## Summary

**acatech (Ed.): Mobility 2020. Perspectives on Tomorrow's Traffic, Stuttgart 2006. (In German language)**[1]

Mobility is a basic human need that involves far more than merely the desire to stay in motion. Mobility goes hand in hand with independence and individuality, with participating in a community and being embedded in a social network. Lack of mobility ultimately limits a person's sphere of influence. In an increasingly networked world, the mobility of people and goods is also of central significance to the wealth of a society. This particularly applies to Germany in light of its diverse economic interconnections, its automotive and transportation-oriented industry and its role as a hub for European transport. While this scenario opens the door to valuable opportunities, it also presents a major challenge to traffic systems and traffic engineering, which are the responsibility of policymakers and industry.

More than any other mode of transportation, road traffic – the major form of travel – is today living off of its reserves. Only eight in ten kilometres of the German autobahn can be travelled on without restrictions. Across the nation, more than one hundred bridges require renewal. Many roads require substantial repair. Moreover, many autobahns need to be widened, gaps in the road network must be closed and the network as a whole must be expanded to keep astride of the increased traffic volume. The railway, too, is experiencing a considerable demand for quality assurance of the existing network, and new and extended facilities need to be constructed.

Against this background, acatech – the voice of technical sciences for science academies in Germany – has established an expert group to examine the future of transportation. The subject of the group's first project segment, which came to a close in March, 2006, was primarily the infrastructural aspects of mobility, which were examined for both road and rail.

It was clear from the beginning, when this topic was first placed on the agenda, that the issue of mobility could not be limited to merely improving infrastructure. In the face of increasing energy consumption coupled with dwindling resources, the problem of polluting emissions, and the need to improve traffic safety, the mobile society is confronted with other, equally complex challenges. No one can speak of tomorrow's mobility without considering the impact of a multitude of other factors on transportation or looking at other modes of transport.

These problem areas are already being addressed in continuing legislative activity, far from the public eye, in the interest of advancing transportation engineering. The development, maintenance and use of the road and rail network, issues that raise emotions far less than fuel price increases or the impact of traffic noise and emissions on humans, has in the view of acatech taken a back seat in recent years.

The objective of the acatech project group, therefore, has been to point out infrastructure bottlenecks, the elimination of which is a basic tenet for good traffic flow, and to develop recommendations on the use and financing of the road and rail network. The project group was able to base its work on a variety of transportation-related research studies and traffic forecasts published in recent years. However, it decided to prepare

[1] acatech (Hrsg.): Mobilität 2020. Perspektiven für den Verkehr von morgen, Stuttgart 2006.

a new traffic scenario that reflects the state of knowledge in 2006.

**The acatech 2020 Traffic Scenario**

The basis of the acatech 2020 Traffic Scenario is the Federal Transport Infrastructure Plan (FTIP) of 2003, which contains all infrastructure expansion measures through 2015. For the purpose of this study, the urgent measures earmarked in the plan for implementation by 2015 are considered by acatech to have been fulfilled. In other words, this report presumes that the infrastructural measures classified as urgent by the federal government will be fully implemented by 2020. The road and rail network in the acatech 2020 Traffic Scenario is therefore identical with the 2015 network provided for in the Federal Transport Infrastructure Plan.

However, in regard to the predictable traffic volume, acatech arrives at different initial conditions. This is primarily due to the time that has passed since the Federal Transport Infrastructure Plan was written.

Thus, the FTIP is based on premises that reflect the state of knowledge in 1997. In fact, however, the economy has grown more slowly and immigration rates have been lower than had been predicted at the time. In the acatech 2020 Traffic Scenario, the influencing factors have been updated and adjusted for 2002.

The report nevertheless bears significance for the period after 2020. In light of this, it becomes all the more important to proceed with measures based on the results and conclusions found in this report even beyond that date. This particularly applies to the recommendations made regarding the expansion and financing of the road and rail networks, but also to the capacity increases of the traffic infrastructure. Therefore, with the support of the Federal Ministry for Transport, Building and Urban Affairs (FMTBUA), acatech undertook various investigations into the optimisation of network operation, the results of which are presented in the report.

**Results of the acatech 2020 Traffic Scenario**

The acatech 2020 Traffic Scenario is founded on the assumption that population growth in Germany will stagnate due to low immigration rates and that Germany will have a population of only around 82.1 million people by 2020. Furthermore, the scenario assumes a growth in the gross domestic product (GDP) of 1.8 percent per year, which will have an impact on employment levels and the situation in private households. However, in acatech's view, this growth represents the lower limit necessary for a positive development in Germany.

For passenger car traffic, these factors and the postulated infrastructure for 2020 result in an increase in driving rates of 20 percent over 2002 values, where a disproportionately high increase will fall to the autobahn. Truck traffic is estimated to increase over the same period by 34 percent. Here, too, the autobahns will be most heavily affected.

More meaningful than these average figures, in acatech's view, is the fact that traffic in the growth regions along the so-called C region (Hamburg, Ruhr region, Frankfurt Rhine/Main, Mannheim, Stuttgart/ Karlsruhe, Munich) and in Berlin with the surrounding affluent suburbs will increase at a particularly rapid rate, while traffic in other regions will stagnate or actually decline. In fact, according to the calculations of the acatech 2020 Traffic Scenario, the construction measures planned in the Federal Transport Infrastructure Plan will merely result in sustaining a situation in

these regions that even today is partially unsatisfactory.

The brunt of the traffic load and traffic growth is borne by roads. However, the scenario calculation also found a marked increase in rail traffic. Passenger traffic is predicted by the report to increase by 22.5 percent by 2020, and freight should increase by 55 percent. The geographic distribution of rail traffic is just as uneven as it is for road traffic. Here, too, there will be traffic overload in several federal states despite network expansions, affecting primarily the north-south axis between Hamburg and Hannover, and the stretch from Karlsruhe to Basel, Switzerland.

The principle assertion of the acatech 2020 Traffic Scenario is therefore that even if the planned measures of the Federal Transport Infrastructure Plan are implemented, considerable bottlenecks in the infrastructure will remain. In other words, the FTIP is insufficient – and does not always set the right priorities from today's point of view. According to the assessment of the project results, the actual problem of traffic growth is not the overall increase in traffic over a period of almost 15 years, but the large differences among different regions. They are an expression of a heterogeneous economic and demographic development. These disparities therefore demand, at least in the long-term, a needs-oriented prioritisation of network expansion.

**acatech recommendations**

*1. Road maintenance measures and bottleneck elimination*

Based on the scenario analysis, acatech sees an urgent need for action in the maintenance and expansion of the road infrastructure and recommends

- rapid realization of the maintenance planning measures to counter a decline in the road system, especially on federal highways, including engineering works,
- rapid implementation of the measures defined as urgent in the Federal Transport Infrastructure Plan 2003 along with an updated examination of individual measures,
- elimination of bottlenecks through the targeted implementation of the measures defined as 'additional' in the FTIP,
- expansion of the public transportation systems in line with an economic effectiveness study, especially in congested urban areas.

*2. Increase in road traffic efficiency and safety through traffic management and vehicle engineering*

In addition to measures to maintain, expand and add to the road network, acatech recommends more efficiently utilising the existing infrastructure with the aid of modern traffic and vehicle engineering. For traffic management to be effective, the traffic situation must be recorded across the entire road network, traffic management headquarters must be networked, and there must be a standardised open system architecture. acatech therefore supports the institutionalisation of traffic management on all levels across the entire country and the establishment of a federally authorised traffic management organisation (TMO). Its task would be to create and monitor, together with public agencies

and the private commercial sector, a unified network architecture for traffic management that would also take into account the secondary road network.

acatech further recommends:

- the allocation of a radio frequency that could be used throughout Europe for wireless communication between vehicles or between vehicles and the infrastructure,
- the establishment of an intermodal traffic management system in which the necessary framework conditions and system architectures are defined,
- the use of anonymous vehicle position data for traffic recording,
- the introduction of a quality management system along with specific quality standards for traffic management,
- a flow-oriented traffic-incident management system,
- the large scale use of a cooperative network control system that adapts itself to the traffic situation, above all in congested urban areas,
- the promotion of driver assistance systems that help prevent accidents and improve traffic flow,
- the improvement of construction site management.

*3. Recommendations for the financing of the highway infrastructure*

The maintenance, expansion and operation of the total road infrastructure requires considerable financial resources. In principle, the funds needed for expanding and maintaining the federal highways can be generated by the fuel and vehicle tax income, which in 2004 amounted to some 50 billion euros. Nevertheless, in the past, the federal government has allocated less than one third of this amount to the maintenance and expansion of the road infrastructure. Only about 10 percent was earmarked for highways.

The federal government has assured the allocation of 4.3 billion euros of additional funding for transportation through 2009. However, the traffic analysis evaluation shows that implementation of the necessary measures to build and maintain the highway system will require further funding. As part of the project, therefore, acatech has outlined various avenues for improving financing and the allocation of funds for federal highways that are intended to stimulate discussion in politics and society.

Two models were examined more closely: The first is a model for user financing (model A), and the second is a model for public financing (model B), both of which can serve as a foundation for a policy decision.

acatech recommends a careful examination of the opportunities and risks of each model and to weigh them against each other. The following issues should be considered:

- New forms of infrastructure financing should not lead to an additional burden on motorists, who already bear significant financial hardships.
- The ownership and responsibility of the federal government for the federal highway system as stipulated by law must remain in full force.
- Investments based on structural policy must not fail due to return-on-investment calculations in the course of privatisation measures.
- Planning, construction and operation of the infrastructure should be accelerated compared to today's

standard, and under no circumstances should it be delayed.

Some of the central aspects of each model are described below.

*Model A*

A core aspect of this model is the partial substitution of fuel and vehicle taxes by utilisation fees, which should also be charged for light duty commercial vehicles and passenger cars. These fees would be charged not as a lump sum but based on the actual kilometres driven, in the manner of the existing truck toll. For passenger cars, fees could be charged using a road tax sticker until an affordable technology has been developed. In return, petrol station tourism in neighbouring countries would be curbed due to the lower fuel tax and foreign users could be drawn on more widely to help finance the highway infrastructure.

Another major aspect of this model is the creation of a highway infrastructure association with contractual capacity and credit eligibility that can contract out the management of network parts to private operators, such as in the form of Public Private Partnerships (PPP). Alternatively, the association could be developed into an agency responsible for coordination, for contracting and tendering arrangements, and for funds transfers for several concessions. The construction, management and operation of the traffic network would be the responsibility of the concessions. The role of the federal states as the administrative authority would in both cases pass to the highway associations.

The federal government nevertheless would in both cases retain ownership of the infrastructure association.

It would define the framework conditions, develop the Federal Transport Infrastructure Plan as before, define the public projects, and monitor the external effects and the public coordination of the terms of use.

*Model B*

This model is primarily based on retaining federal financing of the road transportation infrastructure projects through the fuel tax and stipulates the fixed allocation of a sufficient portion of this tax income to the planned infrastructural measures. This would utilise a tax that is already in existence and closely linked to road use without causing additional administrative effort, and in addition would stimulate efforts to economise on fuel and would not result in undesirable effects.

Another objective of model B is the reorganisation of responsibilities into a federal highway association, which would represent a more centralised organisation of the management of infrastructure planning, construction, maintenance and operation. An association of this type should be endowed with the right to use the financial resources allotted to it in accordance with the Federal Transport Infrastructure Plan. This suggestion is similar to the corresponding objective in model A.

In terms of the partial privatisation of the federal highways, the economic efficiency of Public Private Partnership projects is viewed with scepticism. Still, model B endorses testing of the five projects already approved and their critical evaluation.

*4. Rail maintenance measures and bottleneck elimination. Suggestions for a long-term service level and financing agreement.*

acatech also sees a need for action with respect to rail transportation. This not only involves the implementation of operative and legal harmonisation across Europe, but also long-term financial planning viability. Maintenance and bottleneck elimination of the railway infrastructure is coupled with a considerable financial effort for which the

federal government provides funding as laid down in the constitution. The current financing system with its large number of individual agreements generates a high level of bureaucracy for the federation and the infrastructure companies of Deutsche Bahn AG (DB AG). The resource allocations are subject to an annual budget proviso, which results in poor planning ability, delays and additional costs.

To improve this situation, at least for the measures in the existing network, the federation and DB AG are working on a service level and financing agreement (LuFV) in which the government agrees on fixed infrastructure funding for several years, while the railway in return is obliged to implement and verify specific equipment and quality achievements. In this way, DB AG obtains long-term planning reliability and financial security, while the federation obtains a guarantee of quality that it can enforce by means of sanctions.

acatech therefore supports the

- simplification of the planning and financing processes by means of a long-term service level and financing agreement (LuFV) for the existing network, and the
- rapid implementation of measures that serve to eliminate bottlenecks in the rail network.

*5. Harmonisation of the framework conditions in railway transportation in Europe and its financing*

Railway freight transportation over great distances is of particular economic interest to the expanded European Union. However, poor interoperability in terms of system technology and operation has been an impediment. Thus, the enhancement of the various national railway control systems by the unified European Train Control System (ETCS) often fails not only due to financial bottlenecks, but also because of the failure to mutually recognise rolling stock registrations. This results in high costs and time delays due to multiple technical inspections. The first step in the harmonisation of the European framework conditions would be to universally equip the corridors along the major European transport axes with the European Rail Traffic Management System (ERTMS). Originally, EU funds of 20 billion euros were designated for the expansion of these axes of the trans-European network (TEN). The actual figure will in all likelihood range between 5 to 8 billion euros. Therefore, acatech recommends the following measures for harmonisation of the framework conditions of railway transportation:

- rapid implementation of the operational, legal and technical interoperability,
- simplification of Europe-wide rolling stock registration,
- securing of national co-financing of the EU funds for the expansion of the TEN corridors and the ETCS implementation,
- concentration of fund allocation to the main traffic corridors, and
- opening of market access in Europe, as has already been realised in Germany.

**Outlook**

acatech aims to continue following up on the traffic issues treated in the “Mobility 2020” project. The various aspects of traffic only touched on here but not discussed in detail will be dealt with in a number of individual projects and examined in a similar manner. These include the optimisation of environmental protection and a discussion of alternative propulsion systems and fuel types, which will receive a more prominent position as societies become more conscious of the need to economise on fossil fuels.

Other topics are the continued improvement of traffic safety, the challenges that demographic change present to traffic systems and considerations on the reduction of traffic through the optimal use of traffic areas. Special attention will be paid to the development of traffic in metropolitan areas and its impact on local public transport. Primarily, it will be the congested urban areas that need to come to terms with the growth in individual and freight traffic, as documented in this report. It is they, therefore, who are particularly dependent on effective mobility concepts.