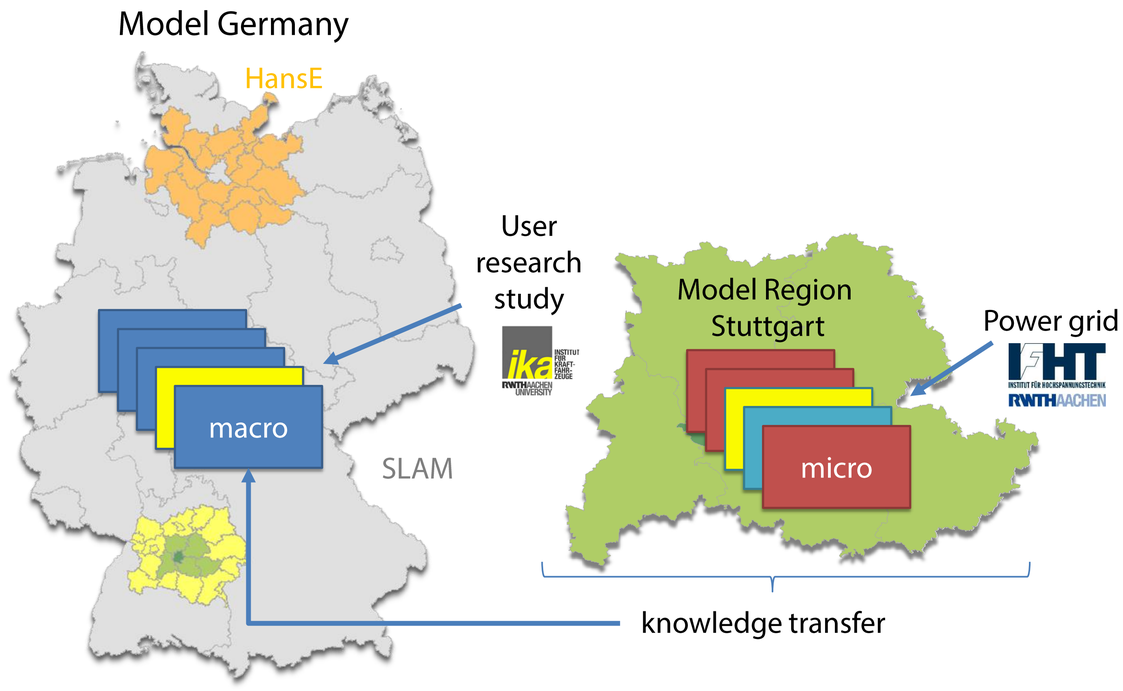
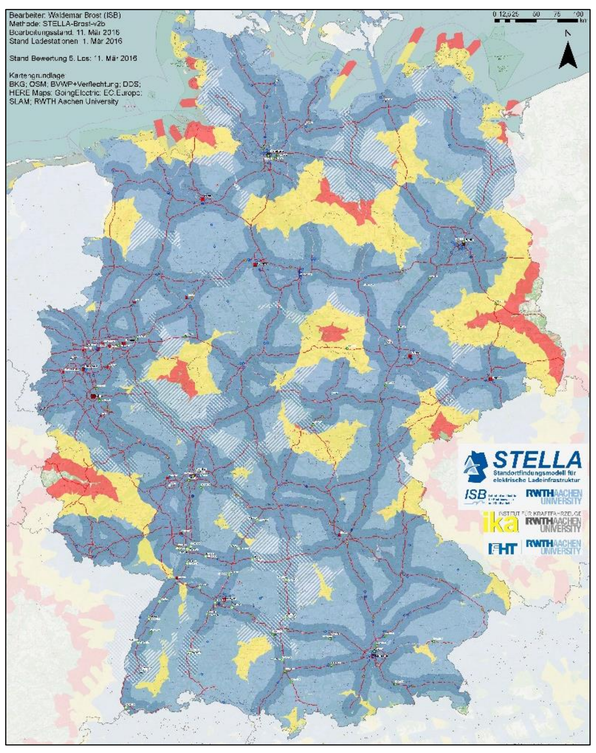
Site Selection Model for electric Charging Infrastructure

german title: STELLA – Standortfindungsmodell für elektrische Ladeinfrastruktur

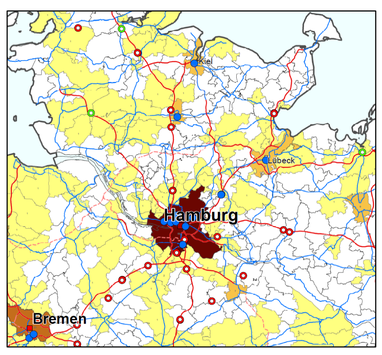
Taking a close look at the user level is the core element of site modelling with STELLA. The user characteristics, such as belonging to a specific age or income group, are connected with the mobility behaviour recorded in surveys to form a basic potential. By combining the basic potential with the potentials of the long-distance road network resulting from the extensive transport connectivity and with the spread of electric vehicles and their charging infrastructure (CI), the total potential is calculated.



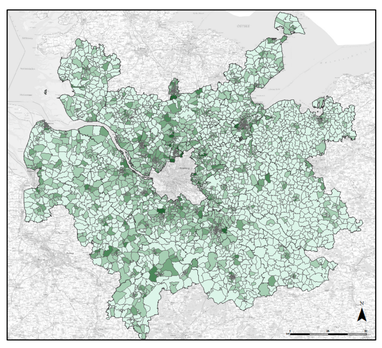




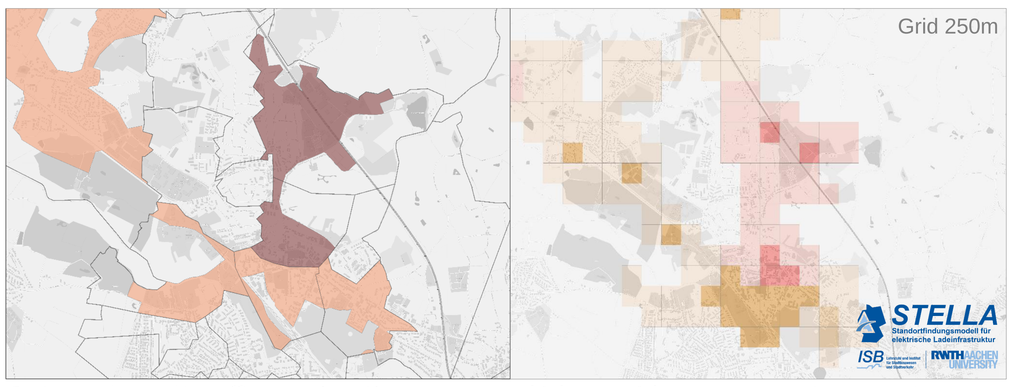
Accessibility analysis of long-distance network



Potential of fast charging station sites



Projected demand in traffic zones



Projected demand in traffic zones (detail)

high potential
- medium
- low
- very low

medium potential
- medium
- low
- very low

Going into detail, a type of urban space is allocated to each of the roughly 94,000 traffic zones (ca. 500 households per zone) that Germany is structured into. The origin-and-destination traffic generation is calculated using population data, building typology, spatial structures and local businesses. The resulting traffic is allocated to the transport modes for each zone specifically. While the goal of the modelling is to give all mobile people access to electric mobility and charging infrastructure, the focus here is on motorized private transport. The calculated traffic volume constitutes the basic potential for the further analysis.

In the following step, supraregional traffic observation is added to the basic potential. For this purpose, the accessibility of the intermodal transport hubs and the connection to the long-distance network are analysed. In combination with the traffic loads and the supraregional European transport interconnections, an additional potential of electric-mobility users is assessed. This also includes a differentiation of seasonal load fluctuations.

In the third step, the different user groups and their trip behaviour are added to the potential that exists at the level of the urban quarter or the street, also taking into consideration the zone-specific Points of Interest and the information regarding the necessary range and duration of stay.

By supplementing the data on the availability of electric vehicles, through a vehicle ownership model and projection, and by including the existing charging infrastructure, the potential of possible charging cycles is determined. The result constitutes the basis for the allocation of the zone-specific demand of charging stations depending on the necessary charging capacity. Based on the experiences with the power grid of the cities of Stuttgart and Düsseldorf, the maximum number of charging points per site that can be implemented without requiring significant financial investments into the grids is assessed. If the existing electric capacity does not suffice, the site is stretched to several smaller, less clustered charging points in order to cover the projected demand.

In the final step, the potential calculated at the level of urban quarters or streets is transferred to a nationwide grid with an edge length of 250 meters. The result allows local planners to make detailed micro-location plans.

An installation sequence can be provided for all locations for ideal area coverage and demand orientation in order to provide potential users of electric mobility with a well-coordinated charging infrastructure service.