Erreichbarkeitsatlas der Europäischen Metropolregion München (EMM)

Benjamin Büttner, Johannes Keller, Gebhard Wulfhorst

To cite this report: Benjamin Büttner, Johannes Keller and Gebhard Wulfhorst (2012) Erreichbarkeitsatlas der Europäischen Metropolregion München (EMM), in Angela Hull, Cecília Silva andLuca Bertolini (Eds.) Accessibility Instruments for Planning Practice. COST Office, pp. 91-94.

Erreichbarkeitsatlas der Europäischen Metropolregion München (EMM)

Author of report: Benjamin Büttner, Johannes Keller, Gebhard Wulfhorst

Organisation: Technische Universität München, Department for Urban Structure and Transport Planning

Address: Arcisstr. 21, D-80333, München

E-mail: benjamin.buettner@tum.de

Background

Accessibility is at the heart of the research approach on sustainable mobility. The TUM department of urban structure and transport planning is developing suitable instruments and tools with manifold partners of the Munich metropolitan region and beyond. Since 2007, the EMM accessibility atlas has been conceived and developed as a strategic tool for analysis and planning, across all transport modes and on various spatial scales. The main objectives are to investigate, understand and visualize the potentials and risks of land-use and transport development on a local level in order to improve regional governance and decision-making processes.

Conceptual framework and theoretical underpinnings

The 'Erreichbarkeitsatlas der EMM' is mainly a database of structural (population, employed people, motorization etc.) and transport supply data (road networks with relevant attributes, public transport stop and line model with timetables) that covers the geographic area of the European Metropolitan Region of Munich (EMM, www.metropolregion-muenchen.eu): an area with a diameter of approximately 170 km and a population of 5.5 million. The structural datasets are incorporated in the database on the spatial level of municipalities with a further differentiation on city district level for the three largest cities in the area (München, Augsburg, Ingolstadt).

This database is the platform for regional accessibility analyses. It is also the starting point for the development of sub-models that can analyze smaller parts of the EMM with a higher degree of detail.

Per se, this accessibility modelling platform does not pose any limitations on the methodological framework, as long as a selected methodology does not require data other than the aforementioned structural and transport supply datasets (which however can be extended flexibly with according data surveying efforts).

Practically, the 'Erreichbarkeitsatlas der EMM' has been developed with a focus on implementing variations of isochrone and gravity accessibility measures, since these are both relatively easy to implement as well as to interpret and therefore appear to be most useful within strategic transport and land-use planning processes (Geurs and van Eck 2001).

Beside these classical accessibility measures, other measures have been used e.g. network analysis indicators based on the methodological framework of Multiple Centrality Analysis (Crucitti *et al.* 2006, Curtis and Scheurer 2010).

The underlying assumption is, that accessibility is a complex, multi-dimensional concept that cannot be captured by one or few indicators, but needs to be analyzed with a variety of indicators, each of which is specifically designed to explain one specific aspect of accessibility.

A future goal in the development of the 'Erreichbarkeitsatlas der EMM' is the specification of location-specific accessibility profiles that bring together these separate issues of accessibility, thus providing a multi-faceted overview of how a certain location performs with regard to the different aspects of accessibility (Keller and Ji 2012).

Operational aspects

On the regional level, the 'Erreichbarkeitsatlas der EMM' has been used for analyzing accessibility indicators for car and public transport. These indicators include travel time analyses (isochrones) to different locations of regional interest (e.g. airport, long-distance train stations, universities, major leisure facilities) and the development of an accessibility index that calculates population and job potentials that can be reached from

every municipality in the study area. This index implements a gravity accessibility indicator in which spatial resistance is defined by travel time.

In the local accessibility analyses, the degree of spatial resolution is strongly improved, a larger variety of indicators is being implemented and cycling and walking are included in the analyses. Accessibility differences within a municipality are analyzed, e.g. by analyzing access and egress to public transport stations; and by determining network-based catchment areas of points of interest (health-care, shopping, services etc.). Public transport service quality is determined on the basis of an index that combines the aspects of travel time, service frequency and numbers of transfers. Public transport accessibility levels of locations are compared with land-use density levels to determine areas with accessibility deficits. Further indicators are under development. The goal is to categorize and later aggregate very specific indicators to a lower number of generalized indicators (categories to be specified, e.g. 'local public transport accessibility', 'regional public transport accessibility', 'non-motorized neighbourhood accessibility'). These aggregated indicators can be used for the development of a location-specific accessibility profile. Such an accessibility profile could be used in assessing land-use plans with regard to 'sustainable accessibility' by applying it to every block of a planning scheme and assessing it against land-use-type-specific benchmarks.

As mentioned in Figure 1, all aforementioned accessibility analyses are based on firstly structural datasets and secondly transport supply datasets. The main structural datasets are population and employment. In Germany, these datasets are publicly available from the statistical administration of the German states with a spatial resolution of municipalities. To arrive at more detailed structural data, disaggregation methods based on land-use density estimations are used. This is currently done by using CORINE Land Cover data (http://www.eea.europa.eu/publications/COR0-landcover), but is intended to be refined by additional datasets in the future.

The analysis of travel times for car, cycling and walking on a network basis is done by using the OpenStreetMap network (www.openstreetmap.com). OpenStreetMap is a user generated world-wide map ("Wikipedia-principle") that can be used without cost for any purpose.

Public transport timetable data is generally publicly available (internet, timetable booklets) but its implementation in the database requires a lot of work unless a study area is covered by an already existing transport model, as has been the case in all applications of the 'Erreichbarkeitsatlas der EMM' so far.

To date there are no automatic routines for calculating the different accessibility indicators, therefore the tool can only be used by experienced modellers who have been made familiar with the database. Advanced GIS skills are indispensible. The time required for calculating different indicators varies but is generally quite high (several hours to several days).

Beyond this modelling database, a prototype of an online tool of the 'Erreichbarkeitsatlas der EMM' has been developed. This online tool covers a few basic indicators on the regional level. The underlying data is static, but users can specify which specific datasets are to be visualized, e.g. by specifiying a time budget for an isochrone analysis. No technical skills are required for using the webtool, but its applicability for actual planning purposes is very limited. After a short testing phase the webtool is currently not publicly available due to technical problems. The future of the webtool mainly depends on whether more funds for its development will be available in the future. The functionality of location-specific accessibility profiles could then be integrated in the webtool.

Relevance for planning practice

The instrument (local accessibility model) is currently being applied for the first time in a real-world planning context: a climate protection concept for a county near Munich. Within this project, the tool is mainly being used to determine potentials for transit-oriented development, promotion of neighbourhood mobility and strategic land-use planning. The project is still at an early stage and the local modelling environment is still in the build-up phase. Therefore, no experiences on usability, effectiveness or outcomes can be reported at this time. The project will be completed in mid-2012.

Beyond this planning application, the tool is used in different research projects. Most noteworthy is a French-German cooperation project on "Stress-tests for sustainable mobility – an accessibility approach". Within this project accessibility indicators are combined with other socio-economic and demographic data to establish an area-wide vulnerability index, which examines a municipality's vulnerability in the face of potential energy cost increases due to peak-oil developments and/or stricter CO_2 emission regulations/trading schemes. This project is perceived with high interest by regional planning professionals but since it is still under development it is not possible yet to assess its impact on decision-making or usability.

Strengths and limitations

The most important strength of the 'Erreichbarkeitsatlas der EMM' is its flexibility in incorporating a large variety of indicators. It has not been designed to calculate one very specific kind of indicator but to provide a data platform suitable to handle all major state-of-the-art accessibility modelling techniques.

Another major strength of the tool is, that all core datasets are available free of charge. Therefore, the instrument can be set up in any German region and could probably be transferred to many parts of Europe (with minor adjustments according to the availability of structural data). It gives public bodies with limited financial and personal resources a possibility to develop a quantitative evidence-base for the purpose of integrated land-use and transport planning.

Its major limitation is that it is not a tool that can be used by anyone. It clearly needs time and expertise to develop the model for a specific region and equally to calculate specific indicators. The further development of the online prototype is an option but cannot be advanced without a strong funding base.

References

Crucitti, P.; Latora, V.; Porta, S. (2006) Centrality in networks of urban streets, *Chaos*. Vol. 16 (1), 1-9.

Curtis, C.; Scheurer, J. (2010) Planning for sustainable accessibility: Developing tools to aid discussion and decision-making, *Progress in Planning*, 74, 53-106.

Geurs, K.; van Eck, J.R.R. (2001) Accessibility measures: review and applications. Rijksinstitut voo Volksgezondheid en milieu (RIVM) report 408505 006. Utrecht University: Utrecht.

Keller, J.; Ji, C.: Developing accessibility models to foster climate-efficient regional development. Proceedings of 9th World Congress of Regional Science Association International. Timisoara 2012.

Figures

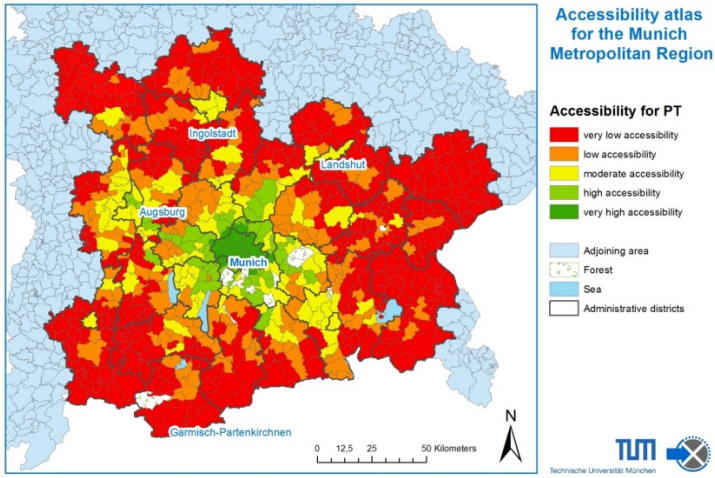

Figure 1 Public transport accessibility in the EMM (gravity accessibility indicator)

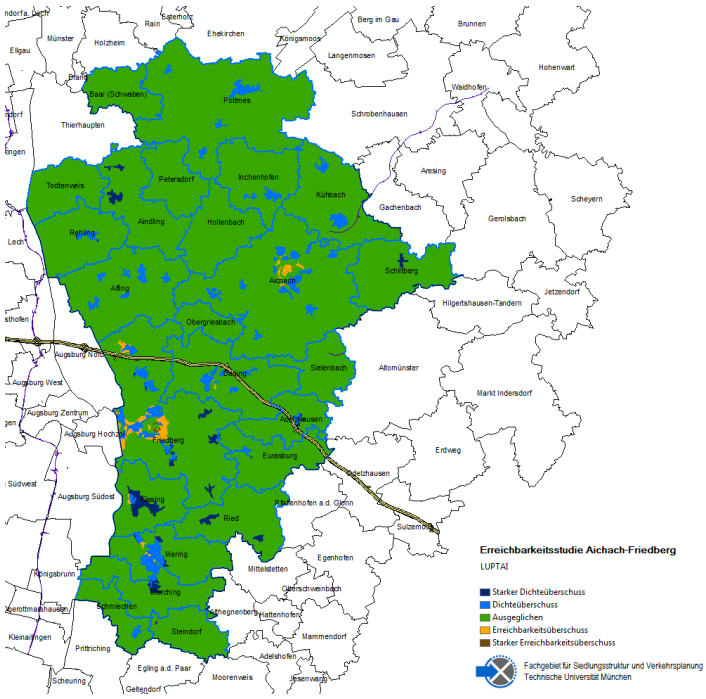

Figure 2 Land-use and public transport accessibility index: population density vs. Public transport accessibility