

## The Future of Mobility Scenarios for the Year 2020

The Institute for Mobility Research is a scientific research body established by the BMW Group. The institute focuses on future developments in the area of mobility, with auto-mobility being only one of the many aspects studied. The spectrum covered involves socio-scientific, societal, economic and ecological, as well as cultural issues in the context of the major challenges of the future. The objective, operating in a networked environment and taking a wide range of different measures, is to ensure sustained and socially accepted mobility in the long term. The Institute is supported in its work by a number of scientists and researchers in numerous disciplines as well as representatives of Deutsche Bahn and Deutsche Lufthansa.

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# The Future of Mobility

## Scenarios for the Year 2020

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## 1 Another Study?

Involving a multitude of different facets and factors, mobility is an extremely popular subject for all kinds of studies and examinations. And mobility involves us all – each and every one of us. So it is not surprising that studies on the most varied aspects of mobility have been carried out in recent years, some of them – and of this we are proud – initiated by the Institute for Mobility Research.

But none of those investigations is as elaborate and comprehensive as the present study on the Future of Mobility. Indeed, this is a scenario project never before conducted in such complete detail. For the first time three large and renowned representatives of the most important providers of transport – the **BMW Group**, **Deutsche Lufthansa**, and **Deutsche Bahn** – have worked together in a project focusing comprehensively on the future development of mobility in Germany.

The entire subject matter has therefore been treated from a wide range of different angles, some 50 experts in various disciplines and from different institutes contributing their particular knowledge: population scientists, economists, sociologists, engineers, transport scientists, to mention just the principal contributors. Whilst representatives of universities form the largest group, experts from the corporate world, from associations and federations, research institutes and consultancies also took part. The sheer diversity of experts and different opinions alone made it virtually impossible to influence the result of the study by particular interests – which again distinguishes this project from many other studies and examinations.

Two realistic scenarios follow from the perspective applied. They both describe the situation in the year 2020 as it might transpire in the opinion of experts. In some major respects (such as the development of the economy in Germany) the study compares projections varying only slightly from one another – with the surprising result that the outcome at the end of the day is very different indeed. This, in turn, shows that the influence of politics, values and market mechanisms should not be underestimated. The conclusion is that we need **action** and not **reaction** as the most important lesson to be learnt from the study. Precisely this is why we have called the two scenarios “Action” and “Reaction”.

The present study provides the starting point for a comprehensive dialogue involving all players with an influence on the mobility scene in Germany and Europe. First and foremost, the main objective is to consider the various views on opportunities and problems in the ongoing development of transport and the development of options for further action urgently required.

At the end of 2003 the scenarios will be compared with the situation that has developed by that time, thus being continued on an ongoing basis. This will give the study dynamic character, helping the portier involved to come to terms with new conditions and reconsider their own plans.





## 2 Taking a Look into a Networked Future

Mobility is an essential aspect of our life – both our private life and our pursuit of business. We see the option to enjoy mobility according to our own intentions and wishes as part of our quality in life. Understandably, therefore, many people are sensitive to any curtailment of their mobility or to any increase in the price of mobility: Anybody not able to be mobile – for whatever reason – will sometimes feel excluded and shut out from society.

Some manifestations of mobility may develop a very special appeal and become a genuine source of attraction. The automobile, for example, is ranked far higher by many than its actual practical use would justify. Railbound transport is currently experiencing a kind of renaissance, and flying has always been the synonym of status, adventure and unrestricted freedom.

Adequate mobility is also an essential prerequisite for the economic success of a country such as the Federal Republic of Germany, success ensured in the past by a system of transport infrastructure tailored to the requirements of the country and its economy. The reunification of Germany and the formation of the single European market show that political and economic integration as well as cultural exchange are quite simply not possible without the appropriate infrastructure.

Mobility is manifested by transportation on the road, on rails, on water and in the air. But transportation also has its bad sides: traffic congestion, delays, noise, exhaust emissions – these are just some of the terms we hear time and again in the context of traffic as perceived by many today. Traffic and transport have therefore become a sensitive issue believed by some to offer more advantages than problems but seen by others as an area of growing difficulties. These different views are often debated in a rather emotional manner in politics, in the world of business, by associations and the public, often being considered in isolation without the right context.

This also applies to the development and expansion of our infrastructure: In recent years traffic has increased significantly but the infrastructure required has not developed in parallel. The action required to maintain and develop the infrastructure needed has not been taken primarily on account of inadequate funding and long, drawn-out licensing procedures. In the light of growing problems, the debate on the pros and cons of traffic and the provision of appropriate conditions and requirements is taking on growing momentum. Whilst this is certainly justified, such discussions are often characterised more by ideological confrontation and less by the search for reasonable, realistic compromises.

Everybody agrees that something must happen. But opinions as to what exactly must happen with what priority vary quite significantly. Nearly every plan or suggestion brought forward involves pros and cons, one and the same aspect often being judged quite differently, depending on the respective party's personal perspective. And since it is a feature of democratic, pluralistic society to consider different views and opinions, mobility must be seen in its entirety as an indispensable part of a modern, networked world.

Seeking to maintain or even enhance the standard of living in Germany and Europe, we must realise that in all likelihood this will only be possible with even more transport. Today, at any rate, it is impossible to create a significant increase in value without causing a greater demand for transport. In the decades to come we therefore face the challenge of providing mobility while at the same time reducing or even totally avoiding its negative manifestations and repercussions.



There is not much time left to set out the path for a successful future of mobility. But the decisions now to be taken are based on such an intricate network of interacting factors that simple cause-and-effect concepts fail to appropriately describe reality.

The present study seeks to provide effective support and assistance in answering these questions. A group of approximately 50 scientists and researchers, representatives of various companies and the BMW Group, Deutsche Bahn and Deutsche Lufthansa has developed views and forecasts in this study, showing how mobility and transport may evolve up to the year 2020. Two scenarios presented here in greater detail clearly describe the opportunities and risks of alternative paths of development. In presenting these views, it was not the objective of the companies involved to develop a “desirable” picture of mobility in future, and then, in a next step, determine the action to be taken in order to reach this objective. Rather, the issue was to entrust independent, non-partisan experts with the task of assessing future developments and their interaction in order to create an overall picture of mobility in the year 2020.

Applying an acknowledged and reproducible method, the study opens up a window leading into the future, serving to make the interaction of relevant factors clearer and more transparent. Comprising the most important factors crucial to mobility in future, the study shows which developments must be expected in the next 20 years. At the same time the two scenarios indicate which consequences in terms of mobility are to be expected in Germany for the government, the various groups within society, and each individual.


In the study we also sought to consider the alternative development options arising time and again today as critical issues in discussions. Typical examples in this context are the cost of mobility, the controversy of whether railbound traffic is more sensible than air traffic for a distance between 200 and 500 kilometres, as well as the critical balance of individual transport and public short-haul transport in densely populated areas.

To provide a clear and detailed description of future developments, on the one hand, while keeping the project within reasonable limits, on the other, it was essential, in conducting the project, to maintain a good balance of breadth and depth in terms of the features covered. Inevitably, this also meant applying certain restrictions which are presented in the next Chapter.

The value of this scenario approach lies in the systematic, interdisciplinary preparation and appraisal of largely confirmed and acknowledged data, facts, forecasts and experts’ judgments on the future and the way they will interact with possible manifestations of the future in the years to come.

A regular dialogue is to start next year on both scenarios involving decision-makers in politics, the world of business, federations and associations responsible for transport. We hope to make it clear in this process how transport-related decisions interact with other factors and what repercussions they themselves have on the – transport – situation in Germany. This will then make it possible to assess the quality of decisions to be taken more appropriately in advance. And if we were then able to initiate appropriate political action or prevent counterproductive decisions, this project would indeed have reached one of its primary objectives.

Starting in 2004, the scenarios and their contents will be updated at regular intervals. A comparison with developments in the years then transpired will show where and at what points the outlook at the year 2020 still has to be modified. These results will then also be made available



to the responsible decision-makers in politics, economic life, federations and associations, as well as the world of science, hopefully leading to ongoing discussions.

Far-reaching, previously unconsidered trend-breaking events (also referred to as “wild cards”) with a broad impact on developments in the years to come may still create the need to thoroughly revise the scenarios presented herein. A limited number of such events and their fundamental repercussions on mobility have therefore been analysed in the study. Conceivable examples are an unexpected development of the economy in Germany, a severe shortage of oil, or an economic miracle in China.

The particular value of such a regular exchange of views is not the debate as to how much a specific criterion or factor will change in the years to come, but rather lies in the fact that all players involved (representatives of corporate life, politicians, scientists, etc) are able to focus on the perspectives of other parties in an interdisciplinary, inter-institutional process.

## 3 The Process of Developing Scenarios

The following provides only a short description of the project and the approach taken.

### 3.1 The Method Chosen: Scenario Concept

Whilst many projections of the future applied for the purpose of planning or research are by all means conceivable, they are not necessarily feasible in their process of evolution and development. Scenarios, by contrast, are developed systematically out of the current situation, providing consistent and meaningful images of the future and what may be expected to come.

A scenario not only describes a conceivable situation in future, but also sets out the path leading to that situation. And since we can naturally envisage more than just one feasible path leading into the future, it is only appropriate to develop alternative scenarios.

The first consideration in developing a scenario is that each specific issue is characterised and influenced most significantly by external factors. To recognise and assess how a specific issue will develop in future, we must first, therefore, consider how the relevant factors surrounding that issue will evolve. Then, on the basis of these forecasts, we are able to postulate largely consistent images of the future and what it holds in store.

These perspectives are supplemented by another important feature in the development of a scenario: the introduction and analysis of so-called trend-breaking events. The very nature of such events is that their occurrence is initially impossible to anticipate when analysing a trend. They are sudden and unforeseen and possibly lead the development of a scenario in an entirely different direction. Such events may be breakthroughs in technology, surprising political or economic developments, as well as catastrophes, terrorist attacks or wars.

The present study was conducted by means of the scenario technique developed in the '70s by Prof. Dr. Horst Geschka and his team at the Battelle Institute in Frankfurt, Germany, and consistently refined ever since.

### 3.2 Project Approach

In terms of its features and contents, the project was based on 12 two-day workshops with experts, two two-day networking workshops, four one-day sessions with the mentors of the project, regular meetings of a working team (core team), and several written feedback rounds involving all participants.

The first step within the project was to define the term “mobility”, the following definition being chosen for this purpose: Mobility is understood to be “physical mobility” in the meaning of actual or at least potentially travelling from one point to another. It results from the needs or requirements of an individual or group and manifests itself in the form of traffic on the road, on rails, in the air or in water, using different means of transport in the process.

In order to avoid the risk of excessive complexity and due to restrictions in time and manpower available, it was deemed appropriate to apply the following restrictions to the study:

- In geographical terms the scenario concentrates on Germany. Looking at travel movements, the study does of course also consider the international flow of traffic to the extent to which it originates or terminates on German soil or reflects on the traffic situation in Germany. Overriding changes such as the enlargement of the EU to the East bringing about an increasing flow of trade are taken into account separately.
- The question of mobility in densely populated areas is considered on an abstract level. Differences between individual areas and agglomerations are not taken into account.
- Goods transport is considered only to the extent to which it influences mobility and, respectively, passenger transport.
- Passenger transport on water remains unconsidered due to its minor relevance to the present study.

Proceeding from these general, overriding assumptions, the Institute for Mobility Research then determined the areas of influence to be considered in greater detail in studying the development of mobility in Germany:

- Economic development, development of the population, development of geographical structures
- Politics, in particular traffic and transport policies, environmental policies, traffic infrastructure
- Technology and innovation
- Mankind and the world of occupation/working conditions
- Society, lifestyle, values
- Strategies pursued by transport providers in making specific offers/providing specific options, mobility services.

In each of these areas we were able to find renowned specialists and researchers recognised for their competence as mentors (see Annex A II for a list of names). The mentors served as an Advisory Board providing input for the actual course of the study and offering their expert opinion on the interim results.

Acknowledged specialists preferably coming from different institutes and research bodies were then appointed for determining and compiling the influence factors (see Annex A I for a list of names). In terms of size, these expert groups varied between 6 and 11 participants, with a total of 48 experts working on this phase of the project.

In two two-day workshops, the experts determined the factors of influence to be considered in each of the six areas mentioned above. Their first step was to identify the most important factors influencing/determining the status of mobility in Germany (individual descriptors). Then, proceeding from this basis, the experts compiled projections presenting the development of these individual descriptors in the next 20 years, providing the reasons for these projections and assessing the likelihood of their occurrence. The possible effects of such projections of individual descriptors on mobility were also determined in this process.

The next step was to coordinate the individual descriptors for the various areas defined and condense the data established. This provided so-called meta-descriptors then assessed for their consistency as the basis for establishing the scenario. This was done in two further two-day workshops involving 16 rapporteurs representing the former groups of experts (see Annex A III for a list of names).

Special software (INKA 3) was used to condense the alternative meta-descriptors into consistent, meaningful and harmonised scenarios. This software is made up primarily of a calculation algorithm able to identify the most appropriate, consistent assumptions.

Then, proceeding from this basis, further evaluations and analyses were carried out:

- Determination of the relevance to mobility of the individual meta-descriptors
- Determination of the driving and driven factors within the system
- Identification of two clearly different scenarios

All relevant interim results in the processes described are presented in Annexes B and C.

### 3.3 Choice of the Two Scenarios

The INKA 3 program revealed a number of consistent combinations of scenarios, two of which were to be chosen and interpreted.

In the first selection phase consistency was the dominating criterion considered. The scenario chosen was the one with the highest level of consistency, that is the scenario with the lowest level of contradiction (inconsistency) between the individual meta-descriptors and their specific features. This is the scenario referred to as “**Action**” in Chapter 5.

To choose an alternative scenario, the experts subsequently identified those meta-descriptors which, first, show a high level of relevance to mobility and, second, are deemed to exert significant driving power acting on future developments. These factors of influence are as follows:

- Economic development (GDP) (gross domestic product )
- National and European road transport policy
- National and European organisation and guidance of air and rail transport (including public short-haul passenger transport)
- Volume of investments in transport infrastructure
- Degree to which external (environmental) cost factors are taken into account
- Development of the population
- The dominating image and philosophy of mobility

Compared with the scenario already chosen, these meta-descriptors were to show a different path of development in each case regarded as possible and conceivable by the experts.

The calculation algorithm was used again to determine the most consistent and meaningful combinations of the other meta-descriptors versus the manifestations already established. Here again, several options remained after this calculation process. In determining the second scenario, the experts again followed the overall consistency of the pattern established and at the same time looked for the largest possible contrast to the scenario already chosen. The result of this selection process is the scenario defined as “**Reaction**” in Chapter 4.

## 4 Scenario: “Reaction”

### 4.1 Main Parameters

Seen from the perspective of the year 2020, the most important assumptions for the “Reaction” scenario are as follows:

➤ In the area of **demographics and economy**:

- As expected, we have seen **negative population growth** in recent years, immigration slowing down this trend only slightly.
- Despite their growing involvement in the labour market, the **number of gainfully employed has continued to decrease**.
- **Growth rates** of the gross domestic product were **below 2%** on average in the last 20 years.
- **Goods transport**, particularly on the road, has **increased significantly** (approx + 60%), particularly due to the expansion of the EU to the East.

➤ In the area of **society and politics**:

- Most Germans pursue **consumption habits that demonstrate their lifestyle**.
- **The car remains the dominating factor** in the world of **mobility** in Germany.
- The member states of the EU are continuing to pursue a **heterogeneous transport and environmental policy** with noticeable variations.
- There has **hardly been any progress in the deregulation of transport markets** leading to more competition in only a few areas and cases.
- **Ecological and resources policies** play only a **minor role**:
  - **Society at large** is still held responsible for repairing **external damage to the environment**. The polluters really responsible are hardly required to pay for the damage they cause.
  - **Infrastructure** is still financed primarily out of **tax money**.
  - Most **intervention through environmental and socio-political regulations** relating to transport policies involves the **subsidisation** of specific transport **providers** (eg in public short-haul passenger transport).

➤ In the area of **infrastructure**:

- **In real terms**, the **overall level of investments in transport infrastructure** in the Federal Republic of Germany has remained **largely unchanged** in recent years.
- At the same time government **investments** in the infrastructure of railbound transport have constantly increased over the years **at the expense of road construction**.

➤ In the area of the **mobility and the cost of mobility**:

- Since the year 2000, the **price of gasoline** has almost **doubled** in real terms.
- Despite this trend, **mobility expenditure** by private households has **increased** only moderately.

## 4.2 Story

### 4.2.1 Lack of Political Action Breeds Fear of the Future

The general attitude in Germany is poor for a number of reasons:

Economic growth in the period from 2000 – 2020 has been only moderate. On average, the gross domestic product (GDP) has grown by less than 2% a year.<sup>1</sup> At the same time the unemployment rate averages approximately 10%. Although towards the end of the second decade, due to the general decline in the number of people seeking gainful employment, the absolute number of unemployed decreased slightly, the rate of unemployment has remained at the same high level. A further point is that public and private households have been required in recent years to constantly spend an increasing amount of money on their old-age provisions and many people are therefore afraid of an economically insecure future. The interaction of foreseeable demographic development, the low level of economic growth, the shortage of properly qualified labour, and the economic security of families and individuals has constantly become more obvious in recent years.

Weak economic growth and unemployment remaining at a high level

With unemployment in Germany being largely structural in nature, people lose their jobs time and again in some industries whilst other industries are looking in vain for qualified labour. The increase in the age of retirement introduced in 2010 has not really taken effect: Many elderly employees are either not willing or not in a position to consistently face new challenges at work in the last few years of their vocational life.

Shortage of qualified labour

To a certain extent the globalisation of the economy has also had a negative impact on the availability of labour and, accordingly, on the growth potential in Germany: Young people with good training show an increasing interest in emigrating to a country with better potentials of economic development or more attractive living conditions. And it is easy for them to do so, since, having spent time abroad in their training, they have acquired an appropriate knowledge of foreign languages and an appropriate standard of intercultural competence.

Young, highly qualified people often prefer to work abroad

Given these trends, there is a lack of sufficiently qualified employees for demanding jobs in Germany in many areas. The growing number of women gainfully employed, which has been increasing for years, is likewise not able to close the gap between supply and demand in the labour market. Each year the number of employees leaving vocational life exceeds the number of new employees.

In the years to come the number of over-65-year-olds will continue to increase on account of demographic development, the age quotient<sup>2</sup> relating to old-age pensions and provisions becoming increasingly unfavourable. Many people are therefore deeply concerned about their prosperity and the economic situation in Germany and Europe.

At the beginning of the century immigration into Germany was rather restricted, the authorities fearing that excessively generous immigration regulations would endanger the integration of foreigners into society and possibly cause substantial social problems.

<sup>1</sup> For comparison: overall development of the economy since 1995 (in real terms):

	95/96	96/97	97/98	98/99	99/00	00/01	01/02
Overall economic development in real terms	0.8	1.4	2.0	1.8	3.0	0.6	0.6

<sup>2</sup> Age quotient:  $\frac{\text{over-65-year-olds}}{15-65\text{-year-olds}}$



Germany competing internationally for qualified labour

The primary objective of Germany's population and employment policy was to support the immigration above all of foreigners with an appropriate level of qualifications – the kind of people clearly in demand in Germany, but hard to find in the market. But since there is now keen competition for qualified employees all over the world, Germany often lags behind North America and Asia in finding such qualified specialists.

Germans today are less opposed to and sceptical about foreigners. But wherever people differ through the colour of their skin or their physiognomy from Germans or Europeans, their integration in certain regions is still difficult. With – relatively rare – incidents against foreigners receiving broad coverage in the media, the image of the Federal Republic of Germany abroad suffers time and again in this respect.

Transport policy in the EU still lacking uniform principles

In important areas of politics there has been a lack of far-reaching political decisions – or where such decisions have been taken, they have been only half-hearted. This applies both to Germany and to the EU as a whole. In the light of unsatisfactory development, many politicians have been afraid of burdening the population with further commitments and insecurity. Decisions have therefore only been taken in matters requiring urgent action, national interests being given priority over the interests of the EU. And many aspects relating to transport policy still lack a common, standardised solution.

As a result of dominating national interests, the process of Europe growing together has so far been slower than planned. The gap in income between the various countries, particularly versus the new members of the EU in the East, is closing only slowly, with weak but ongoing East-West migration within the EU into economically stronger countries.

Good transport has increased significantly, particularly on the road

Particularly the enlargement of the EU to the East now largely completed has boosted goods transport most significantly (+60%). Due to its central location in the heart of Europe, Germany is now burdened even more by traffic in transit, and the situation in road traffic has grown a lot worse than it already was. Conditions are therefore chaotic time and again on the Autobahn and in densely populated areas, although the railway system has almost exhausted its potential in taking over a share in goods transport.

Global economy creating additional mobility

In the light of growing internationalisation of industry, many companies have abandoned areas and activities not belonging to their core business (strategic outsourcing), concentrating more and more on their core competences. Corporate locations and production facilities – and with them, the value creation chains – are now spread out increasingly across the globe. In this process of restructuring, companies have established new facilities also in threshold and development countries in order to capitalise on the incomes gap and develop new markets of the future. The economic benefits provided by such international structures are so significant that companies are willing to accept the higher cost of transport.

Competition in the transport markets, particularly with the railways and public short-haul passenger transport, has shown only a slow process of development, since politicians are facing a dilemma: the Federal Government, the German Länder, and the communities often act simultaneously as drivers and promoters of competition, on the one hand, and as owners or partners of transport companies, on the other. This creates a conflict of interests never really solved so far. And it has proved impossible to avoid negative repercussions on the national labour market.

#### 4.2.2 New Technologies Do not Provide the Anticipated Relief

Ongoing development in the area of information and communication (IuC) technology has created a wide range of applications influencing mobility.

Today, for example, we have much better systems determining current traffic conditions and providing transport users with traffic information almost in real time. With the road infrastructure being neglected, however, there are often no alternative routes in road traffic, since in the event of traffic congestion the entire surrounding area (exits, secondary roads, etc) is also congested within a short time. Given this situation, people are hardly willing to pay for such transport services.

Technical systems serving to control traffic, such as interchanging direction signs and speed control adjusting flexibly to traffic conditions, have improved significantly in terms of quality and are now widely accepted.

Information on the options provided by various transport systems has also improved significantly, users now being able to compare departure and arrival times, the cost of transport, travel times, etc whenever they wish. Particularly people focusing particularly on the time and cost factor have to optimise their mobility by using a Personal Travel Assistant (PTA). But even though this technology and the services provided have become quite common, the overall transport situation has hardly improved. This is because, given the high volume of traffic on German roads, attractive alternative routes are rarely available.

The various means of transport are now very well equipped with information systems and technology. Access to the internet and the use of PC functions are quite natural above all in long-distance railbound traffic. Many car makers also offer this technology either as standard or as an option, helping to make traffic jams more bearable, since people can use their time to work, communicate or entertain themselves. Due to their unsatisfactory economic situation, however, many motorists are not willing or are not in a position to spend money on such technologies, which therefore are only making extremely slow inroads into the national car parc.

New technologies  
in the car developing  
slowly

New IuC technologies are used most thoroughly and intensely in goods transport on the road. Major haulage companies have in most cases equipped entire fleets of vehicles with these systems and are therefore able control their trucks flexibly according to the current traffic situation and order status. But again, goods transport on the road has increased to such an extent that this new technical assistance can hardly set off the additional problems (particularly traffic congestion) now encountered.

E-commerce has increased significantly in recent years. But whilst such digital ordering systems have reduced the number of consumers driving to the shops, they have increased the volume of supply and delivery transport taking goods to the customer. In all, therefore, E-commerce means an increase in the volume of traffic.

Video conference technology linking partners and colleagues already forming a close team has replaced many business trips. But at the same time internationalisation and the change in regionally divided corporate structures has led to a greater need for talks, meetings and conferences. Accordingly, many people use the travel time saved through video conferences for other trips and travelling activities, the number of national and international business trips therefore dropping only slightly.

Video conferences  
only slightly reducing  
the volume of travel

#### 4.2.3 Individual Interests Win – at the Expense of Society

Fear of losing one's job and a feeling of economic insecurity

Work and employment are becoming increasingly insignificant in the individual's structure of values. In the light of the overall economic situation, however, many people are afraid of losing their jobs and feel insecure about their economic prospects in future. This makes them work harder and longer than they actually would like to, more out of discipline than genuine motivation.

Since the late '90s more and more women have been seeking gainful employment. The number of women with a high standard of qualifications is increasing, and fewer women than ever before are willing to form a family. As a result, they have the same career opportunities as men.

People are increasingly reluctant to enter into a steady partnership or form a family, since they are afraid of an unclear and unforeseeable personal situation in future. Job-related mobility and communication options using the internet, mobile phone, etc allow a wide range of social contacts, friendships and relationships spread out increasingly over a number of regions. This, again, has direct consequences on mobility.

Population of Germany decreasing faster than expected

As a result of this lifestyle, the birth rate in Germany has dropped slightly once again from the former figure of 1.4 children per family. The gap between births and deaths is thus opening up even further than before, the population of Germany declining in absolute terms slightly faster than expected at the turn of the millennium.

With working times and conditions becoming increasingly flexible, the dividing lines and structures between professional and private life are becoming increasingly blurred. For economic reasons many of the gainfully employed have several jobs ("moonlighting"). This makes life more dynamic, but also more hectic and restless for most people.

The car remains the dominating means of transport

Facing a wide range of requirements and demands in their private and professional life regarding their presence at different places and at different times, many people are hardly able any more to follow a specific routine in their mobility decisions. In short-haul transport people still use their car despite all the problems involved, since this still gives them the greatest feeling of flexibility. And this is despite the objective fact that due to difficult traffic conditions you often need more time in your car to move from A to B than when using public transport.

The Germans have become a country of commuters: New corporate structures often require longer commuting distances between a person's home and his place of work. On the one hand people attach great significance to their job security, on the other hand fewer and fewer people are willing to move when switching to a new job. If at all possible, they tend to accept a longer drive to and from work or even live the life of a weekend commuter.

People enjoy life the best they can. Most people try to demonstrate that they are among the lucky individuals who are – still – well-off economically. Whoever can afford this kind of lifestyle will do so through material property such as a car or a house, or through "trendy" activities such as a prestigious hobby.

General interest in long-distance travelling and international tourism is undaunted, but growth rates are down. Many try to escape everyday life and economic insecurity, relaxing at least for a short while in beautiful surroundings far away from their "real world".

Given these developments and the economic situation, consumers make particularly great demands of their means of transport, prices (fares) and overall travel times being the relevant decision-making criteria. Consumer expectations in terms of punctuality and reliability have also increased. Only if these criteria are fulfilled, therefore, are consumers willing to pay an appropriate price for transport.

#### 4.2.4 No Money for Repairs and Renewal

The state has hardly increased its investments in road traffic infrastructure in real terms over the past couple of years. Money has indeed become scarce, other areas – in particular old-age provisions – weighing heavily on the public budget. The only option remaining in transport, therefore, is to close gaps wherever possible. For quite some time funds for the partly long overdue maintenance of transport routes have been quite insufficient, not to mention funds for the construction of new or the improvement of existing transport infrastructure. Whilst the various parties involved were aware that this was slowly but surely making Germany a less attractive place for industry and investment, the relevant groups within society (trade unions, employers, associations, etc) were too far apart in their opinions and policies regarding the priorities to be set by the government. As a result, urgent decisions have been delayed or even prevented time and again.

Different opinions on the priorities to be set by the government

To improve the financial position of the government at least in part, politicians had planned to introduce passenger car toll on the Autobahn before the year 2010. But then this plan failed because many politicians were not willing to increase the price of mobility and, as a result, to put a further burden on public sentiment in the country. At the end of a long debate, however, toll was introduced only at a few neuralgic points previously streamlined in the flow of traffic by elaborate construction measures.

Facing hard economic times, many citizens no longer show the same interest in environmental protection as they used to. On the one hand, they tend to withdraw from this cause, stating that the environment is the responsibility of the politicians; on the other hand, they do not really trust in politicians and their ability or willingness to take action. So nobody is surprised to see that relatively little has happened in this area in recent years.

Only minor interest in environmental protection

Noise emissions in road and air transport have decreased to a certain extent thanks to progress in technology. But new technologies take a relatively long time to penetrate the market, taking at least 10–15 years until they really have an effect. Further reduction of noise emissions can hardly be expected at the moment at least in road traffic, since the main reason for noise is the tyres rolling on the road. And with road conditions deteriorating consistently, many of the steps taken to reduce such noise prove to be in vain.

Cars and aircraft continuing to generate a lot of noise


Work has continued in recent years with all transport systems and providers on the ongoing reduction of energy consumption and air emissions. Conscious of the finite nature of crude oil reserves and in the light of international debates and agreements for reducing CO<sub>2</sub>, people have remained permanently aware of this issue. Again, however, technical improvements introduced in new vehicles take a long time before they come to bear within the car parc as a whole. And such improvements are more than set off, anyway, by emissions from much heavier goods transport.

Compared with the year 2000, the price of gasoline has almost doubled. Whilst this serves to reduce the volume of traffic within certain limits, this is only the case with consumers who, on account of their household budgets, have to calculate their spending very carefully. In principle people are more likely to forego other pleasures than limit their personal mobility.

Price of gasoline has doubled in real terms

In all other respects the cost of mobility has increased only slightly in real terms in recent years. But at the same time the disposable budget of most private households has likewise grown either slightly or not at all. And since the traffic situation as such has deteriorated over the same period (eg more traffic congestion, longer delays), many people now feel that they are less mobile today than they were 10 years ago.

#### 4.2.5 The Automobile Still Dominates the World of Transport



The car has once again become a greater status symbol

Although obstructions in road traffic have worsened dramatically due to the poor infrastructure and longer travelling times by car, people have not turned away from their cars so far. Presumably this is because the car, compared with other means of transport, is still seen as relatively inexpensive: Most motorists only calculate the cost of fuel and not the overall cost of a journey by car, consistently, for example, neglecting the actual cost of purchasing a car in the first place. As a result, the user of transport systems fails to properly compare the individual cost items versus other means of transport and, out of habit alone, decides in favour of his car. Using other means of transport, the individual would furthermore be required to adjust to different requirements and even a different lifestyle, which again is a barrier to making such a change.

The significance of the automobile as a status symbol and as a means of individual, self-determined mobility particularly in a difficult economic environment has increased once again: People again feel an even stronger emotional attachment to their car, which is still the best way of demonstrating that they are well off economically. Many consumers prefer saving on goods and services of lesser significance (eg furniture at home, clothes, going to restaurants) and instead drive a car which actually exceeds their economic abilities.

Due to the tense financial situation the share of small, fuel-efficient cars has increased significantly in recent years. People unable to afford their own car opt for car-sharing or rental car arrangements in order to enjoy mobility from time to time. Particularly on account of this demand, the market share of various car-sharing and rental car concepts has increased step-by-step.

Holding a driver's licence is essential in life

For years it has been quite normal to take your driver's licence as early as possible in life: Now 90% of all women and men between 18 and 80 years of age have a driver's licence. As a result of this development passenger car density has slightly increased again in recent years, people also tending to keep their cars longer than they used to.

With car sales markets dwindling in size and with international competition becoming even keener, carmakers have spread out their model ranges even further than before, introducing more and more different models to create new niches in the market. In particular, they now ensure even more comfort and safety in the car by way of navigation, traffic information and driver assistance systems, and access to the internet is also offered in many cars. In the meantime the share of electronics in the value of a luxury performance car has increased to more than 50%. But since the clientele in this segment is relatively small, there is not much demand for such services. This explains why the offers made by online transport services are very slow and sluggish in penetrating the market.

#### 4.2.6 Railways Becoming More Attractive

Railbound transport has shown the greatest and most rapid development in the last two decades. Benefitting from a broad range of financial support provided by the government above all in the first 10 years after the turn of the century and the consistently growing share of state funds invested in the railways infrastructure, railbound transport has enjoyed better conditions than other means of transport. Many trains and stations have been renewed, not only improving the looks and appearance of the railways system, but also the image of long-distance railway connections.

Positive change of the image of railbound transport

The rail network has been expanded and broadened to meet requirements on routes with promising economic prospects. Rail transport has therefore developed successfully, the railways making attractive offers. But railway operations are economically worthwhile only where railway lines, as required by law, are financed by public funding.

Due to the difficult economic situation in Germany and the generally reserved attitude towards private travel, even this enhanced railway system lacks genuine success. A further point is that rail transport is still suffering from the dominating position of the automobile, the railways never coming close to the emotional acceptance and popularity of the automobile despite many advantages and the great efforts made by operators.

This is actually quite surprising, since on many routes the railways now offer much shorter travel times than the car. The features and technologies available in trains also give the traveller various options and advantages, for example the possibility to use his laptop or communicate with others in special compartments, or, quite simply, to relax while travelling.

In the last 10-15 years we have seen more and more direct competition between railbound and air transport. In particular, this is attributable to the establishment of new high-speed routes with record-breaking travel times particularly for medium distances. The ICE Intercity Express from Cologne to Frankfurt, for example, takes only one hour and therefore clearly outperforms the aircraft on this route. On distances between 300 and 500 kilometres the railways are usually at an advantage, the number of flights on these routes being reduced accordingly.

Competition between railbound and air transport becoming keener

Competition developing slowly over the years on account of other railway operators entering the market has led to the introduction of additional offers and innovations.

#### 4.2.7 Public Short-Haul Transport – Still a Problem Child

The image of short-haul passenger transport has still not improved fundamentally. In most cases the communities are still responsible for the operation of public transport services of this kind. Feeling responsible for adequate mobility, they subsidise such services also on routes which economically are not viable.

The number of passengers has nevertheless increased significantly, more people than before having to rely on public short-haul passenger transport for financial reasons alone. Demand has increased above all in cities imposing restrictions on access to inner city areas – either by banning private vehicles from such parts of town in the first place, or by making streets smaller and narrower and imposing high parking fees on individual motorised transport.



The demands made by customers of public short-haul passenger transport are fulfilled as far as possible, despite the general shortage of funds. In many cities, therefore, the public transport network has been developed and individualised to an even higher standard, albeit without the desired economic success, since there has never been any real pressure to achieve an appropriate level of profitability.

The Mobile Card  
makes things easier

Payment processes, by contrast, have become far more convenient: Using a “Mobile Card”, passengers are now able to choose among various transport options and provider services in an increasingly large region, paying their fares at the end of the month like their telephone bill. On long trips and when switching from one transport provider to the other, this avoids the complicated process of applying and calculating different fares and buying several tickets.

With an increasing number of employees working at home or with teleworking concepts, people are moving increasingly out of the inner cities to the suburbs and surrounding areas. This gives additional means of public transport growing opportunities, on-demand bus and share-a-taxi services being introduced wherever people do not necessarily own a car and running a regular service is not feasible in financial terms. Regular buses are used to replace closed-down railway lines only in exceptional cases, large areas around major towns inevitably remaining without appropriate short-haul passenger transport.

Taxis offer a wider  
range of services

In the inner city the range of taxi services has also been enhanced, with an increasing number of individual options: From “standard” taxis through the provision of cars with a chauffeur all the way to goods transport services, taxi and rental centres offer all kinds of services and transport schemes. There are even agreements between taxi companies and public short-haul transport services supplementing each other. All the passenger has to do is pay a surcharge on his public transport ticket, an appropriate amount subsequently being credited by the transport service provider to the taxi company.

Bus journeys becoming  
increasingly popular

Demand for bus transport has increased over the years, particularly senior citizens and population groups using the bus for holiday travel within Germany and to nearby European countries. This kind of travel offers various advantages: First, the fares charged are often lower than with other means of transport, since services of this kind are provided by medium-sized companies able to operate at lower costs (and due to competition, such companies are required, anyway, to keep their costs to a minimum). Second, a passenger reaches his destination in vehicles with an extremely high standard of comfort and convenience, without having to get out or change transport on the way. And with a wide range of different tour and transport services for specific target groups (senior singles, handicapped passengers, young people, single parents, etc), such trips have even become a kind of event successfully marketed to specific target groups.

#### 4.2.8 Air Transport – Going up, but How?

Ongoing increase in  
air transport demand?

Demand for air transport has continued to increase in the last two decades, inter alia due to the internationalisation of large companies and joint ventures established all over the world leading to a much greater number of business trips. Private demand for air transport has also continued to rise despite the difficult economic situation, albeit not to the same extent as in the past.

The air transport market was fully deregulated by the year 2010, leading to fierce competition in the market. Even so, the market has not been able to develop at random, since further economic growth in this segment has been restricted mainly by the lack of airport capacities and slots available for



flights. A further point is that the harmonisation of European air traffic control has turned out to be a slow and difficult process still obstructing the efficient management of air traffic in Europe.

The large German airports are nevertheless successful in their business: They work to full capacity, sometimes even above their planned capacity limits. And since they are of great significance to the local economy, the state governments consistently seek to influence the development of these major airports. Due to their regional significance, even small airports actually operating at a loss are subsidised by state governments, thus using public money to support such airport operations as long as they offer a certain potential for ongoing development.

Free access to the market and the increasing number of passengers has given momentum to the air travel market. For a long time low-budget airlines have been offering inexpensive flights to holiday areas and the new EU member states in the East (in particular Romania, Bulgaria, the Baltic countries, etc). These airlines also operate from regional airports further away from the large cities, passengers willingly accepting such longer distances due to the cheaper air fares.

Initially only small airports of limited regional significance were able to expand their areas and facilities, all other development and expansion projects being delayed by harsh protests from local communities and environmental initiatives. The main reasons for these protests were the fear of noise resulting from a tight schedule of flights and the common practice to issue special permits for taking off and landing at night. This debate only lost momentum slightly after the year 2010, when new developments in aircraft technology promised a further reduction of noise. This enabled the authorities in recent years to approve a number of expansion projects which had still been prevented at the beginning of the century.

The new large Berlin-Brandenburg International (BBI) Airport was likewise subject to delay before being opened. Similarly, the airports in Munich and Frankfurt also suffered a delay before being able to conclude their process of expansion, the extra capacities provided in this way being used mainly for long-distance connections to other countries. Even with this increase in capacities, the airports were however never really able to shed some of the pressure, since the expansion of capacities consistently lagged behind the ongoing increase in demand.

A number of airports therefore operated to their very limit of capacity until well into the second decade of the new century. In response, many passengers, in planning their flights, choose hubs in nearby European countries. Passengers from the Ruhr District, for example, tend increasingly to fly via Amsterdam, passengers from the Rhineland increasingly take flights through Brussels, Paris, etc, in each case travelling to their airport by train or by car, the number of connecting flights within Germany decreasing accordingly. At the same time both existing and new jobs around major airports have also moved abroad in the process.

Some passengers  
switching over to  
foreign hubs

With major airports being overburdened, the smaller airports have new potentials for further development. A number of additional connections between German and foreign regional airports have been established in the meantime, offering both private and business travellers interesting advantages as low-budget operations relatively far away from the main high-speed train lines.

With most major airports having their own railway connection, an increasing number of airline passengers flying away for a lengthy period take the railway to the airport, and do not go by their own car or by taxi. The smaller and more remote airports, on the other hand, present a different situation, providing lots of space and therefore allowing the passenger to drive to the airport by car and park his vehicle there at low cost.

Although the airlines have been facing higher prices and increases in costs, airfares have remained at a relatively low level on account of keen competition. Particularly higher capital expenditure on new aircraft with quieter engines, additional safety and security measures, higher airport charges, etc have tended to increase the financial burden acting on the airlines.

Cost-reduction measures have set off these higher costs only in part: Such factors helping to reduce costs are the lower level of fuel consumption thanks to more efficient aircraft engine technology (also serving to reduce CO<sub>2</sub> emissions), the decrease in the number of aircraft required to fly in holding patterns, and enhanced use of aircraft made possible by more efficient transport control. In all, therefore, the general increase in costs has significantly burdened the economic situation of many an airline, serving at the same time to “clean up” the market: Apart from the major airlines only some small niche providers have been able to survive whilst many medium-sized airlines have disappeared from the market or have been taken over.

#### 4.2.9 Passengers Hardly Switching from one Means of Transport to Another

Even back in the ‘90s, politicians, federations and transport companies expressed the wish to improve networking within and between individual systems of transport. This demand had developed in the light of an anticipated increase in traffic, the objective being to break through the dominating role of the automobile. The assumption was that the situation would only relax with a reduction in resistance both within (intramodal) and among (intermodal) the individual providers of transport. In practice, the main wish was to reduce waiting and transfer times and to increase the reliability of transport systems and connections.

In reality, however, this wish remained largely unconsidered for a long time, transport providers seeking mainly to optimise their own systems. The improvement of intermodal interfaces usually failed on account of unclear responsibilities and the apprehension among transport providers that with connections becoming too easy they might lose customers to other transport systems. Inter-modal networks have therefore made only very slow progress in recent years.

The users of transport systems were not particularly interested in the establishment of such networks, either. The reason, quite simply, was that many people, lacking experience with intermodal services, regarded the process of switching over from one transport provider to another as elaborate and bothering.

For many years, therefore, intermodal connections were restricted to points where passengers were no longer able to continue their journey with the means of transport chosen, either for technical or organisational reasons: bus stops, taxi ranks, car parks, as well as car rental stations at airports and railway stations. More elaborate solutions serve to link airports to underground and/or long-distance trains, transfers from one to another means of transport usually being limited to signs and symbols alone. There has however been an increase in the number of integrated services provided by airlines and the railways, an increasing number of airline passengers using, say, ICE express trains instead of short connecting flights in Germany. In practice, only the physical barriers at intermodal junctions (long distances, stairs) were streamlined significantly quite some time ago to make the process of changing over from one means of transport to another more convenient, especially for the handicapped.

It was only when pressure became even greater due to the increase in traffic that the state authorities (the Federal Government, the German Länder, and the communities) showed greater interest in a better and more efficient networking system, hoping in this way to shift individual transport to public short-haul transport and, quite generally, to streamline the flow of traffic. In the course of these efforts both the German Federal Government, the governments of the Länder, and regional

transport networks have initiated and financed a series of new pilot projects one after the other. The purpose of these projects was to try out various kinds of networks involving a broad range of features such as integrated inquiry and booking systems, services provided by intermodal information centres accessible through a Personal Travel Assistant (PTA), payment by means of a Mobile Card, etc.

Whilst these pilot projects have been largely successful, other cities and regions have shown hardly the slightest inclination to take over such concepts in a suitable, modified form – usually due to lack of funding. Due to this slow and sluggish procedure, we now see exemplary concepts only in a handful of cities and Germany is still a long way away from nationwide implementation of the intermodal concept. There are however signs that existing, attractive offers establishing suitable networks are serving to shift transport from individual to public providers.

Most experiments remain pilot projects

### 4.3 Conclusion: not Satisfactory

The volume of transport has increased significantly in the last 20 years. Particularly as a consequence of the expansion of the EU to the East, Germany, given its central location in Europe, is burdened more heavily than ever before by goods transports passing through the country in transit.

Noticeable increase in transport volume since the year 2000

With the transport infrastructure not being able to keep up with this development, traffic congestion has become a lot worse than in the year 2000, creating chaotic conditions on our roads time and again.

Chaotic conditions on the road

Even in this situation, however, people have not given up their cars. On the contrary: motorised individual transport still plays a dominating role, as in the past. The first point is that the automobile remains an important prestige factor in society. A further point is that the automobile gives the user the greatest feeling of flexibility so pleasant and even necessary in mastering everyday life in an increasingly hectic world.

The automobile remains the dominating means of transport

This latter point also shows that structures in the area of mobility have changed. Changes in occupation and the world of labour, for example – the increasing significance of women in gainfully employed positions, job agencies, people in self-supporting and freelance professions, as well as employees with several jobs and commuters travelling home only on the weekend – have made transport routes longer and, in particular, more complex. Transport related to job training and apprenticeships, in turn, has decreased in volume due to the changing infrastructure within the population, whilst other forms of transport have increased – particularly private everyday transport and holiday trips.

Longer and more complex transport routes, less transport for training purposes and apprenticeships

In air transport the demand for business travel has grown even faster than the increase in private holiday flights. The airport capacities available, however, have failed to keep up with this development. A further point is that the process of harmonising European air traffic control has remained slow and complicated, still obstructing the efficient management of air transport in Europe. Overcrowded airports, flight delays and long waiting times are still an everyday experience in air traffic.

Overcrowded airports flight and delays

For this reason and with new ICE express train lines being opened, we now see more direct competition between railway and air transport services. Particularly on distances between 300 and 500 kilometres rail transport has taken over the leading role from air transport, more passengers now using the railways on distances of this kind.

Greater competition of railway and air transport

Although technical improvements have served to reduce specific energy consumption in transport as well as specific noise and air emissions, this progress has been set off both by the general increase in traffic volume and, even more so, by deficits in the overall transport infrastructure as such.

Environmental burden not down versus the year 2000

## 5 Scenario: “Action”

### 5.1 Main Parameters

The “Action” from the “Reaction” scenario only by a few – albeit important – basic factors. But since these are the essential elements in the study, they lead to a significant difference in results: the situation in the year 2020 looks far more positive in the “Action” scenario. Again presented from the perspective of the year 2020, the most important assumptions for the “Action” scenario provide the following picture:

➤ In the area of **demographics and the economy:**

- Due to a relatively high rate of immigration, the **population** of the Federal Republic of Germany has **decreased less than expected** in recent years.
- The **number of gainfully employed** has **slightly increased**.
- On average, **annual growth** of the gross domestic product has been **slightly more than 2 %** in the last 20 years.
- Due to expansion of the EU to the East, **goods transport** on the road **has increased dramatically** (by approx 80–90 %).

➤ In the area of **society and politics:**

- An increasing number of citizens **no longer live the flaunting lifestyle** of former years, but are rather far more pragmatic in their decisions and behaviour.
- **The dominating role of the automobile** has **decreased** in favour of a more flexible concept of mobility also comprising other means of transport.
- The member states of the EU have **largely harmonised** their **transport and environmental policies**.
- **Market conditions** have been **largely deregulated** for all means and providers of transport.
- **The policy of preserving the environment and resources** is **taken seriously, implemented** into specific action plans and **consistently followed up**:
  - **External environmental effects** are already considered to a large extent
  - The **transport infrastructure** is largely **financed by rates and fees based on the actual use of transport**.
  - **Subsidisation** is no longer paid preferably to **transport providers**, but rather to their users (eg by subsidising mobility).

➤ In the area of **infrastructure:**

- The level of **investments in traffic infrastructure** in the Federal Republic of Germany has **increased** in recent years. Private investors have made a growing contribution to this higher funding
- At the same time **state investments** in railbound transport have further **increased at the expense of road construction**.

➤ In the area of **mobility and the cost of mobility:**

- **Prices of gasoline** (as in the “Reaction” scenario) have almost doubled in real terms since the year 2000.

- Toll has been introduced in general on the Autobahn, the funds provided being used for the development and expansion of infrastructure.
- For years, **mobility budgets** have been a lot higher than in the past.

## 5.2 Story

### 5.2.1 Increase in Passenger and Goods Transport

The German economy has shown a largely positive development in the last 20 years and people are relatively well off. The gap in the distribution of incomes has however widened. Whilst growth rates in West and East Germany have basically followed the general development of the economy, there is still the traditional South-North economic slope. On a nationwide average, growth of the GDP has been consistently just above 2% a year, the course of growth however being unsteady, with several years of substantial growth (more than 2%) setting off phases of recession.<sup>3</sup>

Growth rates are high above all in the services sector. Company-related services (such as consulting, outsourced service functions such as maintenance, accounting, corporate training) have shown particularly significant growth rates, since many companies tend to concentrate in full on their core competences. Private demand for personal services growing since the turn of the century (eg adventure parks, wellness centres, child care) has also increased. The range of such options has been constantly expanded (with entertainers of all kinds, specialist entertainers for senior citizens, “doers” for private affairs, pet care services, home cooking, death and mourning care services). Most of these services and the jobs involved create additional mobility.

Growing services sector generates additional mobility

Following an initial increase, the population of Germany has decreased in absolute terms, but not to the extent originally assumed. This is attributable in particular to the controlled immigration of qualified labour (green card concept). There has also been – and still is – moderate but uncontrolled immigration from poor countries and crisis areas. Whilst the (net) number of immigrants has grown slowly but surely in the first 10 years, it reached its peak of 250,000 people a year in 2010. Demand for qualified immigrants in the Federal Republic of Germany has nevertheless not been met in full. The population will continue to decrease significantly up to the year 2050, even assuming optimistic immigration rates.<sup>4</sup>

Despite the improvement of child care options (day care centres, all-day schools, etc), the birth rate has increased only slightly in recent years.<sup>5</sup> It is therefore impossible to forecast what action must be taken in political and/or societal terms to increase the birth rate to the region of 2.1 required in order to maintain the population at its current level.

<sup>3</sup> The assumption of average growth rates of more than 2% pa would appear very optimistic, given the current economic situation in the year 2002. But other studies such as the German Federal Transport Plan also assume similar figures in their premises.

One must also realise that the assumption of average economic growth of not more than 1.5% up to the year 2020 would inevitably mean a deterioration of economic conditions in Germany versus the current situation (unemployment rates would remain high or even increase to an even higher level than today, the government would only be able within very strict limits to make the necessary investments, for example in infrastructure, pensions would no longer be secure). Given this situation, we find the assumption of average economic growth of just over 2% pa optimistic, but not unrealistic.

<sup>4</sup> Considering their integration into German society, immigration of more than 200,000 people a year (net) is currently regarded as virtually impossible. If, however, we assume that in the year 2020 the share of over-60-year olds has increased from 23.0% in the year 2000 to approximately 30.5% (= approximately 6.2 million more) and that at the same time the share of under-20-year olds is down from 21.1% in the year 2000 to 17.3% (=approximately 2.4 million less), we see clearly that with an ongoing trend of this kind the share of the population able to work versus the share of the population not able to pursue gainful employment will consistently decrease (by 2050 the share of over-60-year olds will amount to 36.4% and the share of under-20-years olds will be just 16%). (Continued on page 28)



The “seniorisation” of society has followed the trend predicted for years, but this development will only show its real effect by the year 2050. Forecasts already stated at the beginning of the century that the share of over-60-year-olds would increase from 22.4% to 36.4% in the year 2050. Even the lower age of immigrants and the initially higher birth rate of foreign women have not been sufficient to change this situation, immigration only alleviating, but not turning around, the decline in the size of the population and their growing age. And immigration will not be able to compensate this trend in future, either.

Shortage of qualified labour despite immigration

On all levels of qualification, economic growth has led to a growing demand for labour in both quantitative and qualitative terms. The growing share of gainfully employed women and the increase in the statutory retirement age as well as the growing number of immigrants have been able to meet part of this demand, but never really satisfy all requirements in full. To a certain extent, this has led to a shift in jobs from Germany to foreign countries or to increasingly stringent rationalisation and streamlining programmes.

Further increase in leisure-time travel

Like in the “Reaction” scenario, many people see work as the basis for being able to afford the “niceties” of private life. Thanks to flexible working hours (on a daily, weekly, monthly and even annual basis), in conjunction with a sound economic and financial situation, people are able to enjoy a wide range of demanding leisure-time activities. Indeed, such activities remain of great significance within society, leading to a substantial increase of short-term leisure-time travel. The trend towards short vacations and long-distance tourism, which had already increased significantly towards the end of the former century, has continued, albeit at a slower pace.

Households spending an increasing amount on mobility

In real terms, households spend more on average for their mobility than at the beginning of the century: Back then such expenditure was approximately 14% of their household budget, today it is slightly more. This is attributable to the higher cost of fuel, road toll and taxis, with the demand for mobility as such remaining the same. Mobility is seen as an essential and desirable element of life in our society hardly anybody wishes or is in a position to forego.

Road traffic remaining a problem

The more positive economic development, the enlargement of the EU to the East, and changes in corporate structures have led to a greater increase in transport mileage than in the “Reaction” scenario – but the reasons for this increase are the same. Particularly goods transport on the road has increased drastically by 80–90% and the obstruction of road traffic caused in this way has been set off only in part by technical and organisational improvements.

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Seen from today's perspective, we cannot expect this decrease in the population able to work to be set off by a higher birth rate in Germany. As a result, the Federal Republic will have to make great efforts in order to integrate more foreign employees with a high level of qualification. If this is not possible, economic conditions of the kind we have become used to in Germany in recent years would appear quite impossible in the year 2020 (and, in particular, in the years to follow), due to the shortage of labour alone. In that case we would have to expect a certain migration of companies and economic enterprises to other regions with better conditions in the labour market. The result would then be a fundamentally different picture in the year 2020.

It is however possible to forecast today whether or how the social challenges to be expected in integrating 200,000 people a year can be solved. The current assumption is that the number of foreigners Germany would be able to integrate is far smaller.

We must however be aware of the fact that even immigration averaging 300,000 people a year would only alleviate the decrease in population in the decades to come, without turning around this trend, since calculations carried out by the German Federal Ministry of Domestic Affairs indicate that by the year 2050, even under the most optimistic premises, the number of people dying in Germany would exceed the number of newborn citizens (source: German Federal Ministry of Domestic Affairs, Model Calculations on the Development of the Population up to the Year 2050, pp 10/11). In the same study the German Federal Ministry of Domestic Affairs assumes net immigration of 300,000 people a year when this curve peaks as of 2015. The corresponding figures for the years between 2010 and 2014 are 276,000 people/year and, respectively, 180,000 people in the period from 2005–2009.

<sup>5</sup> The “old” German Länder in the West have shown a stable birth rate averaging 1.4 ever since the mid-70s. In the “new” German Länder in the East the birth rate, following the collapse of the Berlin Wall, dropped from 1.6 to a low of less than 0.8 in 1994. Since then the birth rate in the new German Länder has increased consistently to the same level as in the “old” Länder.

<sup>6</sup> Source: Model Calculations on the Development of the Population up to the Year 2050, p 12, German Federal Ministry of Domestic Affairs, June 2000.

The volume of goods transport by the railways has also increased in recent years, but has not really relaxed the situation on the road. Indeed, this shift to rail transport has only slightly alleviated the increase in road transport by trucks.

Only a broad range of improvements and action plans has been able to prevent the imminent collapse of road traffic. After the year 2010 many technical and organisational innovations in traffic control have shown positive effects attributable above all to the introduction of the Galileo satellite system (replacing the US GPS system). Even so, traffic congestion remains a common phenomenon at peak times and at neuralgic points.

### 5.2.2 Electronics Make Life Easier, but Do not Reduce Traffic

Information and communication (luC) technologies have been further developed to an even higher standard, taking the strain off traffic conditions. Particularly the following systems have shown definite effects:

- City guidance systems, flexible speed control on long-distance routes, real-time traffic information, automatic toll systems
- Systems coordinating and harmonising timetables and thus ensuring a better network connecting the various means of transport
- Intermodal mobility advice by telephone/mobile phone
- Optimisation of routes and capacities for trucks by means of satellite-based luC technology

Better use of transport infrastructure through luC

Systems and applications requiring the ownership of special equipment and active use of luC technology take somewhat longer to really penetrate the market, with their effects having become evident only recently. This applies, for example, to:

- Navigation and information systems, the availability of the internet in various means of transport, use of mobile Personal Travel Assistants
- Internet-based booking and accounting systems in organising travel and the actual process of travelling

Even more than in the “Reaction” scenario modern luC technologies have changed corporate processes and the flow of work. To an increasing extent employees are expected to show a high standard of flexibility, being willing to travel and work unusual hours. Business trips are substituted only in a few cases by the use of stationary or mobile communication systems – and any time saved in travelling is generally used for additional trips. Ultimately, video conference technology is used only for routine talks among business partners and colleagues who have been working together for many years.

luC technology is also the prerequisite for homework and telework now very common. Whilst reducing the volume of professional commuter traffic, this also means more irregular traffic demands making it impossible to form car pools. And any time gained in the process is usually “lost” again due to the increase in leisure-time traffic.

Homework/telework mean less, but more irregular professional commuter traffic

Internet-based trade (E-commerce) has also increased significantly, with the consequences already described in the “Reaction” scenario (decrease in shopping traffic, increase in delivery transport).



### 5.2.3 Life More Flexible, Time More Scarce

Greater flexibility in everyday life requires people to show greater flexibility in their decisions

People have changed their lifestyle over the years: Many conditions and parameters in life which formerly led to firm decision-making routines have been drawn apart and individualised to an increasing extent both timewise and geographically. Working hours, shop opening hours and the official opening times of the authorities and other offices have been deregulated, sometimes providing even total freedom. Numerous jobs and activities, particularly in the services sector, are no longer pursued according to rigid timetables and/or geographical requirements, many people thus enjoying greater freedom in their everyday life.

Wherever priority is given to flexibility and a tight schedule, people usually opt for individual motorised transport

Despite the larger number of gainfully employed women, the traditional division of labour (the wife taking care of the children, driving them to kindergarten or school, taking care of the household; the husband pursuing his profession) has remained unchanged in many cases. Apart from their everyday professional life, people want to experience something special in their leisure time, pursuing sports, going to events, doing something for their own well-being. To make all this possible, many people have to organise their everyday life very efficiently, without wasting any time. Combining many errands with one another to reach this objective, people cover complex transport routes for which the automobile is particularly suitable. So despite the wider range of options now offered, public short-haul passenger transport still suffers from inherent disadvantages in this respect.

Many leisure-time activities quite impossible without the automobile

Consumers with the funds and time required take several short vacations a year. The automobile is still the most suitable means of transport for trips of this kind as well as spontaneous leisure-time activities at one's place of residence (offering the possibility to take along sports equipment or similar cargo, to meet friends outside of urban centres, to pursue activities in small groups, etc).

People have also become more demanding in terms of convenience and reliability in travel, the cost of transport and overall travel times remaining the most significant decision criteria. Wherever time is money the demands made in terms of punctuality and reliability are particularly stringent. This applies above all to business travel, but also to the travel requirements of married couples both pursuing a profession as well as single parents required, despite their lack of time, to organise child care, professional leisure time, occupational requirements, etc.

Modern lifestyle demands increasing mobility

The dissolution of traditional family ties and household structures has also led to an increase in mobility: With an increasing number of single households involving both young people and old-age pensioners, the process of pursuing social contacts usually calls for more mobility. Since in many marriages or partnerships both spouses have a job, they feel less inclined to move to a new place "just" for a new job. This, in turn, has led to an increasing number of weekend commuters. A further phenomenon is that people have their friends and acquaintances spread out over an increasingly large region – some people often travelling abroad for professional reasons or on holiday even have a truly international group of friends and acquaintances.

### 5.2.4 Mobility More Expensive, but Traffic Flowing

Transport conditions harmonised EU-wide

General conditions within the EU have been largely harmonised in terms of general order, competition and infrastructural policy, with the exception of specific national distinctions such as speed limits, road toll, etc. After several years of national interests dominating the scene, people are now starting to realise that common, uniform market and competition rules both for Europe as a whole and for individual states are an advantage. National policies have therefore lost a lot of their former significance. Following years of disputes and discussions among the individual countries, a supra-national, Europe-wide transport coordination authority is now in place.

This development has been accompanied in recent years by a growing number of market economy concepts introduced within the EU, all transport markets starting to operate according to the same principles. An important factor fuelling this trend was the constant shortage of money in public households, an increasing number of tasks and responsibilities previously financed by public money being shifted to private companies. In particularly lucrative areas of business, however, the state still holds a share in such private enterprises, nevertheless focusing increasingly on planning requirements and privileges in the development and expansion of transport infrastructure. Only where transport requirements are not sufficiently attractive to private investors does the government take over with public funds, for example in the construction and maintenance of regional airports or in subsidising public short-haul passenger transport outside of densely populated areas.

More market economy  
also in transportation

The reason for this policy pursued by the EU, the German Federal Government, the German Länder and local communities was their assumption that apart from taking the pressure off private households they would also be able to make transport systems more efficient – a wish that has come true after a certain time.

For a number of years an increasing share of the significantly reduced state infrastructure budget was spent on railway services, expenditure on road construction being reduced accordingly. The small amount of funds spent on air transport, in turn, remained at the same low level as before.

This policy was only possible because private investors now provide a large share of the funds required for developing and expanding infrastructure. In return, such investors are either able to charge road toll themselves or at least receive a share in such proceeds. As a result, the overall volume of investments in transport infrastructure, particularly in road construction, has increased accordingly.

Reduction of state  
spending on infra-  
structure set off by more  
private spending

With the Galileo satellite system allowing further distinctions in charging toll on trucks already levied for a number of years (with the focus on additional criteria such as time, place, emission categories, etc) and with sufficient experience having been gained in this area, road toll has also been introduced step-by-step on passenger cars for the Autobahn and long-distance routes by way of a Europe-wide multi-stage scheme. The funds raised in this way are reinvested for the maintenance and expansion of road infrastructure.

Following toll on trucks,  
toll on passenger cars  
is now levied on  
the Autobahn and  
long-distance routes

Toll has been introduced on passenger cars not to provide some kind of new system or order, but rather as a result of economic considerations by the State and Federal Ministers of Finance. Otherwise it would simply have been impossible to fund the rapid development of road infrastructure and to introduce elaborate traffic control systems.

The decision to use road toll largely for financing the road infrastructure remains the subject of political debates to this day. Indeed, it was only when the effects of the poor transport infrastructure on the economic development of Germany became increasingly obvious that a general consensus was reached in using such funds for a specific purpose, ie, spending the money available in the area in which it was raised in the first place. At the same time the population have changed their attitude towards the significance of road transport and the need to have our roads financed by their users. The only way to justify the higher cost of mobility to the population was to improve the infrastructure provided.

Road toll widely accepted  
since the funds are used to  
improve the infrastructure

The positive effects and contributions of road toll have helped to make this system of charging money for the use of roads acceptable in the first place. Introducing a range of toll levels depending on the type of road and the period of use, transport managers have succeeded in drawing apart the volume of traffic, reducing peak loads and cutting back traffic congestion. A positive factor for the



economy as a whole is that better use of the infrastructure available has served to make the economy operate more efficiently. Whilst drivers of passenger cars have to pay higher prices for transportation, they consume less fuel and require less time in the process.

Rebuilding and rapid expansion of the road network has substantially improved infrastructural efficiency, helping to reduce bottlenecks and traffic congestion. Together with other concepts and technologies serving to control and mastermind transport (such as telematics), this has to a certain extent set off the significant increase in traffic, particularly with goods transport. With mileage and transport volumes consistently increasing, however, the efforts required for the management of traffic on the existing level have increased over the years.

External cost of  
environmental damage  
allocated to road users

A further issue in focusing on transport and environmental policy from the perspective of a market economy is to allocate the cost of external effects increasingly to the responsible parties. This is the result of several developments: The first necessity was to meet binding international agreements on the protection of the climate and to overcome the distortion of competition on an international level. The second point is that (re-)insurers have exerted increasing pressure on politicians in the light of growing environmental damage. The road toll already mentioned, therefore, comprises both an element for the use of roads and a – smaller – share of money for covering external burdens.

Growing demand for crude in the threshold countries has led to a significant increase in the price of crude. Together with additional fiscal burdens introduced above all in the first decade of the new century, we have seen a significant increase in fuel prices. Benefitting from improved technical features, new cars consume less fuel in absolute terms, but still remain more expensive to run on account of higher fuel prices.

In railbound and air transport the cost of external environmental factors has led to higher fares and prices charged to passengers.

Mobility behaviour  
hardly changed despite  
higher costs

In all, mobility has become more expensive in general, particularly on the road, but also in railbound and air transport. This does not mean, however, that people have fundamentally changed their demand for mobility. Rather, consumers seek to set off the higher cost of mobility wherever possible by shifting their private spending and by saving money in other areas.

Mobility has become more  
expensive in general

The number of people forced to cut back their mobility for economic reasons has increased. Many people required to be mobile in pursuit of their professions are able to set off the higher cost of mobility against tax or receive fiscal benefits if they are low income earners. Indeed, such special rules and exceptions have made the higher cost of mobility acceptable to the population without leading to major protests. But at the same time such financial support largely undoes the controlling effect of higher prices.

With both transport options and the quality of transport improving, it is now more worthwhile than ever before to compare various transport options and possibilities before setting out on a trip. With this in mind, many consumers have become more pragmatic in the choice of their means of transport and in their travel itinerary: Many people first work things out and then take their decisions afterwards.

The general increase in the price of mobility has had various effects:

- Transport users have switched over from individual motorised transport to public transport. This trend has however been rather limited, since the cost of mobility always remains only one of several decision-making criteria in choosing the means of transport.

- Short trips have once again become more important in leisure-time behaviour, increasing traffic congestion on weekends around attractive recreation areas close to big cities or at major events.

For years there has been a debate on whether compact settlement and economic structures involving short distances are better than suburban settlement structures. But since other factors also play a role in the choice of one's place of residence, the higher price of mobility has not led to a clear trend towards re-urbanisation. Only in cities with excellent transport infrastructure, that is with positive general conditions for public short-haul passenger transport and motorised individual transport and with an attractive supply of large and comfortable housing, do we see a slight trend towards the inner city. On the other hand, the efforts made by some large cities to limit access to the inner city for large or high-emission cars, thus improving the quality of living, have not proven successful.

### 5.2.5 Changing Attitude on the Automobile

The automobile still plays a fundamental role in mobility, consumers appreciating its many advantages such as quick and convenient access to their destination, individual choice of one's route, availability of a nationwide network of roads, and maintenance of one's privacy. Precisely this is why the density of passenger cars in the Federal Republic of Germany has continued to increase. Holding a driver's licence is a natural prerequisite these days for one's professional and private life also in the "Action" scenario, more than 90% of all men and women between 18 and 80 now holding a driver's licence and regularly driving a car.

Holding a driver's licence is regarded as part of life

For some years, however, the general attitude on the automobile has started to gradually change: The concept of mobility is no longer what it used to be, the emotional orientation towards the automobile has slightly slackened. Various reasons for this trend are conceivable: First, more and more people now think twice before setting out on a trip which means of transport is most appropriate in their current personal situation or for their destination/objective. Second, the automobile has lost significance as a status symbol. Whilst the issue of status and the wish to stand out from others still persist today, the attributes involved are now different – people have become more pragmatic in the choice of their means of transport.

This has opened up the door for new, innovative mobility options, use of a vehicle – as opposed to ownership – becoming increasingly significant. Apart from the conventional rental car business, car sharing has become increasingly popular in the last two decades, developing from a small niche into an economically viable area of business. We now find carpool stations close to people's homes above all in densely populated areas, with a wide range of different vehicles and joint ventures with other providers of transport. A further point is that various carpool companies cooperate all over Germany. One prerequisite for this development was the widespread introduction of electronic technology automating the process of booking and paying for a car and thus making the entire process more convenient (Mobile Card).

Car sharing becoming a widely accepted mobility option

Since nearly 90% of all women now have a job, they make a significant contribution to the volume of car traffic. Many of them work in high-mobility service industries, and most women still have the main responsibility in organising their households and child care (eg transport to nursery or school and back). Despite greater support by service providers (such as nannies, cleaning ladies, tutors), they often have to cover very complex routes within a very complex timetable in their daily life, which they could hardly do using public transport alone.

Women covering complex routes in their jobs, which they can only do by car



Car manufacturers have taken the trends in society and the economy into account through their model policy, introducing an increasing number of different car concepts in the last two decades. Many people with the necessary means own not only a large, well-equipped saloon, but also a small car they use in town or for short errands. Municipal transport policy seeking in many cities to restrict inner city motorised traffic involving individual vehicles, as well as traffic congestion often prevailing in many centres, are the main reasons for purchasing such city cars.

The automobile industry has further reduced the fuel consumption and emissions of new cars, helping to avoid any further increase of energy consumption despite a significant increase in mileage. Indeed, CO<sub>2</sub> emissions have decreased significantly, small zero-emission or low-emission cars having been exempted from road tax for some years. Emissions of CO<sub>2</sub>, NOX and particles are therefore no longer an important issue. Traffic noise has also decreased significantly, but is still one of the most difficult problems to solve.

Navigation systems  
reducing traffic congestion  
and drivers in search  
of parking space

Navigation and traffic information systems have achieved a high standard for a number of years and – as assumed in the “Reaction” scenario – are now a regular feature in many models. There are also new systems in the car helping to make life easier for the driver and make motoring as such safer. Typical examples are Adaptive Light Control, Brake Force Display, the active gas pedal, Active Front Steering, and cameras with an image processor. Thanks to these new technologies, both the number of accidents and the number of people killed or injured in road traffic have decreased significantly.

As a result of these developments, public and political pressure on motorised individual transport has slackened a bit in recent years.

#### 5.2.6 Railways Catching up

Europe-wide deregulation  
has led to increased  
attractiveness of long-  
distance railbound transport

In the last two decades Deutsche Bahn (DB AG), the German railway system, has succeeded in becoming more competitive thanks to ongoing state support. To make railbound transport more efficient within the European Union, the authorities have moreover deregulated access to the market almost throughout the whole of Europe: Now all railway companies are able to operate Europe-wide under comparable conditions, using the same rail lines, stations, etc. Ultimately, the reason for this new policy is that the railways clearly benefit from intramodal competition and become more appealing in the process – one of the basic prerequisites for coping with the growing volume of traffic, particularly on the road.

Privatisation of the European railway systems was the essential prerequisite for harmonising operating conditions in a market based on intramodal competition. This struggle for shares in the railway market has made railway operators fitter and more efficient, enabling them to compete with road transport, the airlines and inland waterways transport.

Today people can travel by rail largely without restrictions from North Cape all the way to Gibraltar thanks to comparable rates and prices in using the European railway network and due to the elimination of technical barriers (eg engine technology, signal and control systems, electrical supply systems, track gauge). This has given the railways the same opportunities and potentials as the passenger car and goods transport by trucks.

Public and private money  
financing the expansion of  
the railways

Railbound transport has consistently increased in recent years. It is acknowledged as environmentally friendly, serves to reduce CO<sub>2</sub> emissions, and takes the burden off the roads. The share of public money spent on improving and expanding the railways infrastructure has consistently in-



creased, only dropping again slowly towards the end of the second decade in the century. This growth of railbound traffic has also attracted private investors, building and operating railway systems ever since deregulation came into force. This is to be observed above all in regional and municipal areas where such railways are expected to yield an adequate profit.

Although the Transrapid Maglev Train has proven its benefits both in China and on pilot routes in Germany, there are no plans in Germany to build further routes even with substantial public subsidies.

Competition among the railways benefits above all the customer: Railway coaches and their equipment are new or have been modernised. There are various facilities for entertainment (television and video programmes, games), information (internet) and communication (e-mail). However, fees are charged for use of these facilities only partly included in the fares charged.

Greater comfort and better equipment in the trains make the railways more attractive

When the first competitors entered the railways market, fares on the routes involved dropped almost immediately. This trend has continued in the meantime, fare hikes or a higher level of fares than the competition only being accepted in return for a genuine improvement of the standard provided.

Competition is therefore no longer based primarily on fares, but rather on other quality criteria such as travel times and the availability of all kinds of services. The railway companies, in their customer retention schemes, have largely followed the example of the airlines, with bonus systems, discounts for early booking, etc. And wherever alternative transport providers are available, customers carefully compare their options and the rates charged and take a new decision each time.

Competition among railways leads to innovative offers

Apart from Deutsche Bahn AG, other operators now provide long-distance passenger rail transport, without however endangering the dominating position of Deutsche Bahn. Foreign railway companies concentrate above all on routes from their countries to Germany and Deutsche Bahn AG provides international connections particularly to the new EU Member States in Eastern Europe. International railway connections have become faster, the expansion and development of Trans-european transport networks following the initiative of the EU and making substantial progress in Central Europe. Further expansion and modernisation is now required primarily in the Eastern European countries.

The latest generation of ICE Intercity Express Trains is even faster and more comfortable than before, enabling Deutsche Bahn AG to replace an increasing number of domestic flights as well as flights to nearby foreign locations within the last few years. With the modernisation of existing and the construction of new airports taking a long time in a rather tedious process, and with the number of passengers consistently increasing, airline passengers experience delays more often than passengers using the railways. As a result, Deutsche Lufthansa and other airlines have reduced the number of domestic flights, increasing the number of more profitable long-distance flights accordingly.

High-speed railway connections competing with the aircraft

New transport providers now offer regional railway services, particularly after Deutsche Bahn AG closed down many lines in the first decade of the century. Introducing innovative, customer-oriented concepts, new companies have taken the opportunity and have moved into this segment. The offers provided benefit above all from a high standard of flexibility in their timetables geared to demand, but also from encounter-oriented and enjoyment features such as weekend trips, etc. Since these companies' entrepreneurial risk was limited and operating costs were low from the start, most of these companies have been economically successful. In response, Deutsche Bahn

New niche players adding momentum to regional transport



AG returned to the regional transport market with new momentum in the second decade, re-entering the market with its own concepts.

Benefitting from competition, railbound transport has become faster and more reliable, particularly on account of improved and new tracks and rail systems, innovations in technology and telematic systems enhancing the capacity of the existing network. Energy efficiency in railbound transport has also improved.

The growing number of passengers using rail transport in the last 10 years is attributable in particular to the following factors:

- Travelling by train has become more attractive, that is more comfortable, more convenient, more individual and safer. Personal offers tailored to specific target groups take the specific expectations and demands of customers into account.
- Taking the train has become a genuine alternative to travelling by car, especially because traffic congestion often slows down traffic on the road.
- Motoring has become expensive due to the high cost of fuel and road toll, making the cost of rail travel quite competitive, at least per person.
- Many people are now far more pragmatic in the way they see mobility than they used to be. The strong orientation towards the automobile has somewhat declined, more customers now showing a preference for rail transport.
- Whenever the additional benefits of travelling are relevant to the final decision taken by the traveller, going by train offers advantages: In a train the traveller can work, relax, etc, which he cannot do in the same way in his car. And as long as other important requirements (reliability, comfort, price, etc) are fulfilled, this advantage is often crucial to business travellers and other people with a clear focus on their timetable in choosing their means of transport.


More than in the past, railway companies have recognised the significance of these advantages over the automobile and short flights, placing greater emphasis on these points in their marketing activities.

### 5.2.7 Passenger Short-Haul Transport Becoming More Attractive

There have also been many changes in public short-haul passenger transport: In some large cities private investors participate in the operation of new, economically promising underground systems and there has been a trend to convert tram lines into inner city railways separated from road traffic and running on their own tracks. This makes such trains faster and also more appealing thanks to their more frequent operation. At the same time this policy has – intentionally – to a large extent replaced the motorised individual vehicle in the inner city due to competition between public short-haul passenger transport and individual motorised transport.

In the construction of new roads or city trains, and in the modernisation of existing facilities, the focus is now far more on profitability, with only economically viable routes being built. However, public short-haul passenger transport often fails to offer the requisite standard of profitability above all in the suburbs and surrounding areas of town, with an increasing number of bus and railway lines being closed down. Many people living in the outskirts of town therefore have to rely on their car, and in residential areas without good connections call-a-taxi and call-a-bus services have proved successful.

Together with the increasing focus on the profitability of short-haul passenger transport, public subsidies have decreased significantly. Individual groups within society are therefore at a risk of no



Benefits of the railways receiving greater emphasis

Private investors financing only profitable short-haul passenger services

The less privileged receive "mobility money" to ensure a minimum level of mobility



longer being able to afford rising fares in order to enjoy a minimum level of mobility. These groups have to be funded directly, social support no longer being provided by funding transport companies, but rather – as has already been the case for years – being paid as “mobility money” to target groups in need of such financial support. This enables the recipients of such funds to choose freely from the mobility options available, without being required to take a specific means of transport.

In all, public short-haul passenger transport has experienced an upswing in many densely populated areas. The number of passengers has been increasing slowly but surely for years, growing demand and the focus on profitable routes ensuring that even at night there are virtually always people at underground and suburban train stations. The level of safety and security, therefore, is much better than before, especially as surveillance cameras and emergency call systems have been installed wherever necessary. Security forces are required only at neuralgic points.

Public short-haul passenger transport has become much safer

Nearly all large cities now have generous pedestrian areas. Apart from underground and suburban stations, park-and-ride stations have been set up in the outskirts of town, at places easy to reach and with adequate parking space. This reduces the volume of traffic in the inner city, but the longer distances involved further increase the overall mileage people have to cover by car.

In densely populated areas the bicycle has become a popular means of transport for short distances and forms an important element in intermodal transport. Now there are secure bicycle parks and even bicycle rental stations at terminal points and important stops on the public short-haul passenger transport system.

Over the years various kinds of small and very small vehicles, bicycles and individual means of transport have been developed for transportation in town, for example for messenger, supply or sightseeing services.

The bicycle has become a popular means of transport in town

The range of taxi services has also changed, deregulation serving to replace fixed rates and soften the formerly rather rigid operating schemes. There are now taxis in various price and quality categories marked as such from outside, and in some cities taxis are integrated in the public short-haul transport fare system.

Taxis integrated in public short-haul transport in many cities

With growing demand for mobility at all times (24 hours a day, 7 days a week), taxi and rental car centres manned round the clock play an increasingly important role. They have indeed developed in many cases into mobility service centres with a wide range of functions: Apart from advising the customer on choosing the best means of transport, features such as messenger services, supply and delivery services (eg for products purchased on the web) and transport accounting services (eg for messengers and the transportation of patients) are now standard offers.

Taxi centres changing into mobility service centres

A trend obvious among some groups of the population for years is to move back into town from the suburbs. Particularly young people prefer to live in town after moving away from their parents.

Many senior citizens more than 60 years of age now living alone have also moved back into town, where they are able to enjoy shorter distances, a wide range of recreational and entertainment options, more services and options for personal encounters. One of the reasons for this trend is the decrease in motorised traffic in town, making life in the inner city more pleasant once again. Public short-haul passenger transport is quite sufficient for many city residents, giving them the mobility they need without owning their own car. And on special occasions (in particular leisure-time activities, short holiday trips) they are able to use a rental car or car sharing options.

Short-haul passenger transport with new options for people moving back into town



This trend of moving into town is however restricted by the lack of housing available: Only a few people who formerly lived in large flats or houses outside of town are now willing to move to small apartments in the inner city.

### 5.2.8 The Aircraft – Mainly for Long Distances

European air transport completely deregulated

Initiatives taken by the European Union and international agreements have completely deregulated the air transport market (“Open Skies”), the formerly state-owned national airlines now being held largely by private investors. Access to the large markets in America, Europe and Asia is no longer restricted, all airlines being able to operate at random between the various airports – provided a sufficient number of slots is available. This process of development was almost completed by 2010, leading to growing concentration in the air transport market with the major airlines purchasing smaller carriers in order to gain access to new regions.

Slow harmonisation of European air traffic control acting as a bottleneck

Like in the “Reaction” scenario, on the other hand, harmonisation of European air traffic control in technical and organisational terms is progressing only slowly. So whilst the situation has improved since the turn of the century, air traffic control remains a bottleneck in the efficient management and handling of air traffic in Europe.

Major airports operating economically; small airports receiving subsidies

Airports and their operations have not gone quite as far as the airlines in opening up to a free market economy. In this case state governments still exert a strong influence on the development of airports due to their great economic significance in the various regions, mainly small airports with a potential for further development still receiving subsidies. Major airports, on the other hand, operate economically, particularly in the case of the Frankfurt/Main Airport, Germany’s largest airport quoted at the stock exchange as Fraport AG since 2001.

Air transport is still more prestigious than travelling by car or by train. A further advantage of air transport is its higher speed, albeit only on longer distances. On short flights the time required to travel to the airport, take care of the usual check-in formalities, and then travel from the incoming airport to one’s final destination often eliminates this advantage and time-saving altogether. Indeed, competition between railbound and air transport has increased in this respect in the last 10–15 years, the railways usually offering an advantage on distances of less than three hours, with the number of flight connections on such routes being – significantly – reduced. The free slots thus becoming available are used primarily for international, economically profitable connections. A further point is that in the meantime the introduction of new technologies and organisational concepts has served to speed up many handling processes and facilitate security problems.

Major airports implementing their expansion plans at a slow pace

The situation at airports was initially the same as in the “Reaction” scenario: The general debate on noise did not start to die down until after the year 2010, when new developments at airports promised a reduction of noise. Now, facing great demand in air transport, the airports have been able to develop and modernise their facilities as planned, following relatively short licensing procedures. The large Berlin-Brandenburg Airport was only opened with a delay, and both the Munich and Frankfurt/Main Airports have been able to conclude their process of expansion, the extra capacities thus becoming available being used mainly for long-distance flights to foreign countries.

Low-budget airlines important providers of holiday flights

Like in the “Reaction” scenario, free access to the market and the increasing number of airline passengers in Germany has attracted low-budget operators into the market. As a result, airfares have remained at a relatively low level due to keen competition.

### 5.2.9 Consumers Flexibly Combining All Means of Transport

Ever since the '90s of the former century, transport providers have been attempting to network their systems more efficiently. In the case of airlines, railways and public short-haul passenger transport, this primarily meant the establishment and introduction of more precise timetables within the network in order to shorten waiting and changeover times. Modern telematic systems have also been introduced, responding to delays and ensuring that passengers are able to reach a suitable connection within the existing network. For a long time this optimisation was however restricted to each provider's own system, being linked to other transport providers only in a slow and faint-hearted process.

Private transport providers initially not very interested in intermodal systems

An alliance has developed between the railways and various airlines in long-haul transport, passengers using new and attractive ICE express train connections to the major airports instead of short connecting flights in order to reach their long-distance flights. Changing from such a train to a plane and vice versa is just as convenient as changing from one flight to another, since railways and airlines now offer ongoing luggage handling.

Apart from this improvement, however, intermodal networks already in great demand 20 years ago have only been established very slowly. Ultimately people realised that even in the inner city it is unrealistic to expect users to give up their cars, meaning that intermodal systems only have a chance of success if they include motorised individual transport. A particular obstacle in introducing intermodal concepts was the lack of clarity about the interfaces involved and the question as to who is responsible in each case.

Even transport users themselves did not appear to be very interested in intermodal networks, many seeming to regard the process of changing from one means of transport to another as a rather annoying nuisance.

In the course of time, however, the state authorities, in particular the Federal Government, the German Länder and the communities showed increasing interest in better and more efficient networking, hoping that this would facilitate the flow and management of transport as a whole and would shift traffic away from the roads. An important requirement to make this possible was to provide customer-friendly and convenient transit points and connections.

Politicians promoting networks in order to improve traffic conditions in densely populated areas

Given this situation, a number of pilot projects was conducted in densely populated areas in the first decade of the century, financed by the German Federal Government, the respective State Governments and regional transport services, such as Mobinet in Munich, WAYflow in the Rhine Main district, and intermobil in the Dresden Region. But although these projects were largely successful, it took a relatively long time until other cities and regions adopted such intermodal network concepts.

Results of pilot projects on intermodal services implemented only slowly

With the automobile being moved out of the inner city increasingly above all after 2010, it was essential to provide a better link of the individual motorised vehicle, public short-haul passenger transport, and bicycle transport (eg with park-and-ride concepts, possibilities to take along your bicycle on short-haul passenger transport, etc). To be successful, such concepts required connecting points and procedures pleasant for the user, clearly designed, and tailored to the customer's specific requirements. Today this networking problem has been satisfactorily solved in nearly all major cities, the great appeal of transport networks serving to increase the use of public transport facilities: Nowadays consumers use intermodal connections more often than before, but the automobile still dominates the typical scene in most inner cities.

Low-traffic inner cities only possible in connection with user-friendly offers



Intermodal transport is now well-established even when travelling long distances: Depending on the purpose of a trip and the demands made by the passenger in terms of cost, time and comfort, people choose the most appropriate transport provider for a wide range of options available.

### 5.3 Conclusion: Slight Improvements Making Life Easier

Significant increases in overall transport since the year 2000

Overall mileage has significantly increased in the last 20 years, particularly goods transport on the road booming dramatically as a result of the enlargement of the European Union to the East. The more positive economic development and the change in corporate structures, in turn, have led to an increase in business travel. The main reason why road traffic has not collapsed under this pressure is the massive expansion and modernisation of the transport infrastructure.

Situation on the roads not significantly better

Expansion of the road network has been financed by road toll introduced on a broad scale. Technologies for the management and control of traffic have also become far more significant, both of these factors acting together since 2010 to provide an increasingly positive impact on road traffic. Even so, there is still traffic congestion today, particularly in rush hours and at neuralgic points. In all, therefore, the situation on the roads has not improved significantly since the year 2000.

The change in lifestyle in today's world has also changed the style of mobility – in some cases quite substantially. The larger number of women now at work, the dissolution of the traditional family and household textures and greater flexibility in individual working time concepts have led to increasingly complex travel chains and processes, the individual distances covered being longer than before.

The automobile no longer dominating mobility the way it used to

Although the automobile, due to its inherent benefits, still plays the central role in mobility, it no longer dominates the concept of mobility the way it used to. First, the options offered by other mobility providers have improved considerably; second, the automobile has lost significance in the meantime as a status symbol.

Number of accidents down

The improvement of transport infrastructure as well as technical innovations making life easier for the driver and road traffic safer have helped in recent years to significantly reduce the number of accidents and victims on the road.

Delays and waiting times still typical of air transport

Like the increase in business travel, the increase in holiday travel has led to substantial demand for air transport. The growth of airport capacities has not kept up with this increase in demand, and harmonisation of European air traffic control has progressed only slowly. Delays, long waiting times and overcrowded airports are still common features in air transport, even though the use of new technologies and organisational concepts has served to alleviate many handling and safety/security problems.

Railbound transport in the rise

Following deregulation and modernisation, railbound transport is gaining increasing popularity, with growth rates going up for a number of years. This success is borne out in particular in competition with air transport. Especially on distances of less than three hours, the railways, with new ICE

express lines now in operation, are at an advantage over air transport, many flights therefore being cancelled altogether on such routes. The slots becoming available as a result are used above all for international connections.

Following the successful completion of pilot projects trying out intermodal network concepts in densely populated areas, such concepts have been adopted gradually also by other cities and regions. In the meantime the great appeal of networked transport options has served to shift passenger transport to public services, although the automobile still dominates the scene in our cities.

Intermodal network  
gradually becoming more  
popular

Despite the increase in traffic, overall energy consumption by the transport system as well as noise and exhaust emissions have remained largely the same as in the year 2000. This was only possible with innovations in technology serving to reduce specific emissions and, in particular, with improved infrastructure helping to relax traffic conditions in general.

Environmental burden  
largely unchanged since  
the year 2000



## 6 Comparison of Consequences – Reaction versus Action

The following chapter compares the two scenarios with one another and shows their system-related interaction.

Applying this perspective, we see how the various factors and parameters are closely connected to one another: The supply of mobility responds to the development of demand for mobility, but may in itself change the nature of such demand. Conditions and criteria relevant to mobility are determined according to political considerations, but also in response to the development of supply and demand. Conversely, general conditions and the overall scenario as such influence supply and demand themselves. Ultimately, therefore, the quantitative and qualitative properties of mobility result from the interaction of the various parameters and factors involved.

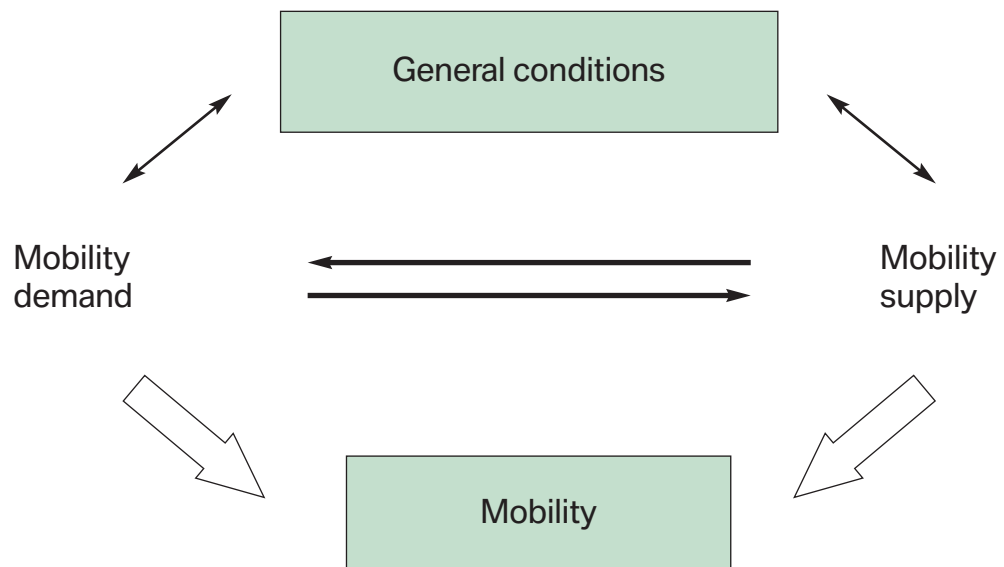




Table 1: Developments influencing the demand for mobility

Scenario "Reaction" Developments influencing demand	Scenario "Action" Developments influencing demand
<ul style="list-style-type: none"><li>● As was to be expected, the population of Germany has decreased in recent years.</li><li>● The number of gainfully employed has also continued to decrease.</li><li>● GDP growth rates have averaged less than 2% in the last 20 years.</li><li>● Private households have increased their spending on mobility in real terms only slightly.</li><li>● Most Germans still prefer a more demonstrative lifestyle.</li><li>● The automobile still dominates the concept and philosophy of mobility.</li><li>● With the European Union expanding to the East, goods transport on the road has increased significantly (+60%).</li></ul>	<ul style="list-style-type: none"><li>● The population of Germany has not decreased as much as expected in recent years due to relatively high immigration.</li><li>● The number of gainfully employed has slightly increased.</li><li>● Average growth of the GDP in the last 20 years has been just above 2%.</li><li>● In recent years private households have significantly increased their spending on mobility in real terms.</li><li>● More and more people in Germany do not live the same demonstrative way as in former years, but have rather become more pragmatic in their decisions and behaviour.</li><li>● The dominating role of the automobile has decreased, with a more flexible, multi-optional concept of mobility taking over.</li><li>● Due to expansion of the EU to the East, goods transport has increased above all on the road (+80–90%).</li></ul>

Table 2: Political decisions developing the general situation and scenario

Scenario "Reaction"	Scenario "Action"
<p>Political decisions changing the general situation</p> <ul style="list-style-type: none"> <li>• A heterogeneous transport and environmental policy still dominates within the EU.</li> <li>• Deregulation of transport markets has not made any significant progress.</li> <li>• Environmental and transport policy play a subordinate role: <ul style="list-style-type: none"> <li>– Up to the year 2020, the polluter pays principle has been applied only marginally in setting off environmental effects.</li> <li>– The infrastructure has been financed mainly by taxes.</li> <li>– Intervention for environmental and socio-political reasons is based largely on the promotion of transport providers (such as public short-haul passenger transport).</li> </ul> </li> <li>• Overall investments on transport infrastructure have remained largely unchanged in recent years in real terms.</li> <li>• State investments on railbound transport have been increased over the years at the expense of road construction.</li> <li>• Fuel prices have almost doubled in real terms.</li> <li>• Road toll is charged only at a few bottlenecks.</li> </ul>	<p>Political decisions changing the general situation</p> <ul style="list-style-type: none"> <li>• Transport and environmental policies have been largely harmonised within the EU.</li> <li>• Access to markets has been largely deregulated for all transport providers within the EU.</li> <li>• Environmental and transport policies have been taken seriously, carefully implemented and consistently followed up: <ul style="list-style-type: none"> <li>– The polluter pays principle is applied on a broad scale to external effects on the environment.</li> <li>– Transport infrastructure is largely financed by a system of tolls, fares, etc.</li> <li>– Subsidies are now paid primarily not to transport providers, but rather to the users of transport (eg by way of "mobility money").</li> </ul> </li> <li>• Due to private investments, the overall level of investments in transport infrastructure in Germany has increased in recent years in real terms.</li> <li>• During the same period, state investments in railbound transport have continued to increase at the expense of road construction.</li> <li>• Fuel prices have almost doubled in real terms.</li> <li>• Toll is charged on all Autobahnen and other major transport routes.</li> </ul>

Table 3: Development of mobility options

“Reaction” Scenario: Development of mobility options	“Action” Scenario: Development of mobility options*
<ul style="list-style-type: none"> <li>● Traffic information is more up-to-date and offers a higher standard of quality.</li> <li>● PTAs are available, but only grow slowly in popularity.</li> <li>● Car makers offer such LuC technologies either as standard or as optional extras.</li> <li>● Particularly haulage companies use the most advanced LuC technologies to optimise their routes and efficiency.</li> <li>● ZEVs and LEVs remain a niche segment (ZEVs = zero emission vehicles; LEVs = low emission vehicles).</li> <li>● The market share of various rental car concepts (incl car sharing) has increased step-by-step.</li> <li>● Both trains and railway stations are fully renewed in a major effort to update the railways.</li> <li>● Connections to the internet, television and PC functions are offered in trains (in 1st class).</li> <li>● The number of high-speed routes and trains has increased.</li> <li>● Apart from the major carriers, low-budget airlines have gained a strong position in air transport.</li> <li>● Small regional airports are used to take the burden off the large airports, since the latter have had to postpone the expansion of their capacities time and again.</li> <li>● Mobile Cards are used to pay for public short-haul passenger transport, connecting various transport providers and covering an increasingly large region.</li> <li>● Call-a-bus and call-a-taxi services have become common around towns and cities.</li> <li>● Taxi and rental car centres have developed into genuine service centres for mobility.</li> <li>● All transport providers have made further progress in reducing CO<sub>2</sub> and noise emissions.</li> <li>● Intermodality as an organisational concept is still being introduced only at a slow pace.</li> </ul>	<ul style="list-style-type: none"> <li>● Sophisticated navigation and traffic information systems are standard in many cars.</li> <li>● Systems making life easier for the driver and making motoring conditions safer are being introduced increasingly as optional extras (eg Adaptive Light Control, active steering wheel, active gas pedal).</li> <li>● ZEVs and LEVs represent a steadily growing market segment no longer to be neglected.</li> <li>● Sophisticated LuC technologies for passenger and goods transport increasing comfort and safety on the road are available in the market.</li> <li>● The options available in railbound traffic have become much more versatile and innovative than before thanks to growing competition. Faster trains, a higher standard of comfort and better equipment make long-distance rail transport more attractive.</li> <li>● In densely populated areas public short-haul passenger transport has responded to growing demand by offering a wider range of different options.</li> <li>● Harmonisation of European air traffic control is making progress, but has not yet been completed.</li> <li>● In air transport there is an ongoing concentration process benefitting the major carriers.</li> <li>● Expansion and modernisation of major airports is taking place, but with a certain delay.</li> <li>● More park-and-ride centres have been established at underground and suburban railway stations around town.</li> <li>● Secure bicycle parks and rental bicycle stations have been opened at major stations in the short-haul passenger transport network.</li> <li>● Intermodality has been implemented and accepted as an important concept for organising transport.</li> </ul> <p>* Responses in addition to or different from the points already made in the “Action” scenario</p>

Table 4: Mobility in Germany in the year 2020

“Reaction” Scenario: Mobility in Germany in the year 2020	“Action” Scenario: Mobility in Germany in the year 2020
<ul style="list-style-type: none"> <li>Compared with the year 2000, the volume of transport has significantly increased by the year 2020 (passenger transport: +10%; goods transport: +60%).</li> <li>Traffic congestion on the road has worsened considerably.</li> <li>Most people in the year 2020 still prefer using their own car instead of taking public transport. In terms of comfort, convenience, functions, emotions and the demonstration of lifestyle, the car remains the No 1 provider in fulfilling mobility wishes.</li> <li>Traffic safety has not improved as hoped.</li> <li>Up to the year 2020 more people have moved out of town into surrounding areas, accepting a much longer trip to work and leisure-time areas/centres.</li> <li>More people take the train in the year 2020 on routes between large cities (less than 3 hours). But this hardly changes the modal split.</li> <li>Following modernisation and deregulation, railbound transport gains significance – but hard economic times experienced by many people slows down the success of the rail system.</li> <li>Overcrowded airports and delays remain the reality in air transport also in the year 2020.</li> <li>Overall energy consumption in transport, noise and air pollution have decreased only marginally by the year 2020. Technical improvements have set off the effects of greater transport volume only to a limited extent.</li> <li>Growth rates are down with both long-distance journeys and international tourism in general.</li> </ul>	<ul style="list-style-type: none"> <li>Transport in the year 2000 has increased significantly over the year 2000 (passenger transport: +20%; goods transport: +90%).</li> <li>Traffic congestion on the road remains largely as before.</li> <li>Thorough expansion and modernisation of infrastructure has largely set off the increasing burden of traffic (primarily on account of goods transport).</li> <li>Apart from their own car, people use public transport also in combination with car sharing more than before. Whilst they still feel a certain emotional attachment to their car, this is not the same as it used to be.</li> <li>Traffic safety has improved significantly.</li> <li>People once again enjoy living in town.</li> <li>The railways play a dominating role in intercity transport (less than 3 hours).</li> <li>Following modernisation and deregulation, rail transport once again gains greater significance. This success is supported by greater competition on the rail and from full roads.</li> <li>Significantly greater demand in air transport makes overcrowded airports and delays the reality in flying, despite the expansion of capacities. Even the inclusion of regional airports in flight operations and the integration of hubs in nearby foreign countries does not overcome this situation.</li> <li>After the adjustment and rectification of important factors, together with deregulation, transport markets are largely organised to market economy principles.</li> <li>Overall energy consumption in transport, noise and air pollution have remained largely unchanged despite the significant increase in the volume of transport. This was only made possible by technical innovations and the improvement of transport conditions through the modernisation of infrastructure.</li> </ul>

Table 5: Changes of parameters relevant to mobility in the “Reaction” and “Action” scenarios

Parameter	“Reaction” Scenario	“Action” Scenario
<b>Demand for transport/mobility ratios</b>		
Transport volume (domestic)		
Passenger transport	~ +10 %	~ +20 %
Goods transport	~ +60 %	~ +90 %
Distances	++	+
No. of trips (person/day)	Unchanged	Unchanged
Route structure	Complex	Very complex
Flow of transport	Heterogeneous	Very heterogeneous
Reasons for transport		
Training	--	-
Job	-	+
Vacation (more than 5 days)	+	++
Other (incl. supplies, leisure time)	+	++
<b>Infrastructure</b>		
Infrastructure capacity		
Road	Moderate expansion of road infrastructure and traffic control	Intensive expansion of road infrastructure and traffic control
Rail system	Expansion of long- and short-haul network	Expansion of long- and short-haul network
Air transport	Modernisation of hubs strongly delayed	Modernisation of hubs delayed
Traffic congestion (roads)	Chaotic	Bearable
Waiting times (air transport)	As long as before	As long as before
Waiting times (rail transport)	Short	Short
<b>Organisation of transport markets</b>		
Transport organisation and control		
Road	Hardly any market economy principles, heterogeneous order and transport policy	Application of market economy principles, standard order policy throughout the EU
Rail system	Increasing intramodal competition within Germany	Increasing intramodal competition throughout Europe
Air transport	Partial opening of the market	Deregulation, open skies
Short-haul passenger transport	Status quo	Largely deregulated, open market
<b>Mobility behaviour</b>		
Significance of the automobile	Affinity to automobile, status quo	De-emotionalisation, multi-optional lifestyle
Choice of transport	Less routine	Less routine
Modal split	Car-centred, maintenance of status quo	Slight change: Densely-pop. areas: car → pub trans < 3 hrs: aircraft → train
Mobility spending	Moderately up	Significantly up
Individual mobility area (every day)	Increasing, large area	Unchanged
<b>Environmental effects</b>		
Orientation to the environment	Indifferent	Strong pressure on politics
CO <sub>2</sub> emissions (in consideration of mileage and specific consumption) in road traffic, railbound transports, air transport	Unchanged	Unchanged despite significant increase in transport
CO <sub>2</sub> emissions (due to traffic congestion) in road traffic, rail transport, air transport	Increasing	Unchanged despite much more transport
Noise emissions in road traffic, rail transport, air transport	Unchanged	Slightly down despite much greater transport
Consequences of accidents in road traffic, rail transport, air transport	Down	Significantly down

## 7 Breaking the Trend: When the Unexpected Happens ...

What would happen if the developments predicted in the “Reaction” and “Action” scenarios were suddenly interrupted by unexpected incidents? The consideration and analysis of such trend-breaking events also referred to as “wild cards”, as well as the perusal of their possible repercussions, is an integral element of the seven-stage scenario method underlying the project. Versus the other stages considered in this case, the examination of trend-breaking events involves two fundamental features of a completely different nature: First, the analysis of trend-breaking events is optional, and not essential. In other words, such an analysis may be performed and considered, but is not mandatory. Second, the consideration of such events inevitably encounters three insurmountable elements:

- The limit to the future – since, even with the greatest effort, nobody can tell the future precisely, meaning that all kinds of imponderables always remain
- The limit to reflection – since considerations and concepts focusing on possible but improbable incidents very easily run the risk of expanding into hypothetical thoughts and reflections
- The limit to capacity – since it is virtually impossible to consider all conceivable trend-breaking incidents and their possible consequences in a scenario project

Trend-breaking events always involve the factor of speculation

Looking at these three limits, we realise that any examination of trend-breaking events and their effects inevitably involves the factor of speculation. Of necessity, such forecasts come more in the area of spectacular assumptions and lie less in the area of secure facts. To limit this speculative factor and to come as close as possible to reality, our first step is to examine the overall area and issue involved from very different, to a certain extent even contradictory perspectives. A further important point is not to prematurely and arbitrarily drop or neglect any conceivable trend-breaking events possibly relevant to mobility.

In the course of the project and its various phases, the experts discussed 50–60 trend-breaking events and their possible repercussions, considering their pros and cons to a varying degree and in varying intensity. The result of these debates was a broad scope of different – one might also say, colourful – eventualities ranging from the development of small flying machines (“the flying smart”) through the possibility of meteorites hitting the earth and chemical disasters or disasters involving nuclear power stations all the way to a revolution in Saudi Arabia and civil wars in Eastern Europe.

Particularly very “adventurous” trend-breaking events such as the development of small flying machines or catastrophic meteorite impacts make two fundamental aspects of trend-breaking events very clear indeed: their highly unlikely occurrence, on the one hand, and their great potential impact (meaning that they will influence a whole range of different factors), on the other hand. The greater the probability of occurrence and the smaller the possible impact, the less “trend-breaking” such events are.

After thorough examination and discussion of the wide range of possible incidents, the experts initially formed two groups of events: First, events regarded as extremely unlikely in the next 20 years (such as mass use of a “flying smart”); second, events leading to a natural disaster (meteorites hitting the Earth, unknown infectious diseases, etc). Taking the remaining field of possible trend-breaking events, we finally chose the following four classes of events to be considered in greater detail and analysed for their effects. Events involving the

Restricting the study to four types of trend-breaking events highly relevant to mobility



- development of the gross domestic product (GDP),
- development of the price of oil,
- development of technology, and
- development of the world market.

The reason for choosing these four classes of trend-breaking events or wild cards was their substantial relevance to mobility, their impact on many factors (long range), and the possibility provided in this way to carefully analyse such events and their repercussions.

## 7.1 Boom or Depression – Extreme Economic Developments

As a result of trend-breaking events affecting the development of the GDP, the growth of the GDP averaging  $< 2\%$  or  $> 2\%$  would change significantly and for a long period. In principle, two contrasts are conceivable, that is

Strong economic growth  
vs deep depression

- a “long boom” (GDP growth of 4 % or more)
- a “deep depression” (GDP growth of 0 % or less)

Both trend-breaking events, via the GDP descriptor, have a more or less substantial impact on a wide range of other descriptors.

The following points were considered in the context of a “long boom”:

In economic history there have been periods time and again of economic growth above average in both magnitude and duration – for example in Germany in the ‘50s and in the USA in the ‘90s of the last century. The optimistic assumption of a long boom trend is that such an unusual period of growth might repeat itself during the timeframe of the scenario due to thrusts in innovation.

Proceeding from the “long boom” forecast by Peter Schwartz and his team, such a trend-breaking event in the development of the GDP is a period of growth driven primarily by science and technology largely overriding the cycles of the economy for a lengthy period and providing stable growth of the economy (more than 4% pa). Conceivably, innovations in the development, implementation and economisation of new technologies might result in a long boom starting in part in 2003/2004, then extending through an ongoing period of increasing growth of the GDP to the 4%-mark in approximately 2007/2008, and finally remaining on this level over a period of approximately 10 years. The occurrence and course of such a long period of growth would have dramatic global, regional and national effects, leaving a significant mark on a large number of descriptors particularly relevant to mobility.

Long boom driven by  
science and technology

Borne by such a powerful, sustained thrust in innovation, three strong global growth “drivers” (USA, Europe, Japan) might establish themselves, reinforcing each other and pulling along many threshold countries. Apart from the obvious monetary effects, the most important repercussions of such an event would certainly be of socio-psychological nature, even though this would be difficult to measure: On nearly all levels of action and decision, we would see an optimistic, future-oriented and innovation-minded mentality and sentiment, also in Germany.

Future-oriented  
breakthrough sentiment

During a long period of growth, we would experience a significant increase in both material and institutional margins for a fundamental change in mobility policies as well as individual and collective

Revolution yes,  
conservatism no

commitment to make such a change. Within society we would see a kind of mental paradigm shift, maintenance of existing values being “outdated”, and a spirit of breaking through to new frontiers becoming extremely popular and desirable. In the search for innovations opening up new economic opportunities, we might see, following luC as well as biotechnologies and genetic engineering, an increasing influx of alternative drive technologies and forms of energy leading to new key technologies for the future. These would then be substantially promoted on a broad scale, the “long boom” providing particular momentum to the “Action” scenario, with the following effects and repercussions:

- Considerable increase in passenger and goods transport
- Considerable increase in tourism and leisure-time transport
- Considerable increase in funds spent by households on their mobility
- Considerable increase in total capital expenditure on traffic infrastructure
- Far-reaching process of “internalising” the external cost of the environment (ie application of the polluter pays principle)

A long boom would therefore not only promote mobility, but would also have a truly revolutionary impact, particularly in terms of transport technology and implementation of the polluter pays principle.

The second conceivable wild card, that is “deep depression”, would have exactly the opposite effects on the development of the gross domestic product.

Sudden collapse or gradual decay

Instead of generating a spirit of collective breakthrough euphoria, this phenomenon would bring about a depressed mood in sociopsychological terms reminiscent of two periods in German economic history in which the country experienced a particularly severely depressed sentiment and mentality: from 1870–1900 and the period prior to and after the 1929 world economic crisis. A negative incident of this kind may appear in two classical forms: either as a relatively sudden “big bang” or as a “gradual recession” stretching out over several years. It is also conceivable that these two phenomena are superimposed on one another. Conceivably, therefore, a medium “big bang” might lead to a dramatic, long-lasting “gradual recession”. And although both phenomena would ultimately end up in a similar outcome, they differ in the course of their development and their effects on mobility.

A “**big bang**” is a very typical and particularly spectacular trend-breaking event occurring as a sudden, unforeseen phenomenon very quickly breaking through powerful trends – even trends previously regarded as irreversible – with almost catastrophic force. A typical “big bang” would be a sudden and unexpected crash in the money markets, with speculation bubbles not just shrinking gradually in the course of several years, but rather bursting abruptly within a few weeks or even days. Considering the Asian and Russian crises in the late ‘90s and the experience gained with hedge funds, such a severe financial incident might occur at any time. Possible initiators might be the collapse of the derivative markets, terrorist attacks, natural disasters, speculation attacks or (geo-)political crises. The characteristic course of a “big bang” would be an explosion-like, uncontrollable chain reaction with GDP growth dropping to zero or even less over a period of approximately six years.

Growing pessimism, fear of the future and aversion to risk

A depression of this kind would have dramatic global, regional and national repercussions not only in the financial and economic markets. Rather, a general feeling of pessimism, fear of the future and an aversion to risks would spread rapidly, paralysing all activities and decisions on nearly all levels within a very short time. The collapse of financial markets, destruction of capital worth countless billions of euros or dollars, and economic crises would cause increasing rejection of globalisation processes as well as neo-liberal concepts and strategies the world over.

Such an about-face in the general mood and atmosphere would not pass by unnoticed in Germany. On the contrary, we would see a rapid increase in unemployment, loss of capital and financial assets within both private and public households affecting society as a whole due to a huge decrease in the value of stocks and securities. At the same time drastic intervention in the social security network would build up great resistance to reforms querying – or assumed to query – vested interests. This resistance would be all the greater the more economic and socio-psychological depression people experience. We would see growing demands for state intervention and a broad scale of (re-)regulation, accompanied by a feeling of insecurity, fear of the future and aversion to risks. The attitude would be to “save what you can save”, people following the motto of “preserving what they have” instead of “changing what needs to be changed”.

The “Action” scenario would hardly be able to get anywhere in a “big bang”, and the descriptors to be seen in the “Reaction” scenario would develop even more pessimistically:

Pessimistic sentiment  
dominating the scene

- Considerable drop in the number of gainfully employed
- Decrease in passenger and goods transport
- Decrease in tourism and leisure-time transport
- Virtually no application of the polluter pays principle in assuming the cost of environmental protection
- Reduction of overall capital expenditure on transport infrastructure
- Slower pace of development in enlarging the EU to the East
- No introduction of road toll
- Slower increase in household mobility expenditure

Considering the far-reaching social consequences of a “big bang”, the question of mobility would certainly not be the first and foremost issue in political debates and economic struggles. But it is fair to say that this problem would play an important role, at least as a latent phenomenon in the background. The glorification of the automobile would not start to crumble, but presumably would gain stability, and it is not to be expected that people would find their own car less attractive following a “big bang”. On the contrary, more than ever before the car would be seen as the epitome of success in society and personal prosperity, also confirming a person's individual freedom and performance.

A “deep depression” presenting itself as a gradual process of recession would have largely the same effects on mobility, albeit with a very different profile of individual factors and repercussions: Contrary to the “big bang” scenario, speculation bubbles in this trend-breaking event would shrink only gradually, all private and state attempts at achieving stable and positive economic growth being doomed to fail.

Like the “big bang”, a gradual recession may occur at any time during the period of the scenario, for example as a result of concurrent downturns of the economy in the USA, Japan and Europe, as a result of structural reforms unduly delayed, energy-related and/or (geo-)political crises, etc. Pessimistic observers see Germany today at the beginning of such a process.

Contrary to the “big bang” occurring suddenly and as a kind of shock, a gradual recession would be unspectacular and almost unnoticeable at least to begin with. And such a “wild card” would be far more difficult to identify, each new slump appearing to be the final rock bottom after which everything will move up again. In reality, this would involve economic and sociopsychological depression in instalments, with new hopes for a final upswing arising time and again and of course being seen as genuine. With such expectations being dashed one after the other – and finally, once and for all in a lasting process – we would see a growing feeling of apathy and downright

Gradual recession  
characterised by apathy

agony coming to bear increasingly on the social climate and finally shaping and determining this climate for a lengthy period.

In the course of such a chronical deep depression, the flow of capital, money, goods and persons between the USA, Asia and Europe would decrease, trade conflicts and closed-shop tendencies would occur more often and become more dramatic. Like in all of the countries involved, poverty would spread in Germany, the gap between the poor and the rich constantly growing larger. This, in turn, would create a growing potential for conflicts, fundamentalist movements gaining substantial momentum with their seemingly “convincing” solutions to all problems.

The effects of such a scenario on mobility would be largely the same as with a “big bang”, the only difference being that these effects would not be sudden, dramatic and unforeseen, but would rather come to bear step-by-step, with a certain time lag and a latent impact. Whilst in theory there would be a certain margin of action and decision to counteract a gradual recession in general and its consequences on mobility in particular, this margin would probably not be exhausted in practice, simply because it lies in the very nature of a gradual recession to be constantly seen as exactly its opposite, that is as the economy picking up momentum at long last or even as the beginning of that “long boom”. This not only fuels illusions on the actual situation, but also leads time and again to faint-hearted or even inappropriate economic and transport policies not relaxing and shortening the “deep depression”, but rather tending to reinforce and prolong such a situation.

The longer such a state of depression or even stagnation lasts and the more hopeless and bleak the situation is perceived to be, the more reform forces – like in the “action” scenario – will be supported. A commitment to conduct thorough reforms and make sweeping changes would therefore arise in such a situation, albeit very late and only reluctantly.

## 7.2 When the Supply of Oil Becomes Short and Expensive

Dramatic, lasting increase  
in the price of oil as a  
trend-breaking event

Trend-breaking events involving the development of oil prices would be of fundamental significance in both scenarios, affecting mobility even more directly than economic growth: Such events in the development of oil prices have a direct and immediate impact on mobility provided by the automobile using a conventional combustion engine. Naturally, not all increases in the price of oil at a specific point in time or location represent a trend-breaking event – rather, such an incident is regarded as “trend-breaking” only if within a short period the price of oil were to double from approximately US\$ 27/barrel (August 2000) to more than US\$ 60/barrel, and if this price hike persisted over many months. Among others, the following variants are conceivable in this context:

- **War in oil-producing regions** (rapid, limited increase in the price of oil to  $\geq$  US\$ 60/barrel)
- **Oil shortage** (slow, lasting increase in the price of oil to  $\geq$  US\$ 60/barrel).

Both of these trend-breaking events would have a direct impact on the price of fuel. And although they would both lead to a dramatic increase in the price of oil and, consequently, fuel prices, they differ both in terms of their causes and in the course of events as well as their medium- and long-term effects on mobility.

A **war in oil-producing regions** might quickly lead to a slowdown or, at least for a time, to a complete interruption of the supply of oil, resulting in a rapid (3–6 months), but relatively short-lived (1–2 years) increase in the price of oil of up to US\$ 60/barrel. Considering the events taking place

in the Middle East in the year 2002, such a development must be expected at any time, hostilities of this kind being caused by civilian war and unrest in Saudi Arabia, by local wars in the Middle East, a lasting war between Israel and Palestine, or new, dramatic terrorist attacks. The oil price effects resulting from such a war in oil-producing regions would be a severe, but short-lived shock for the economy.

In terms of its probable repercussions, a war in oil-producing regions would be very similar to the two oil price shocks we experienced in the early '70s of the last century, especially in the magnitude of such an event. The global, regional and national consequences of such a "wild card" would also be similar to the scenario already observed in the two oil crises. The results would be a cut-back of state and private reserves, direct and/or indirect rationing, an increase in panic buying, black-markets, and "fuel crime", people stealing fuel and embezzling others in fuel deals. Inflation would go up and economic growth in real terms would decrease.

In society we would see a growing confrontation in energy policies between the advocates of and the opponents to a change in the political direction. The former would see the effects of a war in the oil-producing countries not just as a signal for consistent reforms, but also as a sign of a change in energy policy and technology now manifesting itself once and for all. A war in oil-producing regions would thus have the following impact on descriptors particularly relevant to mobility:

- GDP and capital expenditure decreasing in the mean term.
- Mobility decreasing in the short term, with greater expenditure on mobility requirements.
- Lasting upheaval of mobility and consumption patterns not coming to an end automatically.
- Passenger and goods transport decreasing in the medium term.
- Strong demands for sociopolitical reforms supporting and supplementing the transport policy.
- Implementation of the polluter pays principle for the cost of protecting the environment being reversed in part, initially for a limited period.

Whilst a war in oil-producing regions would have a dramatic and, indeed, spectacular impact on mobility, this effect would be relatively short-lived in its nature.

The two trend-breaking events in the development of oil prices already described would have two substantial differences relevant to mobility. The first involves the course of such an event: Whilst a trend-breaking war in oil-producing regions would be a sudden, unforeseen and shock-like event, an oil shortage would take effect step-by-step, largely without any spectacular incidents. The second difference involves the long-term effects: Whilst war-induced repercussions would hardly lead to any fundamental, scenario-changing reorientation, the oil shortage wild card would be irreversible and call for fundamental changes in mobility policy.

Initiator for fundamental change in technical and transport policy?

This is because such a trend-breaking event in the development of oil prices would result from the gap between the production of crude oil going down in absolute terms ("Hubbert Peak"), on the one hand, and an increase in oil consumption, on the other, leading to an irreversible process of increasing prices. Some experts expect the Hubbert Peak, with a significantly widening gap between production and demand, to commence in the year 2008. Both the global as well as the regional and national consequences of such a trend-breaking event would be dramatic and irreversible. Out of necessity alone and with irrevocable repercussions, the world would need a shift in paradigms in both energy policy and energy technology. Countries and companies already prepared for such a change or, indeed, already in the process of initiating this change would then become the new "stars" in the process of growth, the new driving forces in the world economy.

Shift in paradigms in energy policy and technology

On the one hand, oil shortage processes might well lead to a succession of fuel price hikes and increasingly rigid quotas and rationing systems. On the other hand, old technologies such as the liquefaction of coal and blending processes, etc, as well as new technologies such as fuel cells, photovoltaics, etc would gain increasing significance in substituting oil either in part or in whole.

Considering the slow and hard-to-interpret course of the oil shortage phenomenon, the “Reaction” scenario would initially be the crucial factor determining the steps taken. To the extent to which the irreversible nature of this trend-breaking event makes itself felt and becomes increasingly obvious, however, people would start to change their attitude. The result would be a growing trend towards the “Action” scenario, the oil shortage process leading step-by-step to the following change in descriptors relevant to mobility:

Mobility becomes a rare luxury

- The classic philosophy of (automobile) mobility is increasingly undermined and gradually crumbles altogether.
- In the mean term mobility becomes an expensive and rare luxury.
- Passenger and goods transport decrease in the medium term.
- We see increasing pressure for sociopolitical action supporting transport policies, the population demanding a minimum standard of mobility guaranteed by the government.
- Private and public investments in mobility are focused on alternative drive systems and forms of energy.

Like with the gradual recession, one of the main problems in the oil shortage process is that this trend break would initially not be recognisable as such and would not become really obvious to the public. Rather, it would be regarded for quite some time as a temporary phenomenon “bound to disappear” sooner or later. Presumably, therefore, the required shift in the paradigms of energy policy and technology would take a long time coming and would initially be very slow and sluggish. A further point is that it would be possible to dampen and delay the oil shortage process in both technical (for example through the use of blending technologies) and economic (for example by tax cuts or subsidies on mobility) terms.

### 7.3 Surprising Innovations in the Automobile and in Transport

Trend-breaking events in the development of technology are quantum leaps over the transport technology we have today. In simple terms, there are two kinds of quantum leaps in technology:

- **New energy technology for motorised vehicles** (alternative drive technology for the automobile)
- **New transport infrastructure** (alternative technologies for transport systems)

The category of new energy technology for motorised vehicles comprises all those innovations in technology that offer alternatives to classical motor vehicle drive systems, whilst the category of new transport infrastructure focuses on alternatives to the transport networks still dominating the market today. Both of these categories affect both goods and passenger transport in a very different manner.

Possible trend-breaking events involving new energy technology for motorised vehicles would lead to achievements in technology replacing the traditional combustion engine and drive system, but not changing the road network and all the mobility problems involved in this area. Such a break in trends would nevertheless be of significance in two respects: First, in terms of ecological effects; second, in terms of greater independence of the price of oil ensured in this way. Without doubt,



worldwide use and propagation of new technologies for driving the motor vehicle would have dramatic global, regional and national repercussions on mobility.

New energy technology for motorised vehicles, particularly a quantum leap in the efficiency of battery and fuel cell technology, would allow the general introduction on a broad scale of low-cost alternative vehicle concepts. Prototype versions of such energy technologies might well be developed in the next five years, breakthroughs in science and technology, investment offensives or economy-of-scale effects serving as the initiators of such quantum leaps in technology. Introduction of technical solutions of this kind in a step-by-step process might well become a self-fulfilling prophecy irreversible in nature after, say, 10 years.

Alternative drive systems ...

Worldwide, we would see a change in automotive technology from the combustion of fossil fuel in the 19th to the introduction of alternative drive systems in the 21st centuries. These new technologies could then become the nucleus of a growth-promoting technology trend, fuelling a “long boom” in the process. In Germany we would also experience an awakening of society and keen competition for the leading position in these new energy technologies borne out by the development of the following descriptors:

... creating a new awakening of society ...

- Significant growth of the gross domestic product
- Significant increase in the number of gainfully employed
- Increase of overall capital expenditure on the transport infrastructure
- Significant increase in passenger and goods transport
- Almost nationwide implementation of intermodal networks
- More consistent application of the polluter pays principle
- Significant increase in mobility spending by households
- Introduction and application of a multi-optional philosophy of mobility

Although these quantum leaps in technology would be limited to the automobile and would fail to solve many infrastructural problems particularly regarding the road network, they would represent a shift in paradigms in technological terms and initiate a new breakthrough, particularly in ecological terms.

... and initiating a shift in technology paradigms

The technologies we would observe in the new transport infrastructure, in turn, would focus not on the automobile but on mobility as a whole. Whilst this would also involve new drive concepts, the consequences of this trend-breaking event would not so much be the revolutionisation of automotive technology, but rather a new world of transport networks. The new transport infrastructure involves interaction of technical and economic trends and developments in transport, alternative technologies and new infrastructures being introduced for goods and passenger transport. One of the perhaps most important potentials of these technologies is that they are able to spread out the infrastructure of passenger and goods transport on long and short distances. With this providing the option to relieve road networks of goods transport systematically in a step-by-step process, transport technologies of this kind (such as Tubexpress or CargoCab) would have far-reaching repercussions also on passenger transport. With the first reference projects starting operation in the year 2007, the fact remains that the expensive establishment and development of such systems would require a very powerful driving force and would take approximately 10 years before passenger transport is really relieved of a noticeable burden.

Revolutionisation of transport networks

Even the pilot introduction and gradual use of such technologies would however have a significant strategic influence on mobility: To the extent to which such reference projects develop a global response, we would see keen competition developing for such projects and market leadership in this

growth industry. New transport technologies and their infrastructure might well create innovations in three areas: as a mobility offensive disentangling goods and passenger transport, as a powerful job machine, and as a lucrative export opportunity. Following the introduction of the railways and the road network, such a new transport infrastructure might well become one of the most significant infrastructural modernisation offensives in the last 200 years.

The “Action” scenario would be crucial to the steps taken in such a process. Particularly in solving all mobility problems resulting directly or indirectly from the increase in goods transport, the consequences of such a trend-breaking development would significantly exceed all forecasts, with the following effects, among others, on the descriptors:

- Considerable increase of the gross domestic product
- Considerable increase in the number of gainfully employed
- Increase in overall capital expenditure on transport infrastructure
- Considerable increase in passenger and goods transport
- Support of intermodal transport provider networks
- Expansion of road capacities
- Considerable increase in the mobility spending of households
- Fast pace in expanding the EU to the East

Like the quantum leaps in automotive technology, such new transport infrastructure technologies would also offer a wide range of innovation potentials initiating or at least promoting a “long boom”- particularly if, in the development of such potentials, we saw synergy effects with vehicle-related solutions for new types of energy.

#### 7.4 The “Chinese Economic Miracle” or “Continental Fortresses”

Upheavals changing the process of economic globalisation and the structure of the world economy dramatically and with a lasting effect are also trend-breaking events in the development of the world market. Two contradictory trend-breaking processes are conceivable in this context: a break in trends promoting integration and growth, on the one hand, and a break in trends blocking integration and growth, on the other. To present specific examples, these two upheavals might manifest themselves as follows:

- **“Chinese economic miracle”** (rapid development of China into a stable and well-functioning market economy)
- **“Continental fortresses”** (clear segmentation of world markets through the formation of closed-shop economic areas)

Should China succeed in transforming into a stable and well-functioning market economy, this would have a significant impact on the world market and the national economies due to the demographic weight, the geostrategic position, and the scientific, technical and economic potential of the country. We would see these effects in terms of both supply and demand.

The “Chinese economic miracle” would create a large and powerful market quickly integrating into the world economy and adding significant momentum to globalisation and worldwide economic growth in the process. Whether and to what extent China succeeds in making such a change will become clear in the next 10 years. Be it as it may, the “Chinese economic miracle” would be an evolutionary process full of conflicts, probably taking place as a permanent, ongoing policy of “revolutionary” reform. Such a development would not only promote the overall progress of the

global economy, but might also be the starting point or catalyst for a “long boom”, also because China offers good conditions for innovations in technology.

Germany might benefit from such prosperous economic development in China in several respects. As one of the large export countries with high-performance global players in the mobility industry, Germany would be ideally suited to play a leading role in this process. Indeed, this follows from internal and national interests alone: Such a trend-breaking event would make China not only a powerful pillar and driving force for the global economy, but also a trendsetter and role model for many threshold countries. At the same time China might well become a perfect place for pilot projects trying out new, trend-setting technologies.

A “Chinese economic miracle” would furthermore tighten relationships with China on all levels, particularly in terms of economic, tourist-related, and scientific/technical cooperation. Step-by-step, therefore, China might develop into one of the most significant export markets and sources of innovation.

In this situation the “Action” scenario would pick up momentum as of about 2010 and become increasingly powerful, particularly in creating a spirit of awakening. The individual descriptors would develop as follows:

- Growing internationalisation of tourism
- Considerable growth of the gross domestic product
- A broad range of options offered by air transport providers and an increase in air transport
- A significant increase in mobility spending by households
- A considerable increase in the number of gainfully employed
- Higher overall capital expenditure on transport infrastructure
- A significant increase in passenger and good transport

Proceeding from this basis, Germany might experience two growth spirals resulting from such transformation in China: The former would involve all factors serving to boost the GDP, such as large assignments from China, consistently growing sales markets, etc. The second growth spiral would be the involvement of Germany and German companies in major alternative technology projects in China, with know-how gained in the process being used and implemented domestically.

Mobility-boosting  
growth spirals

Contrary to the “Chinese economic miracle”, “continental fortresses” would obstruct integration and growth of world markets. In particular, we would see growing barriers closing off the economic areas in North America, Europe and South-East Asia. Such a development would lead to greater trade barriers and an increase in latent trade conflicts threatening permanently to escalate into “cold” or “hot” trade wars. The formation of “continental fortresses” might start at any time during the scenarios presented and would initially be difficult to detect, with such a process not taking place abruptly, but rather, at least to begin with, at specific points, in a slow and seemingly easily reversible process. Only in the course of time would it then escalate, with a growing number of points of no return. An adverse event of this kind might result from various circumstances such as a collapse of growth and various economic crises coinciding with one another, geostrategic conflicts of hegemonial interests, as well as fights for resources and a “piece of the cake”.

Deglobalisation and  
growing barriers...

To the extent to which “continental fortresses” are established and build up growing barriers, we would gradually see a far-reaching, dramatic process of reorientation among the population: With economic, political, cultural, and media-related globalisation successively losing significance and its particular appeal, such “fortresses” would give their “residents” a new world of ideals and preferences.

... from the global village  
to the continental fortress

Such shrinkage of individual and collective horizons in life would not remain without consequences, the ideal of the “globetrotter” and “jetset cosmopolitan” losing its value. In the “European fortress”, for example, we might see strong pro-Europe and regionalisation trends which, depending on the individual's perspective of the world, would either be demonised as narrow-minded continental provincialism or euphorically welcomed as a new renaissance. Such a change in sentiment within society from a “global village” to a “continental fortress” would also have direct effects on the development of mobility in and between the “continental fortresses”.

In such a situation the exchange of capital, goods and persons would decrease, a “fortress mentality” would become increasingly popular, and internationalisation would be increasingly restricted to areas within the “fortress regions”. The “European fortress” would be expanded and secured, but no longer enlarged. And over and above a greater European and regional awareness, we would also see the emergence of continental patriotism.

Such a break in trends in the development of world markets would affect both scenarios, without giving clear preference to one or the other. Rather, all aspects of “Europeanisation” would be fuelled and reinforced more significantly than originally anticipated:

- The European policy of consistently implementing one standard, uniform concept of transport organisation and control
- The pace, but not the scope, of EU enlargement to the East
- Efficient coordination of transport policy
- A significant increase in overall capital expenditure on transport infrastructure
- Changes in corporate structures, service relationships and value-creation processes with a greater focus on Europe

In such a situation mobility would develop not so much on a national, but rather on an inner-European and regional level.

## 7.5 A Change in Trends Rarely Comes by Itself

Trend-breaking events  
may interact with one  
another

It is not only conceivable but even quite probable that the trend-breaking events described as examples in the foregoing do not take place by themselves as isolated phenomena. Rather, there may well be interaction and interplay of such incidents, some of which have already been considered briefly in the foregoing. In somewhat simplified and schematic terms, we can distinguish in principle between two types of interaction, that is:

- **innovation processes** (interaction promoting mobility)
- **regression processes** (interaction obstructing mobility).

This distinction must be made not only with individual trend-breaking events, but also with a view to their possible repercussions against and amongst one another: Certain events may interact to generate either a range of mobility-promoting or a context of mobility-obstructing effects and repercussions.

Innovation thrusts often  
act as the initiator for  
other trend breaks

Looking at **innovation processes**, we must distinguish between two types of interaction – simple **thrusts in innovation** and more or less complex **innovation spirals**. In the former case specific events act as initiators or triggers for other trend breaks, generating a lasting mobility-promoting effect, with the following three phenomena, for example, being conceivable in this context:

- Oil shortage → new energy technology in the motor vehicle: The growing gap between oil supply and demand may stimulate and speed up the introduction of new technologies in the car both in economic and technical terms.
- Chinese economic miracle → long boom: The “Chinese economic miracle” might act in economic and technological terms as the driving force for a global “long boom”.
- Gradual recession → new transport infrastructure: After some time a gradual recession might initiate an “anti-crash” programme manifesting itself in a “new transport infrastructure”.

These three examples show that it would be false and misleading to distinguish simply between “positive” and “negative” or “good” and “bad” trend-breaking events. Neither a gradual recession nor an oil shortage as such would induce individual and collective optimism or automatically serve to promote mobility. But it is quite possible that such “pressure events” may coincide and join forces with “opportunity events”, creating mobility-promoting innovations in the process. Such a connection of problem-induced pressure and potential solutions is able to open up new paths in development allowing a different form of mobility at a different – ie, higher – level.

Whilst this interaction with thrusts in innovation is relatively simple and straightforward in its structure, the link is not only more complex, but also more fragile in nature in the event of innovation spirals. We see this immediately when taking a slightly closer look at the two following conceivable connections between trend-breaking events:

Innovation spirals often complex and fragile in structure

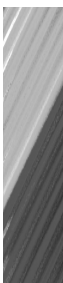
- If China were to initiate a mobility strategy based on new drive technologies, this might well lead to a “long boom” retroactively promoting the “Chinese economic miracle”. Such an upward spiral could then, in turn, generate new transport infrastructure effects on a global basis.
- Large countries and/or economic regions might try to counteract the risk of an oil shortage by launching a strategic technology offensive with new energy technology in the motor vehicle and mobility-oriented new transport infrastructure developments alternately promoting one another. Conceivably, this interacting process might even become the trigger for a global “long boom”.

These two innovation spirals alone serve to illustrate three fundamental problems resulting from the complex interaction of trend-breaking events: First, one could well imagine a large number of conceivable spirals with broadly varying interplay of trend-breaking events in many different ways. Indeed, there are virtually no limits to one's imagination and speculation in conceiving such hypothetical innovation spirals. Second, these two examples clearly reveal the fragility of possible interactions linking trend-breaking events with one another. Third, the two models presented here as examples clearly show that forecasting and discussing such hypothetical spirals is always a relatively theoretical, artificial process.

This is also the case with the second type of interacting trend-breaking events, **regression processes** obstructing mobility. Here, too, we can initially distinguish between two types of interaction, **regression thrusts** and **regression spirals**, the former possibly developing in the following process:

Regression thrusts involve short-lived interaction

- Big bang → continental fortresses: A big bang may lead to the formation of continental fortresses building up barriers around each other.
- Oil shortage → gradual recession: Wherever oil shortage processes hit a national economy unprepared we may subsequently see a process of gradual recession.
- War in oil-producing regions → big bang: A war in oil-producing regions may lead to a big bang without the obstruction of oil supply.



Regression spirals are complicated, time-related interaction processes

In these three cases the problems and pressure exerted by the trend-breaking events do not serve to develop and promote potential solutions, but rather act the other way round in undermining such solutions. In other words, we do not have a combination of pressure and opportunities, but rather an aggregation of trend-breaking pressures ultimately becoming so severe that they release and strengthen the adverse forces obstructing mobility.

Whilst this mechanism of effects is relatively straightforward and clear in its structure in the case of a regression thrust, things become more complicated and complex with a regression spiral, as we see from the two following examples:

- Whenever a fear of oil shortage interacts with strategies involving wars in oil-producing regions and big bang effects, this may create a spiral of agony and/or destruction suffocating mobility potentials from the outset.
- Wherever oil shortage problems interact with a war in oil-producing regions this may lead to economic wars with “continental fortresses” driving themselves mutually into a process of gradual recession.

These two conceivable regression spirals show how trend-breaking events may interact with mobility-obstructing factors in many intricate ways.

## 7.6 How Does a Change in Trends Affect the Scenarios?

In all, nine trend-breaking events have been presented and analysed in this study. Their effects on the “Reaction” and “Action” scenarios have already been covered in the presentation of the events as such, showing that the standard of mobility might improve quite often, in at least five of the nine cases. The interaction of trend-breaking events presented in the foregoing may also lead to innovation processes and, accordingly, to a positive development of mobility and transport. As a result of trend-breaking events we might therefore find constellations fuelled by reinforcement and reaction mechanisms with a more positive impact on mobility than in the two “Reaction” and “Action” scenarios.

Analyses also show that shock-like events such as a “big bang” or a war in oil-producing regions would for a short while query or even overturn many values, whilst in the long term they would only form a slight “dip” in the general trend. Gradual trend-breaking events, on the other hand, such as a long boom or oil shortage, would be more inclined to generate lasting effects.



## 8 What Are the Conclusions ? And How Do We Proceed from Here ?

The most important conclusion to be drawn from this study is not surprising: It is, quite simply, that we can only survive in our economy and society by creating appropriate conditions for mobility and transport. The question, therefore, is how – and not if – we wish to be mobile in future.

The “Reaction” scenario describes a course of development comparable to the process we have seen so far: Dramatic decisions and policies are only taken and applied if absolutely necessary on account of obvious insufficiencies leading to a significant deterioration of mobility. By contrast, the “Action” scenario assumes that far-reaching decisions seeking to optimise the transport system are effectively taken and successively implemented, ensuring at least a bearable situation in transport up to the year 2020.

The findings established in this study make one point absolutely clear: A few important decisions are required at the right time in order to guide developments in one or the other direction in the long term. In part, the issues at stake are difficult and complex, for example the harmonisation of political conditions within the EU. Indeed, this aspect of the results and conclusions obtained should not be underestimated.

Other factors are also of great significance to the development of transport and mobility in Germany, but are difficult to influence through politics or other interests within society. These include demographic developments or the concept of mobility dominating within the population. The only way to influence these aspects in a very indirect and long-term process is to change general conditions and circumstances. This makes it all the more important to modify these factors appropriately and in good time through political or economic action.

Another point basically known for a long time is likewise confirmed by the present study: The only way to provide sustained mobility is by properly harmonising all kinds of disciplines and the various players in the world of transport. Particularly when it comes to decisions relevant to transport policy and mobility, it is inevitable in most cases to look for the best compromise, simply because the many conflicts of interests make a “universal” decision or solution to the satisfaction of everybody involved quite impossible in most cases. And with politics, the economy and science being split up into individual areas with different responsibilities, meeting this challenge is a particularly difficult task.

Consequently, establishing and maintaining a good dialogue, accepting material requirements, mutually acknowledging each other's competence and different perspectives are important prerequisites in successfully shaping the process of mobility in future.

The discussion of trend-breaking events by our project group also led to a thesis often encountered both in literature and in practice: We heard time and again that small corrections would no longer be sufficient to make the necessary changes. So does mankind need a trend break or a wild card encouraging or even forcing people to go beyond the beaten track? This need not necessarily be a catastrophe – rather, a positive trend break such as the “long boom”, new energy technology in the motor vehicle, or the “Chinese economic miracle” may also make all parties involved more willing and prepared to accept changes in their minds and actions.

To fully exhaust the impact and benefits of this study, we now wish to initiate a regular dialogue with decision-makers in politics, in the world of business, science and among various groups within society. The point is not to debate about who is able to forecast the future most precisely and which decisions should therefore be taken here and now. Rather, the focus is on comparing and seeking to harmonise the premises, concepts, ideas and plans of the players involved. Within this dialogue, the objective is to promote a better understanding of other perspectives and bring different opinions and positions together in a process allowing better consideration of the overall context and preventing sub-optimal solutions.

In the years to come the contents and features of the scenarios presented are to be consistently updated by making comparisons with actual developments. Wherever expectations and reality differ, the scenarios will be adjusted accordingly with the focus on the upcoming 20 years in a process able to provide highly interesting findings as to why a factor has developed differently than expected. This makes it possible to gather experience in dealing with the future, consistently considering "What would happen if ..." situations. And with the horizon of 20 years remaining unchanged, the scenarios updated in this way would always provide the latest basis for taking decisions on the future of mobility.

Over and above this process of updating, the present study is also to be expanded and enhanced in its contents, with the focus on two aspects in particular: goods transport and European developments. The former has already been taken into account in the study as an influencing factor. But now we wish to give it greater significance due to its outstanding role crucial to the transport scene in Germany. In early 2003 the Institute for Mobility Research will therefore take a closer look at the subject of goods transport, linking this investigation in a second step with the present scenarios. This project will continue the successful cooperation of the BMW Group, Deutsche Bahn and Deutsche Lufthansa with external experts.

Taking a closer look at the European scene, we intend, proceeding from the results now available, to develop a European scenario of mobility. This will not be a multi-national, overall scenario – that is the simple aggregation of national French, Spanish, Italian, etc scenarios – but rather the identification of European factors and parameters influencing the overall transport situation in Germany. In this way we wish to look ahead, concentrating on the growing integration and interaction of Europe.

A final – important – point to be made in this context is that the Institute for Mobility Research will report regularly on the ongoing development of this scenario project under [www.ifmo.de](http://www.ifmo.de)

## 9 Words of Thanks

This project was conducted in close cooperation between representatives of the BMW Group, Deutsche Bahn (German Railways) and Deutsche Lufthansa under the overall guidance of the Institute for Mobility Research (ifmo).

On behalf of Project Management also involving representatives of Deutsche Bahn and Deutsche Lufthansa, I wish in particular to thank the experts who, in long and challenging workshops conducted in the year 2001, set the foundation for the results presented herein. Without their involvement the demands and expectations we ourselves make of this project could not have been achieved (see Annex A I for a list of the experts' names).

Prof. Dr. Horst Geschka and his wife Martina Schwarz-Geschka, responsible, first, for the methods and structure applied in this project and, second, for the concept, programme and facilitation of the workshops, also deserve my sincere thanks for their great share in the success of the workshops and the project as a whole. They also played an active part in the development and compilation of all interim results.

My particular thanks also go to Dr. Lutz Marz of the Berlin Social Research Centre, who, through his intensive research and the development of trend-breaking events, helped to round off the project in a most interesting and informative manner.

The mentors who accompanied this project likewise left their stamp on the results compiled, many of them not only providing constructive criticism and suggestions seeking to improve the consistency and meaningfulness of the results, but also providing a wide range of input and taking time out for personal discussions with Project Management. I thank them in particular for this commitment.

It would have been impossible to conduct this project in its present form without the co-funding provided by the German Federal Ministry of Education and Research. So on behalf of all parties involved and on my own personal behalf, I wish to thank the Ministry for their support and the smooth and efficient cooperation with representatives both of the Ministry and the project sponsors at the Rhineland TÜV Technical Inspection Authority processing all requirements for the purpose of financial support.

Last but certainly not least, my thanks go to the Members of the Board of Trustees of the Institute for Mobility Research, who, through their approval, paved the way for this project in the first place and, making many suggestions and introducing many ideas throughout the project as a whole, made a significant contribution to the results and findings compiled herein.

Dr. Walter Hell

Director of the Institute for Mobility Research

Berlin, December 2002



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\* Annexes B and C are available in German only from the Institute for Mobility Research under "institut@ifmo.de".

## Annex A: Participants in the Study

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Carl Friedrich Eckhardt	Robert Bosch GmbH, Corporate Planning Previously: Berlin Technical University, Institute of Economic Science, Department for Economic and Infrastructure Policies (Prof. Dr. Hans-Jürgen Ewers)
Dr. Alexander Eisenkopf	Justus-Liebig-University Gießen Chair for Economic Science
Dr. Sassa Franke	Wissenschaftszentrum Berlin für Sozialforschung GmbH Project Group Mobility (Prof. Dr. Meinolf Dierkes)
Christian Fritton	Fraport AG Transport and Terminal Management Strategic Analysis & Air Transport Policy Project Manager, Frankfurt/Main
Prof. Dr. Rainer Geißler	Siegen University/Comprehensive College Technical Division 1, Sociology
Konrad Götz	Institut für sozial-ökologische Forschung GmbH Director of Mobility and Lifestyle Research, Frankfurt/Main
Bernhard Grüber	BMW Group Director of Transport Concepts Berlin, Berlin
Oliver Haferbeck	Deutsche Bahn AG Passenger Transport Division Previously: Director of Marketing and Sales Management/Marketing Strategy, Frankfurt/Main
Prof. Dr. Dietrich Henckel	German Institute of Urban Studies, Berlin Technical University Institute of Urban and Regional Planning
Felix Kasiske	Berlin Technical University Institute for Technology and Management, Logistics Department (Prof. Dr.-Ing. H. Baumgarten)
Prof. Dr. Henning Klodt	Institut für Weltwirtschaft Director of Research Department 1: Growth, Structural Change and International Division of Labour, Kiel
Günter Lange	Deutsche Bahn AG Director of Economic and Transport Studies, Berlin, Frankfurt/Main

Martin Lenz	Deutsche Lufthansa AG Ground Operations Infrastructure Strategy, Frankfurt/Main
Dr. Karl Lichtblau	Institut der Deutschen Wirtschaft Economic and Social Sciences, Main Area of Interest: Structural Policies and Corporate Development, Cologne
Prof. Dr. Irmtraud Munder	Akademie für Technikfolgenabschätzung Technology, Organisation, Division of Labour, Stuttgart
Dr. Norbert Overbeck	German Aerospace Centre (DLR) Information Technology Department of the Federal Ministry of Education and Research, Cologne
Dr. Markus Pennekamp	Deutsche Bahn AG Director of the Transport Policy Department, Berlin
Dr. Marcus Poggenpohl	NETWORK Management Consulting Europe GmbH Director of the Transport and Tourism Unit, Bad Homburg
Fritz Polifka	Deutsche Bahn AG Research and Technology Centre, Munich
Prof. Dr. Werner Rammert	Berlin Technical University Institute for Social Sciences, Department of Technological Sociology
Dr. Stephan Rammner	Wissenschaftszentrum Berlin für Sozialforschung GmbH Mobility Project Group
Dr. Tom Reinhold	Roland Berger & Partner GmbH International Management Consultants, Düsseldorf
Dr. Helmut Richter	Rolls Royce Ltd & Co KG Department Head Concepts, Technologies & Project Engine, Dahlewitz
Dr. Dr. Helmut Schneider	Westfälische Wilhelms University Münster Institute for Marketing (Prof. Dr. Dr. h. c. mult. Heribert Meffert)
Prof. Dr. Volker Schindler	Berlin Technical University Institute for Road and Rail Transport Motor Vehicle Department
Dr. Wolfgang H. Schulz	Institute for Transport Research at Cologne University (Prof. Dr. Herbert Baum)

Dr. Eva Schulze	Berliner Institut für Sozialforschung GmbH Partner, Management, Scientific Project Management
Prof. Dr. Gerhard Schulze	Otto Friedrich University Bamberg Faculty of Social and Economic Science Professorship for Methods of Empirical Social Research
Prof. Dr. Michael Schumann	Soziologisches Forschungsinstitut e. V. at Göttingen University (SOFI) President
Dr. Marcus Steierwald	Academy for Assessment of the Consequences of Technology, Transport and Zoning, Stuttgart
Dr. Barrie Stevens	OECD Deputy Director of the International Future Programme of the OECD, Paris
Henning Tegner	Berlin Technical University Institute for Economic Science Economic and Infrastructure Policy
Prof. Dr. G. Günter Voß	Chemnitz Technical University Philosophical Faculty Industrial and Technical Sociology
Hans-Christian Wagner	BMW Group Marketing Advanced Development and Innovation Projects, Munich
Peter Zoche	Fraunhofer Institute for Systems Technology and Innovation Research (ISI) Director of Information and Communication Systems, Karlsruhe
<b>Geschka &amp; Partner Consultants</b>	
Prof. Dr. Horst Geschka	Geschka & Partner Unternehmensberatung Senior Consultant, Darmstadt
Martina Schwarz-Geschka	Geschka & Partner Unternehmensberatung Partner, Darmstadt
Götz Schaudé	Geschka & Partner Unternehmensberatung Senior Consultant, Darmstadt
<b>Institute for Mobility Research</b>	
Dr. Walter Hell	Institute for Mobility Research Director of the Institute, Berlin
Gundi Dinse	Institute for Mobility Research Scientific Consultant, Berlin

## A.II Members of the Mentors Committee

### Area: Economic / Population / Land Planning and Zoning Development

Prof. Dr. Paul Klemmer                      Rheinisch-Westfälisches Institut für  
Wirtschaftsforschung (RWI)  
President, Essen (until 30 Sept 2002)

Ulrich Pfeiffer                                empirica Wirtschaftsforschung und Beratung GmbH  
Managing Director, Berlin  
Spokesman of the Management Group  
of the Friedrich Ebert Foundation

### Area: Mankind and the World of Labour

Prof. Dr. Meinolf Dierkes                      Wissenschaftszentrum Berlin für Sozialforschung GmbH  
Director of the Organisation and Technology Genesis  
Department  
Berlin Technical University, Department for the  
Environment and Society, Institute of Social Sciences,  
Technology and Scientific Sociology

Prof. Dr. Gerhard Kleinhenz                      Institute of Labour Market and Vocational Research  
Director, Nuremberg (until 30 September 2002)  
University of Passau, Chair for Economic Science  
Specialising on Economic and Social Policies

Martin Stuber                                      Federal Board of the German Trade Union Federation (DGB)  
Department Head Transport Policies and EU Legislation  
Department for Structural and Environmental Policies,  
Berlin

### Area: Society / Lifestyle /Values

Prof. Dr. Dr. h. c. Stefan Hradil                      Johannes Gutenberg University Mainz  
Institute of Sociology

### Area: Politics, in particular Transport and Environmental Politics, Transport Infrastructure

Prof. Dr. Dr. h. c. Wolfgang Michalski                      The OECD International Futures Programme, OECD  
Paris (until 31 Dec 2001)  
Managing Director  
WM International Group Ltd., London

Prof. Dr. Werner Rothengatter                      University Of Karlsruhe  
Director of the Institute for Economic Policy and Research  
as well as the Transport and Communication Section

### Area: Option Strategies of Transport Providers / Mobility Services

Prof. Dr.-Ing. Heinrich Beder                      Previously Deutsche Lufthansa AG and Darmstadt  
Technical University  
Consultant for Aviation and Mobility Issues

Prof. Dr. Dr. h. c. mult. Heribert Meffert                      Former Director of the Institute of Marketing,  
Westfälische Wilhelms University Münster,  
Economic Science Department

Prof. Dr.-Ing. Adolf Müller-Hellmann	VDV – Association of German Transport Companies Executive Managing Director and Executive Member of the Presidents' Board, Cologne
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**Area: Technology / Innovation**

Prof. Dr. Frieder Meyer-Krahmer	Director of the Institute Fraunhofer Institute for Systems Technology and Innovation Research (ISI), Karlsruhe
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Prof. Dr.-Ing. Günter Kappler	Senior Vice President Engineering, Fairchild Dornier GmbH, Wessling
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Prof. Dr.-Ing. Wulf Schwanhäuser	Previously RWTH Aachen, Chair for Railbound Transport and Transport Studies, Institute of Transport Science (until 31 March 2000)
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**A.III Members of the Networking Team**

The Networking Team was made up of the Group Spokesmen (representatives of the six areas of influence) and the Members of the Core Team and had the task to network the results of the individual groups within two two-day workshops, thus developing the foundation for selecting the scenarios described.

Prof. Dr. Udo Becker	Dresden Technical University Chair for Transport Ecology Institute of Transport Planning and Road Transport
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Friedhelm Bihn	Verband Deutscher Verkehrsunternehmen (VDV) Director of Press and Public Affairs in the Passenger Transport Department, Marketing, Cologne
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Prof. Dr. Gerhard Bosch	Institute of Labour and Technology at the North Rhine Westfalia Scientific Centre, Gelsenkirchen
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Dr. Reiner Braun	empirica, Wirtschaftsforschung und Beratung GmbH, Berlin
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Gundi Dinse	Institute for Mobility Research Scientific Consultant, Berlin
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Carl Friedrich Eckhardt	Robert Bosch GmbH, Corporate Planning Previously: Berlin Technical University, Institute of Economic Science, Department for Economic and Infrastructure Policies (Prof. Dr. Hans-Jürgen Ewers)
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Prof. Dr. Horst Geschka	Geschka & Partner Unternehmensberatung Managing Director, Darmstadt
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Konrad Götz	Institut für sozial-ökologische Forschung GmbH, Director of Mobility and Lifestyle Research, Frankfurt/Main
Dr. Walter Hell	Institute for Mobility Research Director of the Institute, Berlin
Prof. Dr. Henning Klodt	Institut für Weltwirtschaft Director of Research Department 1: Growth, Structural Change and International Division of Labour, Kiel
Günter Lange	Deutsche Bahn AG Director of Economic and Transport Studies, Berlin, Frankfurt/Main
Martin Lenz	Deutsche Lufthansa AG Ground Operations Infrastructure Strategy, Frankfurt/Main
Dr. Lutz Marz	Wissenschaftszentrum Berlin für Sozialforschung GmbH Department for Organisation and Genesis of Technology
Dr. Stephan Rammler	Wissenschaftszentrum Berlin für Sozialforschung GmbH Mobility Project Group
Dr. Helmut Richter	Rolls Royce Ltd & Co KG Department Head Concepts, Technologies & Project Engine 3E, Dahlewitz
Götz Schaudé	Geschka & Partner Unternehmensberatung Senior Consultant, Darmstadt
Prof. Dr. Volker Schindler	Technische Universität Berlin Institut für Straßen- und Schienenverkehr Fachgebiet Kraftfahrzeuge
Dr. Dr. Helmut Schneider	Westfälische Wilhelms University Münster Institute for Marketing (Prof. Dr. Dr. h. c. mult. Heribert Meffert)
Dr. Wolfgang H. Schulz	Institute for Transport Research at Cologne University (Prof. Dr. Herbert Baum)
Prof. Dr. Michael Schumann	Soziologisches Forschungsinstitut e. V. at Göttingen University (SOFI) Präsident
Martina Schwarz-Geschka	Geschka & Partner Unternehmensberatung Partner, Darmstadt
Hans-Christian Wagner	BMW Group Marketing Advanced Development and Innovation Projects, Munich



## A.IV Project Management and Core Team

### Cooperative Project Management:

Dr. Walter Hell Overall Project Manager	Institute for Mobility Research Director of the Institute, Berlin
Dr. Ralph Körfgan Deputy Project Manager DB AG	Deutsche Bahn AG Director of Passenger Transport, Corporate Development, Frankfurt/Main
Günter Lange Project Manager	Deutsche Bahn AG Director of Economic and Transport Science, Berlin, Frankfurt/Main
Martin Lenz Project Manager LH AG	Deutsche Lufthansa AG Ground Operations Infrastructure Strategy, Frankfurt/Main

### Members of the Core Team

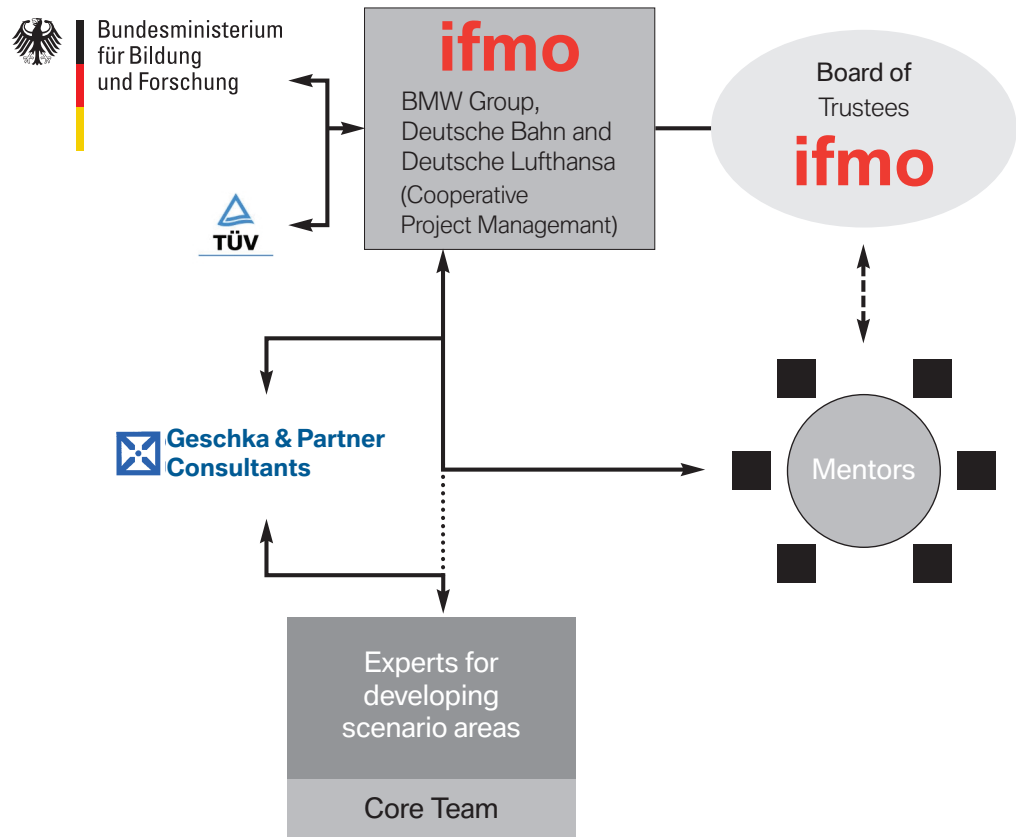
The Core Team served in particular to clarify inconsistencies in the study contents and to formulate / edit the scenario texts.

Apart from Project Management, the following individuals were members of the Core Team:

Gundi Dinse	Institute for Mobility Research Scientific Consultant, Berlin
Carl Friedrich Eckhardt	Robert Bosch GmbH, Corporate Planning. Previously: Previously: Berlin Technical University, Institute of Economic Science, Department for Economic and Infrastructure Policies (Prof. Dr. Hans-Jürgen Ewers)
Prof. Dr. Horst Geschka	Geschka & Partner Unternehmensberatung Managing Director, Darmstadt
Dr. Lutz Marz	Wissenschaftszentrum Berlin für Sozialforschung GmbH Department for Organisation and Genesis of Technology
Martina Schwarz-Geschka	Geschka & Partner Unternehmensberatung Partner, Darmstadt
Hans-Christian Wagner	BMW Group Marketing Advanced Development and Innovation Pro- jects, Munich

## A.V Project Organisation

The following principal groups participated in the Scenario Project and the ongoing updating process following thereafter:



### a) Institute for Mobility Research (ifmo)

The Institute for Mobility Research is responsible for project management in close cooperation with one representative each of Deutsche Lufthansa and Deutsche Bahn (German Railways).

The Institute for Mobility Research therefore has the following tasks and responsibilities:

- Keeping constantly in touch with its Board of Trustees, ifmo is responsible for the project and its underlying concept.
- ifmo is responsible for the course and ongoing development of the project (contents, methods, timetable).
- ifmo organises the regular revision and updating of scenario contents.
- ifmo, following the development and updating of scenarios, is responsible for organising conferences and workshops and publishing project results as well as the results of various events including all other PR activities (such as press conferences), where appropriate.

## b) Mentors Committee

To reach the objectives specified, the scenario contents must be compiled and developed by renowned experts and specialists broadly acknowledged for their competence in the specific area involved.

This gives the **Mentors Committee** the following tasks and responsibilities:

- The Mentors Committee assesses and judges the anticipated development of quantitative and qualitative descriptors.
- The Mentors Committee discusses concepts of the future (scenarios) in terms of their consistency, likelihood and relevance.
- In the light of the scenarios described, the Mentors Committee discusses the consequences, options for further action, foreseeable problems and opportunities for the players involved (politics, associations, companies, world of science).

In a nutshell, the Mentors Committee serves as a kind of advisory board within the project.

## c) Expert Teams

The factors influencing the six areas as well as their interaction in forming an overall scenario are determined and established by Expert Teams made up partly of representatives of the participating institutions and partly of Mentors.

The **Expert Teams** have the following tasks and responsibilities:

- Initially, the Expert Teams work independently of one another, determining and establishing factors influencing the areas of interests determined. This is done in two-day workshops.
- Two representatives of each Expert Team serve as the Team Spokesmen and are responsible in the networking workshops for contributing the results of their Expert Team as well as the process of networking such results with those of the other Teams.
- Ideally, these Teams should remain consistent with the same participants also in the ongoing process of the scenario. Wherever possible, the experts involved also participate in the process of revising and updating the scenario contents.

## d) Geschka & Partner Consultants (GPU)

**GPU** has the following tasks and responsibilities:

- GPU is responsible for the full method-related support and back-up of the project, ensuring that the scenario method chosen can be applied clearly and efficiently, with reproducible results.
- In the light of this responsibility
  - GPU shall act as the facilitator professionally running all workshops with experts
  - GPU assumes method-related leadership on all further steps and the evaluation of the scenario
- GPU documents the results of the workshops and, in close cooperation with the Core Team, formulates a text version of the results of the scenario process

- GPU cooperates closely with ifmo in preparing and implementing presentations to the Mentors Committee

#### e) Core Team

Apart from representatives of ifmo and GPU, the **Core Team** is made up of representatives of the three companies supporting and sponsoring the project (BMW Group, Deutsche Lufthansa, Deutsche Bahn) as well as two representatives of transport research and social science institutes.

The Core Team has the following tasks and responsibilities:

- Support and management of project activities in all phases
- Participation in workshops and presentations with expert advice and process-promoting activities
- Management and processing of individual method-related steps outside of the expert workshops
- Participation in activities processing workshop results
- Participation in the process of compiling the Overall Report
- Consultation of ifmo in matters of implementation and communication

## Annex B: Method and Approach\*

## Annex C: Initial Data\*

\* Annexes B and C are available in German only from the Institute for Mobility Research under "institut@ifmo.de"