23rd WORLD ROAD CONGRESS

PARIS 2007

GERMANY - NATIONAL REPORT

STRATEGIC DIRECTION SESSION ST2

SUSTAINABLE ROADS – PART OF THE CHAIN IN A GLOBALISED WORLD

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1 INTRODUCTION

1.1 Sustainable traffic planning

In 2002 the government of the Federal Republic of Germany presented a strategy for the implementation of its sustainable development concept. This strategy, the National Sustainable Development Strategy, formulates specific sustainable development objectives for all policy areas and contains targets and guidelines for the core areas of intergenerational justice, quality of life, social cohesion, and international responsibility (see http://www.dialog-nachhaltigkeit.de; http://www.nachhaltigkeitsrat.de).

In September 2006, Chancellor Angela Merkel announced her intention to make climate protection and a forward-looking energy policy the central themes of Germany's presidency of both the EU Council and G8. Said Merkel: 'sustainability has become the Federal Government's guiding principle'. In this context, the chancellor gave particular mention to the following issues: fostering innovation in the field of advanced technology, multi-technology universal tasks, the consolidation of the budget, demographic change, the protection of biodiversity, and the reduction of land consumption (see http://www.bundesregierung.de).

In this context, the German transport policy also follows the precept of sustainability. In view of the fact that the functioning of a labour-sharing society, economic growth, prosperity, and quality of life are all directly and closely linked to mobility (270 million trips are made every day), the Federal Ministry of Transport, Building, and Urban Affairs (BMVBS) fully supports the target of sustainable mobility. With 231,000 km of roads for supralocal traffic—of which 53,183 km are federal trunk roads—Germany's transport infrastructure is an important economic factor. BMVBS is striving for sustainable solutions that will ensure long-term mobility, are economically viable and socially just, and simultaneously respect the environment. The Federal Government is implementing a broad-based package of measures that covers all areas of transport policy, encompasses all modes of transport and their respective infrastructures, and will continue to be developed in intensive dialogue with the public. These measures include investment, regulatory, price, and fiscal policies, technical measures, research policy emphases, as well as educational and information campaigns.

Sustainable mobility planning is also practiced at *Länder*, regional, and local level. In this context, a new type of traffic plan is emerging, the so-called 'integrated comprehensive transport plan'. This plan is also subject to the precept of sustainability and is organised in processes (see Huber, 2003).

Traffic plans in Germany take account of the fact that in a globalised world, the country's transport infrastructure is an important part of and link within global supply chains. Those who draft these plans are aware of their overall responsibility to contribute to sustainable solutions when structuring global traffic flows. By signing the Kyoto Protocol, Germany undertook to reduce its greenhouse gas emissions by 21 per cent by the year 2012. To date, these emissions have been reduced by 19 per cent. However, the Federal Republic's central location in Europe also adds significance to the planning, construction, and operation of road infrastructure in accordance with the precepts of sustainability.

This paper shall focus on those areas where sustainable road infrastructure developments have been made and for which exemplary solutions have either already been formulated or are in the process of being formulated.

1.2 Demographic change in the Federal Republic of Germany

Current strategic considerations regarding the further development of Germany's road infrastructure are also being influenced to a great extent by the debate about demographic change, which has become a major social issue. The 9th and 10th co-ordinated population forecasts conducted by the Federal Statistical Office (2001 and 2003) indicate that as a result of the sharp fall in birth rates since the mid 1960s, Germany's population structure is likely to start changing dramatically in the year 2020. These changes will be characterised by noticeable drops in population and shifts in the population's age structure (aging). In the short and medium term, neither an increase in the birth rate nor immigration will have a positive influence on these developments.

Consequently, natural demographic development coupled with both localized and extensive migration flows (continuing suburbanisation as well as migration from parts of eastern Germany and the old industrial regions of western Germany to the vibrant economic centres of western and southern Germany) will result in considerable disparities in the development of regions, sub-regions, and urban districts. In short, Germany will be faced with very different levels of growth and shrinkage.

Traffic planners in the Federal Republic are currently engaged in an intensive debate at all levels of spatial planning about the effects that demographic change will have on transport demand and the design of infrastructure and transport facilities. The results of this debate were published in 2006 by the Cologne-based Road and Transportation Research Association (FGSV) in its 'Notes on the Consequences of Demographic Change on Transportation'.

In view of demographic developments, specific mobility indicators and the factors that determine them are used to estimate future mobility demand and long-term requirements regarding the provision of transport services. A knowledge of the reasons that determine how mobility decisions are made in everyday traffic situations is also vital if transport modes are to be intelligently linked. To this end, four mobility surveys are conducted on a regular basis in Germany:

- Mobility in Germany 2002 (MID 2002),
- German Mobility Panel (MOP),
- Pan-European Survey on Long-distance Passenger Mobility (DATELINE), and
- Motorised Traffic in Germany (KID).

The information provided by these surveys is used by the transport sector in many different ways. Experts agree that in view of demographic changes, the use of 'lifecycle observations' to monitor transport trends, traffic forecasts, and effective and efficient infrastructure planning is essential if solutions that bring economic benefits, are socially acceptable, and respect the environment are to be developed.

1.3 Germany: a transit country and a link in global transport chains

While demographic changes are expected to result in spatial variations in passenger transport growth (traffic growth, stagnation, and even decline in sub-regions), freight transport is expected to continue to grow substantially. Europe is expanding and its economic links are growing ever stronger. Consequently, international freight transport in Europe will continue to increase, whereby the lion's share of freight will be transported by road. As a transit country in the middle of Europe, Germany has a particularly important role to play in this regard. While the North–South axes were of great importance in the 20th century, the East–West axes are now equally important. International transport relations—especially those between metropolitan regions—will continue to intensify.

In 2003, approximately 5.6 billion tons of freight were transported within Germany while freight traffic volume amounted to 516.5 billion ton-kilometres (see BMVBS, *Verkehr in Zahlen 2004/2005* [Transport Statistics 2004/5], pp. 237, 241). Both in terms of traffic volume and the amount of goods transported, much more freight is transported by road than by any other mode of transport (see Fig. 1).

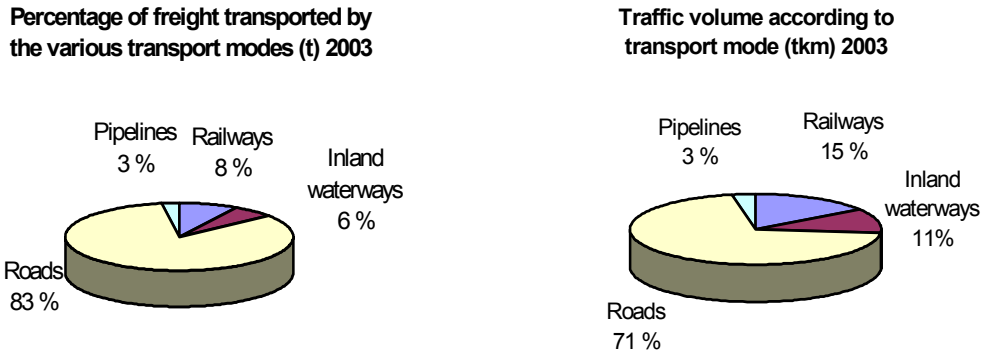

Figure 1 - Domestic road freight transport in Germany (according to transport mode) in 2003

If one looks at the significance of the individual modes of transport in recent years, it becomes clear that the proportion of road freight transport—and in particular of road freight transport volume—has increased continually. The following can be said about road freight transport involving German trucks (see *Güterverkehrstatistik* [Freight Traffic Statistics], Kraftfahrtbundesamt [Federal Motor Transport Authority], 2005): in 2005, German trucks with a payload of > 3.5 t transported 2.7 billion t of freight. Over the past ten years, traffic volume has increased from approximately 238 million tkm in 1995 to approximately 310 million tkm (Fig. 2). While most freight is transported locally, most traffic volume is generated over long distances (Fig. 3). The trend in recent years shows that traffic volumes for long-distance traffic have increased while traffic volumes at regional and local level remain virtually unchanged (Fig. 4).

These developments are clear evidence of the increasing importance of the supraregional road network to economic development in Europe, a continent that is growing ever closer.

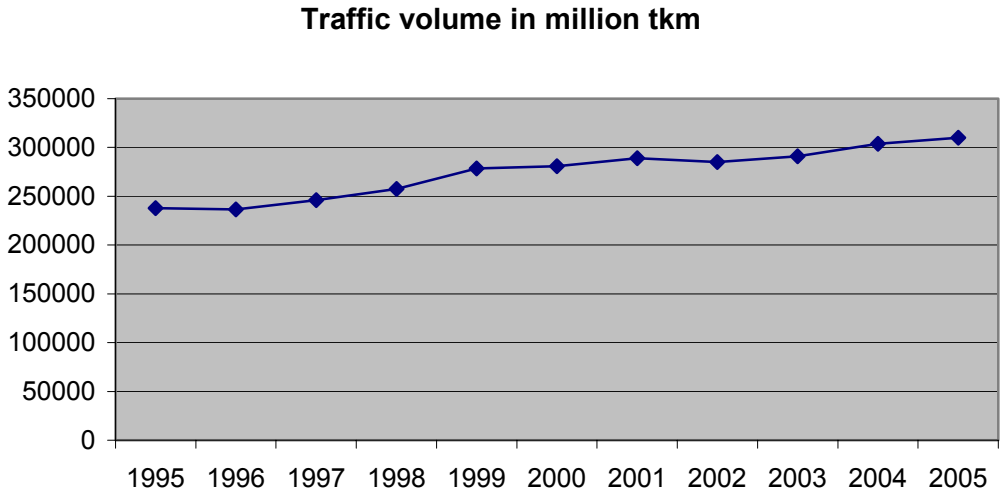

Figure 2 - Development of traffic volume (domestic trucks > 3.5t) 1995–2005

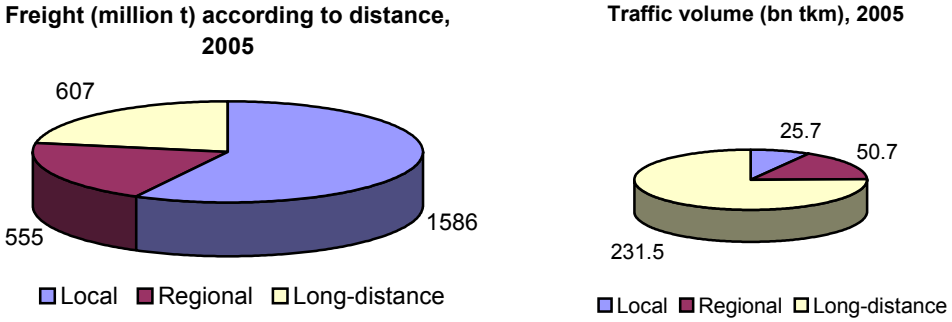

Figure 3 - Generated traffic and traffic volume according to distance (domestic trucks > 3.5t) 1995-2005

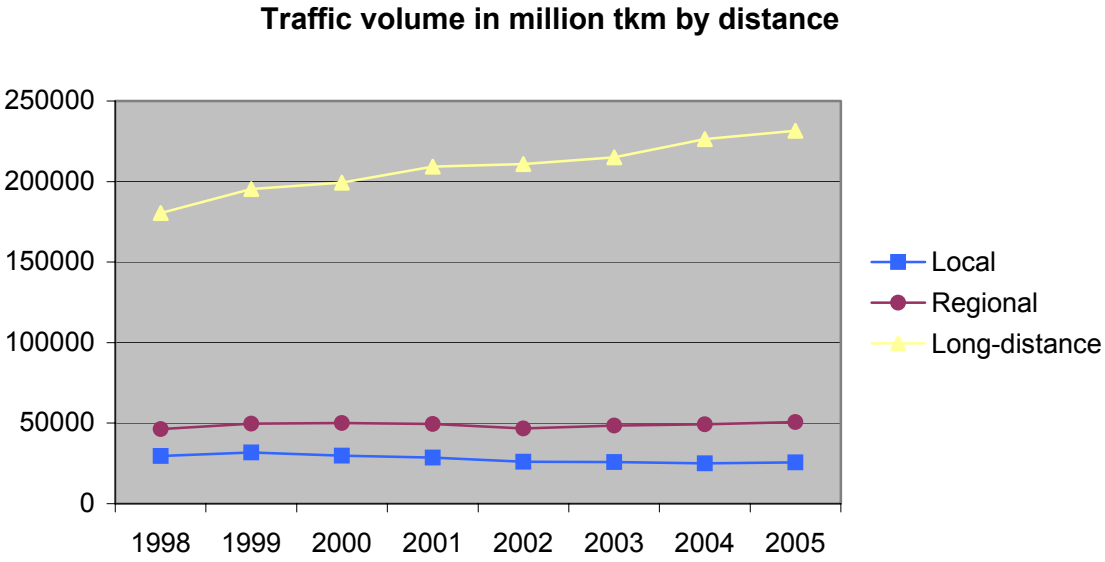

Figure 4 - Development of traffic volume (domestic trucks > 3.5t) 1998–2005

Various forecasts predict that freight transport will continue to grow substantially in the coming years. According to forecasts in the Federal Traffic Infrastructure Plan (BVWP) 2003, long-distance road freight transport will increase from 236 billion tkm in 1997 to 374 billion tkm in the year 2015. Long-distance road freight transport volume is expected to rise by 58 per cent, freight transport by rail 103 per cent, and freight transport by inland waterway 39 per cent (see BVWP 2003, p. 11) over the same period.

The Federal Government is taking a variety of measures to address these forecasted growth rates in the freight transport sector. In view of the high growth rates predicted for freight transport, special attention was paid to the upgrading of European transportation routes when drafting the Federal Traffic Infrastructure Plan 2003 (see BVWP 2003, p. 23). The accession of Eastern European countries to the EU in particular has resulted in the need for the construction of new infrastructure and the upgrading of existing infrastructure. The BVWP identified no less than 13 federal trunk road projects relating to the enlargement of the EU to the East. In order to ensure that Germany is well integrated into global freight supply chains, one of the Federal Government's infrastructure planning targets is to ensure that the federal trunk road network is linked up to important junctions such as ports on the Baltic and North Sea coasts and international airports. Where possible, bulk freight should be transported by rail.

In addition to investing in infrastructure, the Federal Government intends to implement a large number of other measures in order to ensure that freight transport remains effective and efficient in the future. For example, Germany has introduced a HGV toll system on its federal motorways to ensure that users bear a larger share of traffic infrastructure costs. This is in line with the EU's transport policy. This satellite-controlled toll collection system is working very well (see BVWP, 2003, p. 36).

2 NECESSARY CHANGES TO THE INFRASTRUCTURE

2.1 Sustainability in the Federal Traffic Infrastructure Plan

On 2 July 2003, the Federal Cabinet adopted the Federal Traffic Infrastructure Plan (BVWP) 2003, which serves as both an investment plan and a planning tool. This plan has earmarked approximately € 150 billion for infrastructure-related investment in the road, rail, and inland waterways sectors for the period 2001–15. However, in addition to the construction of new roads, the maintenance of the existing road network is gaining in importance. BVWP 2003 has set aside approximately € 83 billion for the maintenance of existing networks.

Comprehensive new-build and upgrading projects for the road network have also been included in BVWP 2003. Top-priority projects cover the following construction objectives:

- the construction of 1,900 km of motorway at a total cost of approximately € 15 billion,
- the upgrading of 2,200 km of motorway at a total cost of approximately € 13 billion, and
- the construction and upgrading of 5,500 km of federal highways at a total cost of almost € 19 billion; of which approximately € 11 billion has been earmarked for the construction of some 850 bypasses.

It is worth noting that the traffic planning process in Germany differs greatly from traffic planning processes in other countries. The main difference is the complexity of the

planning process; Germany includes a large number of infrastructure projects in a single plan. For other countries, it would be inconceivable to include several hundred—or even several thousand—projects in a single plan and to compare them with each other, as is the case with the Federal Traffic Infrastructure Plan. Projects are selected on the basis of the results of a cost-benefit analysis. This analysis takes the following project factors into consideration: investment and operation costs, economic benefits (such as time savings and accident cost savings), and sustainability criteria (such as noise and emission levels). The cost-benefit analysis is also supplemented by an additional sustainability impact assessment. For BVWP 2003, this sustainability impact assessment took the form of an environmental risk assessment and an analysis of the project's expected impact on both the region and urban development.

The environmental impact of traffic at network level was identified as part of the environmental risk assessment. The main focus of this assessment was an analysis of the environmental impact of traffic infrastructure, large parts of which are already based on the content of strategic environmental assessment (SEA) for plans and programmes that implement EU Directive 2001/42/EC on strategic environmental assessments.

Despite the fact that the EU Directive had not been implemented by the time the plan was adopted, considerable environmental impacts were analysed and the results of these analyses included in the decision-making process for BVWP 2003. One of the objectives of SEA is to compare and contrast the following impacts in particular, something which cannot be done at project level:

- the dissection and encapsulation of human, animal, and plant habitats,
- widespread noise pollution, or
- pollutants that have an impact on a large area, e.g. CO_2 and ozone.

The environmental risk assessment conducted for the BVWP already contains methods that allow for the examination and comparison of environmental impacts. These methods are continually being improved in Germany, also in collaboration with other European countries.

2.2 Restructuring the transport network

In addition to the construction of new roads and the upgrading of existing roads, the restructuring of the existing network is a main objective when it comes to adjusting the infrastructure in an optimised manner to meet altered demographic, spatial, and transport needs. In Germany, high priority is given to two particular strategies: firstly, an integrated approach to spatial, urban, and transport planning and secondly, a multimodal transport network design that makes the most of opportunities to co-ordinate and link individual subsections of the transport networks. New tools that meet these requirements will be introduced and tested together with revised road design regulations in 2006 and 2007. One important set of regulations in this regard is the Guidelines for Integrated Network Design (RIN), which are currently being drafted by the Road and Transportation Research Association (FGSV). The RIN guidelines use the objectives of spatial planning (also at *Länder* level) to ensure the accessibility of key urban areas. They also use the classification of key urban areas to define the functional classification of the road network. The RIN guidelines cover the following design aspects for transport facilities: 'the functional classification of the transport network', 'the evaluation of the quality of the transport network in terms of available links', and 'the specification of quality levels for the design of transport networks and network elements'. In short, the RIN guidelines view the

transport system as a whole, therefore obliging traffic planners to include public transport and pedestrian and cycle traffic in their considerations. The objectives of the RIN are:

- the strategic development of the transport network in accordance with the overriding spatial plan,
- the accessibility of metropolitan regions and key urban areas,
- the functional classification of the transport network,
- the evaluation of the quality of the transport network in terms of available links,
- the integrated planning of all subsections of the transport system,
- the specification of graded quality levels for transport networks and network elements,
- the specification of graded quality levels for links,
- the definition of the areas to which design regulations apply, and
- the provision of support for traffic planning processes.

The RIN guidelines will be used to analyse and evaluate existing transport facilities and to draft network concepts for future transport facilities. These steps should be considered to be the analysis of weak points and the development of a series of measures for the traffic planning process. They are used in Requirement Plans drafted by the Federal Government and the *Länder*, in local transport development plans, in isolated transport plans such as local transport plans, as well as in spatial planning and *Land* development programmes. In terms of the road network, the functional classification given in the RIN provides a basis for the design and operation of roads that have to be designed in accordance with the relevant, valid design guidelines. In this regard, the RIN guidelines are the ideal link to the new design guidelines for motorways, rural roads, and urban roads.

Links between domestic/foreign metropolitan regions and the transport system that connects them are particularly important for international transportation.

The RIN guidelines use the system of key urban centres to specify the importance of links, which are arranged in terms of networks of straight lines and expressed in terms of link function ratings. Based on the networks of straight lines, link function ratings are allocated to transportation routes in every transport system. This can also be done for suitable combinations of modes. The ratings are allocated in accordance with the following criteria:

- directness,
- travel speed,
- safety,
- relief for built-up areas and areas requiring protection,
- the grouping of traffic flows.

At this point, interdependencies and/or political objectives that could raise or lower the classification of individual sub-sections of the transport system can be taken into account. With the integrated approach, the link function rating of a specific link in one particular transport system can be upgraded or downgraded in relation to another transport system. Moreover, in order to promote the integrated use of several transport systems, the link function ratings should be based on a systematically structured system of link points. The systematic restructuring of the transport network, which is made possible by this system and is currently in preparation, is the ideal response to the changed requirements mentioned in section 1.

2.3 Standardised roads (using FGSV guidelines for the design of motorways (RAA), rural roads (RAL), and urban roads (RASt))

Based on the network function of a road, it must be possible to derive planning specifications and implement these specifications in the road design. An important basic principle in this regard is the unity of planning, construction, and operation. In order to ensure this unity in the future, BMVBS and the FGSV have decided to restructure the key regulations governing the design of highways in the Federal Republic of Germany. The current system of road classification in accordance with cross section design, alignment, and intersection design is being abandoned. In future, separate and comprehensive guidelines will be available for each of the following types of highways: motorways, rural roads, and urban roads. These guidelines will not only contain planning specifications, but also specifications regarding operation and traffic regulations.

Modern, integrated regulations must:

- classify roads according to road type (motorways including urban motorways, rural roads, urban roads),
- outline the planning and design process (iterative design),
- take into consideration new models based on research results,
- outline design elements and provide details of parameters,
- exploit any potential for making savings,
- observe obligatory minimum standards,
- evaluate traffic safety,
- describe leeway in the decision-making and implementation processes,

The basic principle of the new guidelines in Germany will be to summarise the design standard for different types of roads according to design classes.
The goal of having standardised and recognisable roads can only be reached if the geometric design of the road is in line with signposting and road markings. Road design is a conflict between traffic needs and periphery needs relating to the environment around the road (see Fig. 5).

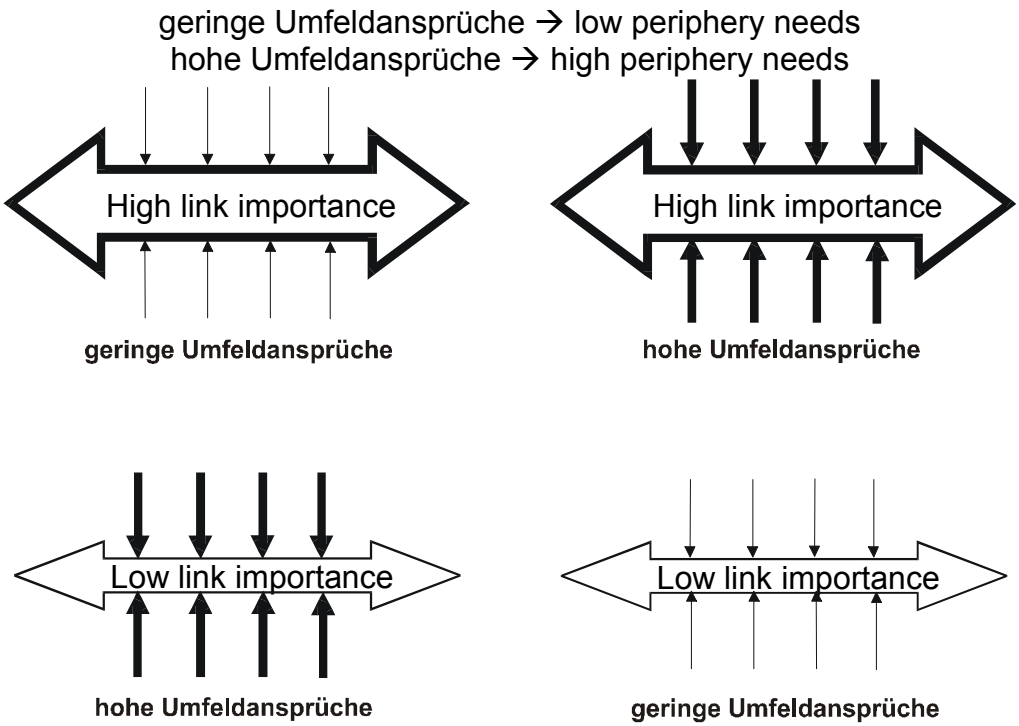

Figure 5 - Conflict of interests (traffic v roadside environment), see Hartkopf 2002

The importance of a road in terms of traffic is determined largely by the spatial planning function of that road (link function rating). The associated travel distances and the traffic load also affect the traffic importance of a road. Both variables are taken into account when specifying the road category. Needs relating to the roadside environment (periphery needs) conflict directly with the realisation of a generous, direct road link. Restrictions in this regard originate in the topography of the landscape, local and natural features that must be taken into consideration, or the needs of local settlement structures.

2.4 Territorial impact and environmental protection in road construction

Roads in Germany that are important for a large area are planned in accordance with the appropriate EU environmental protection regulations and German environmental protection legislation. In view of the fact that the construction and operation of roads have an impact on the environment, environmental impact assessments must be carried out when constructing a new road or amending an existing road. The public must be able to participate in this process.

The advantages and disadvantages of a project are weighed up in a process involving several stages: where necessary spatial planning process → determination of the alignment → official plan approval. The results of the environmental impact assessment must be taken into account when weighing up these pros and cons.

The co-ordination of important regional planning projects - such as the planning of a federal highway - serves to clarify the different demands made on the land in question, the resolution of conflicts that may occur at each level of planning, the development, arrangement, and safeguarding of sub-regions, and the making of provisions for individual functions and uses of land. During the spatial planning process, the project plan is assessed to determine whether the road meets regional planning requirements and whether it can be co-ordinated with other important plans and projects and implemented in accordance with regional planning requirements (territorial impact assessment). The

territorial impact assessment includes all major sustainability objectives such as economic and social requirements.

The route alignment of a new highway is specified during the alignment determination process in accordance with Section 16 of the Federal Trunk Road Act (FStrG). At this early stage, an environmental impact study must be conducted to ensure effective environmental protection and to provide a basis for the environmental impact assessment that must be conducted in accordance with the Environmental Impact Assessment Act. An important part of this study is the examination of a variety of potential corridors. To this end, a sophisticated methodology has been developed in the Federal Republic over the years. For example, the Instructions concerning Environmental Impact Assessment in Road Planning (MUVS 2001) contain information about the way in which the environmental impact study should be conducted at the alignment determination stage. This impact study makes a special contribution to the planning process as it comprehensively identifies, describes, and evaluates the environmental impact of a planned road project at an early stage.

Economic aspects only play a role in the alignment determination stage to the extent that the traffic value of the preferred route must be proven and the development of the foreseeable construction costs over the entire planning process must be compared with monetary benefit elements. For example, a route that develops negatively in terms of its cost-benefit ranking as a result of factors that come to light during the course of the planning process may stand very little chance of actually being realised even at a very late planning stage.

In Germany, environmental concerns relating to road construction projects are addressed at a very high level. Before roads are constructed or upgraded, experts identify and evaluate both the characteristics of the landscape in the area being considered for the project and the impact of the road construction project. The necessary measures are defined at the time when the project is submitted for approval, generally as part of the official plan approval process.

An Accompanying Plan for Landscaping and Environmental Protection containing preventative and compensatory measures is then drafted. These measures relate both to design elements and environmental protection. In cases where natural habitats and the landscape are affected considerably by the construction of a road and where such environmental impact is unavoidable, appropriate environmental regeneration and restoration measures are taken. Germany's Impact Regulation and its regulations regarding the protection of species and land are in line with the Federal Nature Conservation Act and the Nature Conservation Acts of the *Länder*.

Noise protection for new-build projects or for major upgrading projects takes the form of noise prevention measures regulated by the Federal Pollution and Noise Control Act and the 16th Federal Pollution and Noise Control Ordinance. Both pieces of legislation specify zone-specific limits for daytime and night-time noise control as well as the bases on which these levels are calculated. In cases where claims for noise protection are justified, active noise abatement measures (barriers, embankments, combinations of the two) are given priority over passive noise abatement measures (generally noise abatement windows) wherever possible and economically viable.

Air pollution caused by new-build or upgrading projects are also assessed as part of the impact consideration process. EU Directives 96/62/EC and 99/30 EC and the appropriate

equivalents in national law (i.e. the Federal Pollution and Noise Control Act and the 22nd Federal Pollution and Noise Control Ordinance) apply here.

2.5 Integrating motorways into urban areas

Motorways are an important spatial planning design element. They open up opportunities for land use and provide the location infrastructure needed for economic development. Consequently, centre-oriented motorways provide impetus for urban centres and at the same time strengthen the suburban environment. Local and long-distance traffic overlap in and around such urban centres. In addition to the integration of spatially important roads into the landscape, the urban integration of roads running through built-up areas is gaining in importance.

No other road category changes the appearance of our cities quite like motorways do. They do so in two ways:

- as structures that influence the appearance of the city 'from the outside', i.e. from the perspective of those people who don't use the motorway, and
- as transit routes that influence the appearance of the city 'from the inside', i.e. from the perspective of the people using the motorway.

Many city-dwellers in particular experience their built environment from the perspective of the urban motorway, insofar as this is possible and the view is not impeded by noise barriers, embankments, and other protective structures. Conversely, companies are increasingly keen to locate their businesses close to urban motorways—and especially at urban motorway intersections—because of the value of such locations in terms of effective marketing and advertising. Increasing urbanisation means that the motorway is becoming attractive for diverse forms of use.

Constructing motorways under, above, adjacent to, and even through buildings could offer considerable benefits: the motorway would become increasingly integrated into the rest of the built environment, rather than being kept completely separate from it. Intelligent noise protection can not only improve the integration of transportation routes, but also save money. By successfully integrating motorways into the urban structure, important advantages such as an increase in the ease with which plans are approved, faster processes, lower costs, and fewer subsequent conflicts can be achieved.

3 NECESSARY CHANGES TO OPERATION

3.1 Increasing road safety

In recent times, integrating safety into all phases of road planning, design, and operation has become a priority issue. New procedures and modified regulations ensure that road infrastructure operators receive the guidelines, training, and information they need to improve the safety of the road infrastructure for the benefit of the road users and society as a whole. A comprehensive programme for enhancing road safety focuses not only on the driver and the vehicle, but also, and most particularly, on the road infrastructure. This takes account of the fact that both the physical characteristics of the road network and traffic volume are significant factors in the causes of road accidents.

Road safety audits were introduced in Germany with the publication in 2002 of the Recommendations for Road Safety Audits (ESAS) by the Road and Transportation Research Association (FGSV). The systematic identification of safety deficiencies at the planning stage is a quality assurance tool and part of a comprehensive quality management system. It allows roads to be designed in the safest possible way, thereby avoiding an increased risk of accidents and any costs relating to the subsequent reconstruction of accident black spots. Germany also conducts network safety analyses and safety assessments on the existing network in the form of road safety inspections. The purpose of conducting road safety audits is to give more weight to road safety considerations in the decision-making process in proportion to other considerations such as quality, traffic flow, cost, and environmental protection. Auditors must have an in-depth knowledge of road design and the assessment of road safety and several years experience in the field. They must also complete an extensive training course. Approximately 400 auditors work in Germany, assessing plans for the construction and upgrading of federal trunk roads, *Länder* highways, and local roads.

Experiences show that the use of road safety audits leads to an improvement in road designs and consequently to a reduction in both the number of accidents and the consequences of accidents. The analysis of numerous road safety audits to date also shows that deficiencies can creep into road facility designs at the planning stage before the plans are implemented.

3.2 Elderly people and road transport

In view of demographic developments, the road research sector in Germany is currently paying particular attention to the needs of elderly people in road traffic.

In this context, new tools and measures are being developed to ensure that the specific requirements of elderly people will be better taken into account in future. For example, the intention is that central, regional, and local authorities will draw up mobility assurance plans for elderly people. In this case, expert planners and representatives of the affected groups would analyse deficiencies in the transport sector. On the basis of these analyses, suitable measures for ensuring mobility and improving objective and subjective road safety levels for elderly people would subsequently be selected and prioritised. The provision of barrier-free access to transportation should not be restricted to new-build projects. The intention is rather to specify routes that must be barrier-free. The existing infrastructure along these routes—which take into account the trips undertaken by elderly people—should be adapted gradually. By way of compensation, once a specific individual assessment has been completed, special measures to accommodate people of restricted mobility could be waived in new-build projects that are not part of such routes. The intention is that decision-makers will be informed and trained about the special needs of elderly people so that they can, in complete awareness of these needs, adapt the necessary decision-making process accordingly. Measures that meet the requirements of all target groups are used in new-build projects and on specified routes. Generally speaking, ‘elderly-friendly planning’ is based on the ‘two senses principle’. In other words, facilities must address users by means of at least two senses, e.g. tactile elements or optically contrasting elements. In view of the fact that high concentrations of accidents involving elderly people mainly occur at facilities with complicated designs, one of the tasks of the future will be to simplify traffic flows. The combination of tools and measures described here is currently being implemented and is being used to consistently adapt the existing traffic infrastructure to suit demographic changes in German society.

The purpose of the aforementioned procedures and measures is to ensure that the infrastructure makes a contribution to increasing the level of safety on Germany's roads and to reducing accident figures, as already stipulated by the European Commission in 2001 in its White Paper on European Transport Policy 2010 and again in 2003 in its Communication on the European Road Safety Action Programme. In 2001, the European Union set itself the ambitious target of cutting the number of road accident fatalities on Europe's roads from 50,000 to 25,000 by 2010. Germany is taking this target extremely seriously and is supporting the initiative by introducing appropriate new tools.

4 SUMMARY

The Federal Republic of Germany has a highly developed, well structured road infrastructure. As a result of the continuous growth in demand and a rise in prosperity, Germany's traffic infrastructure facilities have in the past been almost completely upgraded and extended. New requirements, such as those relating to environmental protection, have always been integrated into the development of planning methods and procedures at an early stage. In recent years, the observation of the three key principles of sustainability in the transport sector—economy, ecology, and social balance—has become a vital element in the continued development of the country's road infrastructure. This is why the Federal Government is pursuing an 'integrated transport policy' that seeks to guarantee future mobility. With a view to optimising the entire transport system, this policy brings together measures relating not only to the design and funding of the transport infrastructure, but also to all other policy sectors, e.g. price and innovation policy. This integrated transport policy is subject to the principles of sustainability.

The Federal Republic is a transit country situated in the middle of Europe and as such, the realisation has been growing that above all supraregional networks, but also local road networks, have increasingly been becoming part of global supply chains for goods and services since the accession of Eastern European countries to the EU. As an exporting nation, international supply chains are very important for Germany. Society cannot close its eyes to the fact that because of Germany's situation in Europe, road freight transport in Germany is expected to rise by 58 per cent between 1997 and 2015. This increase in road freight transport must be addressed in a socially compatible and environmentally friendly manner.

At the same time, however, current and future social developments in Germany must be taken into account in the planning process. In this way, the effects of a foreseeable demographic change result in the necessity to adapt the guidelines for planning, construction, and operation of road infrastructure, which must react to phenomena such as the exodus from sub-regions and the polarisation of society in terms of age and social structures.

Today, sustainability requirements in network and road design are being met by a variety of new methods, procedures, tools, and measures. The restructuring of the existing network is just as much a part of the strategies to adapt the transport infrastructure to changed requirements as a reinforced safety philosophy. An integrated approach to spatial, urban, and transport planning and a multimodal transport network design that makes the most of opportunities to co-ordinate and link individual subsections of the transport networks serves to optimise transport services. The road safety audit has established itself as a successful quality assurance tool for both new-build and upgrading projects. Any

identified safety deficiencies are used to adjust plans in a targeted manner in order to meet the needs of more vulnerable road users such as children and elderly people.

Necessary operational adjustments result from the associated necessities to make more efficient use of capacity throughout the entire transport infrastructure system and to optimise traffic flow by means of integration effects.

5 RELATED LITERATURE

Bundesamt für Bauwesen und Raumordnung	Raumordnungsbericht 2005, Berichte Band 21. BBR, Bonn, 2005
Bundesministerium für Wirtschaft und Arbeit	EWI / Prognos–Studie, Die Entwicklung der Energiemärkte bis zum Jahr 2030, Energiewirtschaftliche Referenzprognose, Berlin 2005
Bundesministerium für Verkehr, Bau- und Stadtentwicklung	„Klimaschutzprogramm 2005, Verkehr und Klimaschutz“, Berlin, Beschluss des Bundeskabinetts vom 13. Juli 2005
Kraftfahrt-Bundesamt, Bundesamt für Güterverkehr	Statistische Mitteilungen, Reihe 2: Fahrzeugbestand und Reihe 8: Kraftverkehr, Flensburg 2005
Bundesministerium für Verkehr, Bauen und Stadtentwicklung (BMVBS)	Verkehr in Zahlen 2004/2005, Berlin 2004
Europäische Union	EU-Richtlinie 2001/42/EC des Rates über die Prüfung der Umweltauswirkungen bestimmter Pläne und Programme vom 27. Juni 2001 (Abl. Nr. L 197 vom 21.07.2001, S. 30)
Bundesministerium für Verkehr, Bau- und Wohnungswesen	„Bundesverkehrswegeplan 2003 – Grundlagen für die Zukunft der Mobilität in Deutschland, Berlin 21.03.2003
Forschungsgesellschaft für Straßen und Verkehrswesen a(FGSV) (Hrsg.)	„Hinweise zu verkehrlichen Konsequenzen des demografischen Wandels“, Arbeitsgruppe Verkehrsplanung, FGSV-Nr.144, Köln, Ausgabe 2006
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (Hrsg.)	Richtlinien für die integrierte Netzgestaltung (RIN), Entwurf Köln, April 2006
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (Hrsg.)	„Empfehlungen für das Sicherheitsaudit von Straßen (ESAS)“, Köln, Mai 2002
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (Hrsg.)	Richtlinien für die Anlage von Straßen, Teil: Leitfaden für die funktionale Gliederung des Straßennetzes (RAS-N), Köln 1988
Forschungsgesellschaft für Straßen und Verkehrswesen (FGSV) (Hrsg.)	„MUVS- Merkblatt zur Umweltverträglichkeitsstudie in der Straßenplanung“, FGSV-Nr.228, Köln, Ausgabe 2002
Gerlach, Jürgen et al.:	Strategische Umweltprüfung (SUP) in der kommunalen Verkehrsentwicklungsplanung, Endbericht zum Forschungsvorhaben FE-Nr. 73.0327/2004, Wuppertal 2006
Hartkopf, Gerd	“Die neuen Richtlinien für Landstraßen – Ein Schritt zu selbsterklärenden Straßen“, Vortrag auf dem Deutschen Straßen- und Verkehrskongress, Berlin 2004
Huber, Felix	„Integrierte Gesamtverkehrsplanung (IGVP)“ in W. Kolks, J. Fiedler (Hrsg), „Verkehrswesen in der kommunalen Praxis“, Band I, 2. Auflage, Berlin, 2003, Erich Schmidt Verlag
SCI Verkehr GmbH	„Integrierter Verkehrspolitik – Herausforderung, Verantwortung und Handlungsfelder“, Zusammenfassung der Ergebnisse der

Arbeitsgruppe beim Bundesminister für Verkehr, Bau- und Wohnungswesen, Berlin im August 2002