Federal Ministry
of Education
and Research

Future
Megacities
Megastädte von morgen

Sustainable Mobility for Mega Cities – METRASYS

Overview and Findings to Date

Mobility is Life. Sustainable mobility concepts are necessary to keep megacities and urban areas dynamic and alive. Hefei, the capital of Anhui Province, is not one of the largest megacities, but it possesses an important location easily accessible from all directions of the country, and it connects the vast area of Central China. On the inner belt of the coastal regions and the frontier of the upstate, Hefei is trying to cooperate with the Yangtze Delta Economic Region on all levels. Owing to its geographic location, Hefei will benefit greatly from the capital and industrial transfers from the eastern coastal regions.

Such goals are just reachable if the city can maintain its dynamic growth in all areas and topics. In this context traffic and transport management play the major role.

The project METRASYS starts with a detailed analysis of the situation in Hefei including the local authorities with its decision processes, the existing plans of development and expansion, and the strengths and weaknesses of the city and its geographic conditions.

The next step is the development and implementation of last stage traffic management systems including traffic data collection, and Digital Multimedia Broadcast for Traffic Information.
Hefei is a national second-class regional transportation hub in China. With its well developed expressway network leading in all directions, it only takes 45 minutes to drive to Nanjing, 3 hours to Shanghai by express rail, and less than 1 hour to Wuhu, Bengbu, Anqing and other provincial major cities. Six Railways, such as Huainan, Jingju and Nangxi, are well connected in Hefei. Hefei Luogang Airport is an international standby airport in China. There are over 30 domestic air routes and direct flights to Hongkong. The Jianghuai Canal under construction will make Hefei a waterway transportation hub between Yangtze and Huaihe rivers in the future. According to recent and long-term plans, Hefei Port will build two container terminals.

Public transport, operated by buses and taxis, plays an important role in daily traffic. Currently a Bus Rapid Transit system with special lanes and stations is under construction. One important part of METRASYS is the coordination of all these different transport modes.

Objectives of the Project

The scientific objective of the METRASYS project is to gain comprehensive knowledge of energy efficient structures for sustainable development of submega cities as an important part of a supporting strategy on their way to real mega cities. The project follows an interdisciplinary approach integrating spatial planning (new urbanism), transport science, engineering and political science in order to contribute to the

mitigation of climate change. The following specific aims are pursued in the project METRASYS:

- **Putting energy efficiency and the reduction of greenhouse gas emissions at the center of the METRASYS project. At the same time integrating energy efficient transport into the quest for sustainable urban transport. This includes the provision of access to safe, clean, efficient, affordable and non-noisy transport.**
- **Adaptation and/or development of modern approaches and technologies that are oriented towards the mobility needs of the population (usability, acceptability) and take socioeconomic and regulatory conditions (political and public awareness) into account.**
- **Realisation of effective concepts, demonstration and implementation of technologies and tools in the traffic management center of Hefei.**
- **Accompanying the planning process in the region towards capacity building (education, processes, institutions, participation in the transformation process of the Chinese society).**
- **Transfer of measures to increase energy efficiency and reduce environmental impacts of transportation to other megacities in China and worldwide.**

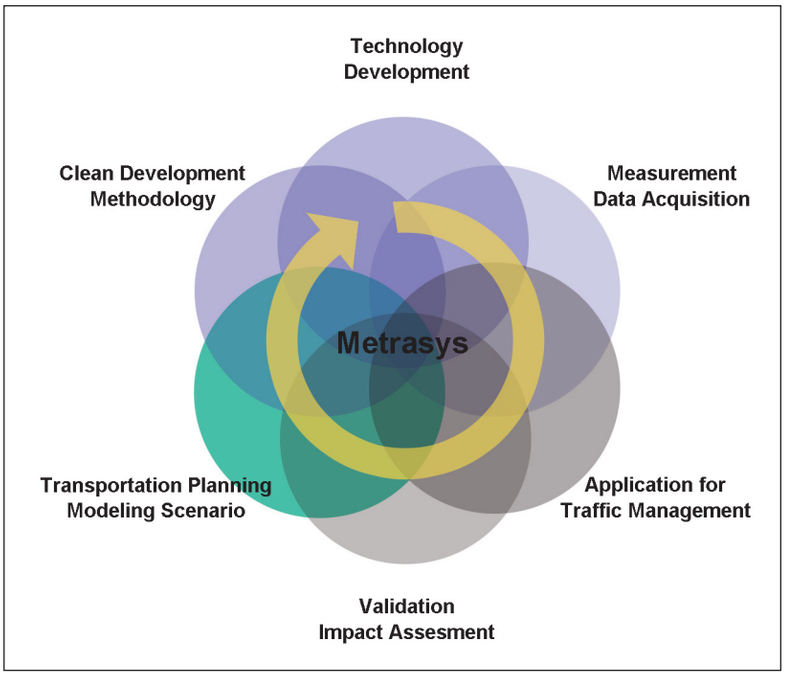
Expected Contributions to an Energy- and Climate-Efficient Development of Future Megacities, Knowledge, Technologies and Performance

Beside the technical developments METRSYS focuses (a) on the evaluation of the traffic management system with regard to its effects on traffic and the environment and (b) on a feasibility assessment of CDM as an innovative financing tool for traffic management as well as on other measures for an energy-efficient transport system in Hefei. In order to ensure the successful technical implementation of the project and to provide the required political, organizational and financial structures for a sustainable traffic development, the project will be implemented in close cooperation with the Chinese actors.

An important part of METRASYS is to assess the environmental impacts of the traffic management system and planned urban traffic developments on the basis of a Business-As-Usual (BAU) scenario. Linking technological developments with urban and transport-planning policies is one of the foci of this project activity: The identification of suitable strategies and policies is a prerequisite to ensure permanent and effective implementation of technological measures.

The results of the analysis as well as alternative measures and instruments for the development of a climate and energy efficient transport system will be discussed with local decisionmakers. In the next step, the results will be used to set up a GIS model. This spatial visualization will assist decisionmakers and stakeholders in their comprehension and evaluation of the effects of policy measures. The BAU scenario is also the basis for the analysis of the suitability of transport management as a CDM-method. It will be analyzed to the extent that the collected FC data can be used in the development of CDM-methods.

In addition to the BAU scenario, including maps from the GIS model, the results of both tasks shall be summarised in several, thematically structured working papers, which should then serve as an input for the thematic workshops.



One important part of METRASYS is to analyze the potential of CDM as a financing tool for sustainable transport development in Hefei. Thus, building upon the analysis of the institutional framework for financing sustainable urban transport (decision-making structures and financial flows). The aim is

to use the floating car data (the main data base of the traffic management center of Hefei) and the emission model to determine emission baselines and to evaluate emission reduction potentials. More detailed analysis will be performed to (a) which supportive structures and capacities exist for CDM in Hefei and (b) if the realistic transport development options may be suitable for CDM application. Based on the results, a CDM feasibility study will be conducted for selected projects. Here, the focus lies on the extension of the existing Bus Rapid Transit system, as well as on energy efficiency measures for taxi companies. The analysis will be done in close cooperation with the local CDM Service Center.

Applicable Instruments, Tools and Methodologies

The traffic of this highly dynamic and fast growing city is just measurable by a dynamic approach for data collection. Therefore a floating car data (or vehicle probes) system on the basis of up to ten thousand taxis will be developed and implemented. Each taxi will be equipped with a special onboard unit including a GPS receiver and a module for mobile communication. Later in the project also a receiver for digital multimedia broadcast (DMB) will be part of the onboard unit.

The traffic management center itself will be equipped with a complex software system to show the current traffic situation of the whole city in real-time, to show the further trend of the travel times in the cities, and to inform, to coordinate, and to guide travellers on all kind of traffic modes. Several communication channels will be used to spread the traffic information and to guide the travellers:

- The internet to reach static and mobile devices,
- Digital Multimedia Broadcast, to broadcast spoken traffic news, to transfer several parameters for updating the onboard units,
- Variable message signs to guide drivers without onboard units,
- Information displays for travellers on BRT and other buses.

Beside these, two major information tools will be implemented during the METRASYS project: A geo information system (GIS) and an online model for the visualisation of the current immissions in the city of Hefei. Both systems are playing a major role for the capacity building and the information of decision makers. The immission model shows the short term development of the air quality and gives the opportunity to react in the area of traffic management. The GIS can show the long term development of the city with its major aspects. This gives the possibility to act sustainable over a long timeline.

In METRASYS indicators, methods and instruments for the environmental analysis and monitoring of the impacts of the traffic management system will be developed. The Chinese partners will be closely involved in the implementation of the technical systems and traffic supervision. Quantifiable parameters, necessary for environmental analysis and modelling in the transport sector, will be determined and related to the available data basis. Furthermore, continuous monitoring will be achieved through the validation and optimization of the emission model.

Capacity Building, Integration and Networking of Institutions

A transdisciplinary working process with decision-makers is realised by focusing on concrete problems of energy saving by traffic management. Hence, the scientific objective of the proposal is to implement new technology solutions in traffic and fleet management, traffic information broadcasting and propagating simulation. These technologies refer to the high-tech-strategy of the German Government; it is supported and acquired by the Chinese national and local Ministry of Science and Technology (MOST).

Socio-Economic, Integrative and Overall Sustainability Aspects

The development of the technical system for traffic management will be installed in Hefei. Beyond this all information and results of the project are open for the public. In contrast to the learning process, the dissemination activities aim at a broader audience within China and worldwide. It is aimed at transferring the results of the project to different cultural and institutional contexts. Main written products are more comprehensive discussion papers presenting the state of research, new findings from the project and recommendations. An important task is the invitation of stakeholders of cities similar in size and function to show the technical system with all its options and functionality. Dissemination includes the participation on practical oriented conferences and workshops summarising the key points of new findings of the project. The METRASYS

homepage will provide up to date information such as reports and an online GIS for stake holders, academia, and the public.

The installed system itself will be used also for demonstration of the different approaches. All interested parties can come to Hefei and see in detail how the approaches and technologies are working.

Last but not least, the project contributes to the theoretical discourse in multiple disciplines e.g. urban planning, climate change mitigation, political science, engineering etc. Main written products are journal articles including peerreviewed articles, as well as practical journal articles; they are aimed at a scientific audience – academic or vocational – outside of the immediate project community. The participation in scientific conferences is intended.

German Partners

- FhG FIRST Institute for Computer Architecture and Software Technology
- Wuppertal Institute Climate Environment Energy
- Freie Universität Berlin, Urban Studies - TEAS
- Albert Speer & Partner (Architects)
- LUAX Software Consultant
- German Aerospace Center Transportation Studies

Cooperative Partners in Host Country

- City Government of Hefei
- Ministry of Science and Technology local office Hefei
- Research Center for Software Engineering Technology Anhui Province (ASEC)
- Chinese Academy of Science Anhui Institute of Optics and Fine Mechanics
- Tnogji University, Shanghai, College of Traffic and Transportation Engineering
- China Urban Sustainable Transport Research Center of Chinese Academy of Transportation Science CATS
- Hefei Municipal Traffic Police Department
- Hefei Environmental Monitoring Center
- Hefei Institute of Urban Planning and Design
- Hefei Communication Bureau
- The Local 38th Institute in Hefei

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