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Determining factors in traffic growth - Developments, causes and possible future directions

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**Determining factors in
traffic growth -
Developments, causes and
possible future directions**

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Outline

Sustainable mobility and the uncoupling of transport performance from economic performance are universally accepted political aims. Sustainable mobility demands that free movement of persons and goods be effected with lower levels of traffic. The reality is however very different. Traffic levels in the last 40 years have grown significantly faster than economic performance, and there are no signs of their peaking. This disproportionate growth in traffic levels is not only having a considerable impact on the consumption of resources and the quality of the environment; it is also taking its toll in terms of cost to the national economy. The growth in traffic flies for example in the face of the sustainability and environmental aims of the German Federal government; its ability to meet its obligations both under the terms of the Kyoto Protocol and with reference to the EU-wide threshold values for fine dust air pollution, in force since the beginning of 2005, is thus put into question. Traffic growth also impacts negatively on noise reduction and land use goals.

When it comes to achieving sustainability and decoupling targets, the political focus has primarily been on technological measures. The questions of how traffic is generated and to what extent traffic levels can be influenced by policy have thus far not been significantly aired in specialist public circles or in political debate. To help stimulate this debate is the intention behind the current work, aiming as it does to identify the most important factors in the generation of traffic. The aim is to render visible the whole network of social, cultural, and economic developments, and to present possible courses of action through which meaningful traffic reduction strategies can play a part in the achieving of political goals.

Four areas of action are central to such considerations:

- Settlement developments
- Integrated trade
- Lifestyle
- Transport infrastructure

Settlement developments have a pronounced influence on commuting and shopping patterns. In Germany in the last ten years, the increasing distances between homes, workplaces, and shopping centres have led to an enormous expansion in settlement areas, making it much more difficult to be mobile without a car. What is needed is the establishment of a new vision for environmentally sustainable urban development to satisfy the following criteria:

- promotion of compact settlement developments to contain urban sprawl,
- promotion of multi-functional cities in which people can work, shop, and live, as well as

- promotion of viable urban district centres.

Politically speaking, these aims are most likely to be achievable using fiscal means e.g. by abolishing the private home allowance, subsidising property restoration and living space improvements instead of building new stock, and increasing the existing basic rates or introducing a tax on land use. A supra-regional settlement and town planning policy is also needed to consolidate commercial and settlement building areas, to keep natural spaces free of construction, and also to encourage businesses to set up in locations where they can be suppliers or customers for existing local companies, thus helping to shorten supply chains.

The last two decades have seen significant growth in **trade integration**, and global trade in general has increased more than three times faster than global aggregate output. Trade gives rise to traffic. Measures aimed at sustainable mobility must therefore influence trade in such a way that it is conducted with minimum impact on the environment and the consumption of resources. Some instruments which might be applied in line with the twin aims of sustainable development and decoupling traffic growth from economic performance are as follows:

- fair cost structures e.g. a full allocation of external costs,
- improving efficiency by the use of modern logistics,
- consensual settlement development planning, and
- support for regional marketing.

Politically speaking, these aims can best be achieved by a complete EU-wide adoption of the internalisation principle. Furthermore, a systematic examination of state and EU-wide subsidisation programmes needs to be carried out with respect to their traffic generating effects.

Changes of **lifestyle** in modern society are readily observable in patterns of consumer and recreational behaviour, those two areas forming as they do the most significant traffic segment in Germany. Lifestyles are subject to dynamic change processes, which can be influenced. Some instruments, which might support sustainable levels of leisure and holiday traffic, are as follows:

- appealing holiday offers in Germany and Europe
- internalisation of external costs, particularly those connected with air travel,
- integrated settlement developments e.g. with short distances to restaurants, cultural and sporting events, and local recreational and leisure areas,
- targeted enhancement of local public transport systems to cover holiday demand,

- flexibility of mobility options at holiday destinations.

Possible ways of implementing the above include reforms in the funding of local public transport, and strengthening the position of domestic tourism by means of educational and advertising campaigns. Financial support for environmentally friendly mobility concepts at holiday destinations and integrated mobility options, which include travel to the destinations as well as within them, could also be effective.

Expansion of **transport infrastructure** does have the effect of easing traffic flow; however, it frequently also leads to the generation of more traffic. Roughly between 15 and 20% of all traffic growth can be attributed to such expansion. In addition, infrastructure expansion leads to significant shifts between transport modes, primarily to cars and goods vehicles, as well as from pedestrian traffic to local public transport. The most important aim of infrastructure expansion – the improvement in economic performance – is in many cases not achieved. The commonly employed mechanism for evaluating infrastructure measures does not, however, in any appropriate or systematic way take into account either induced traffic or the effects of infrastructure expansion on regional development. Improving the evaluation procedures for Federal Transport Infrastructure Planning would help reduce the danger of misguided infrastructure expansion projects. As an alternative to scheduled road building projects, it should be considered whether rail transport expansion, appropriately targeted management of settlement developments, or other traffic reduction measures, might also be able to overcome actual or projected capacity bottlenecks.

Conclusion

Any future untrammelled growth in traffic levels would run counter to the aims of sustainable mobility and make it significantly more difficult to find answers to important questions in the arena of environmental politics, such as issues of climate change, air quality, land usage, and noise. The causes of traffic growth are diverse and find their origins in various unrelated social trends. Nonetheless, there are many and varied ways in which legislators and other political agencies can help shape events, with the aim of guaranteeing the freedom of mobility of people and goods whilst reducing traffic levels.

1 Introduction

In the last 40 years, transport levels have significantly outstripped economic performance. Just one category, that of private travel in Germany, measured in kilometres per person (pkm), has since 1960 increased by more than 350%. Car travel has contributed disproportionately to this increase. Nowadays nearly 80% of all journeys are accounted for by car trips. Leisure and holiday traffic takes the lion's share with 50% of all private travel, about a third is accounted for by commuting and shopping trips, and some 18% is attributable to business trips (Federal Ministry for Transport, Construction, and Urban Development - BMVBW 2002).

The development in freight transport has been similarly dynamic. Between 1960 and 2001 total levels of freight traffic increased by some 360%; road transport increased during this period by a staggering 770%. In this way, the share of road freight in the total portfolio of goods transportation rose from about a third to nearly 70%. Rail and inland waterways, which in 1960 still accounted for two thirds of all transported goods, had a share in 2001 of only 27% (ibid.)

This development has had a substantial effect on the environment. More than 20% of all damaging CO₂ emissions in Germany are attributable to road traffic, and this trend is still increasing. Whereas CO₂ emissions in other sectors declined after 1990, in the transport sector they increased sharply in the same period. Only since 2000 can the reverse trend be discerned, not least because high fuel prices have curbed the specific fuel consumption of road vehicles and restricted journey lengths (Ratzenberger 2004). In general, in comparison with other sectors such as industry or electricity generation, the transport sector is not making an adequate contribution to the combined efforts to meet the CO₂ reduction targets stipulated by the Kyoto Protocol. Inasmuch as there is a long-term need to reduce CO₂ levels much further in order to limit the global greenhouse effect, this imbalance looks set only to get worse.

Although great strides have been made since the middle of the 80s in the reduction of air pollutants associated with road traffic, it remains the main emission source of certain harmful substances. 60% of all nitrous oxide emissions and up to 75% of inner-city fine particulate matter pollution (PM₁₀) are attributable to road traffic. Inasmuch as one third of PM₁₀ pollution caused by road traffic consists of dust whipped up from the road surface as well as particles from tyre and brake lining wear, the emission reductions offered by installing soot filters are limited. Meeting the EU-wide threshold value targets for fine particulate matter, in force since the beginning of 2005, will be made more difficult by the increase in traffic levels.

In 2002, more than half the population reported being seriously disturbed by road traffic noise, whereas about a third was similarly bothered by aircraft and around a fifth by rail noise (Umweltbundesamt 2002a). The expected technical improvements in road traffic will not entail any reduction in noise pollution as long as the present rate of traffic growth continues.

Aircraft noise pollution, after seeing a reduction in the 90s and at the start of the 21st century, will pick up again due to the projected sharp rise in air travel.

Transport infrastructure – roads, car parks, railway tracks etc. – occupies about 5% of all land area in the Federal Republic: a considerable amount. A daily average of about 23 hectares of land dedicated to transport is added each day, including around 2 hectares just for the construction of Federal trunk roads (Penn-Bressel et al. 2004). The proportion of low traffic density regions of 100 km² or more unencroached upon by major transport arteries fell from about 23% to some 14% in the old Federal states between 1977 and 1999 (Federal Nature Conservancy Agency - Bundesamt für Naturschutz 1999). Rising traffic levels, with the concomitant need for extra roads, will run counter to the Federal government's sustainability target of significantly slowing down the ongoing expansion of settlement into ever-greater areas of land.

In 2002 the Umweltbundesamt proposed concrete environmental quality and action targets for the problems outlined above and developed scenarios under which these targets could be achieved (Umweltbundesamt 2002). It reached the conclusion that technological improvements alone would not suffice, and developed the idea of sustainable mobility in order to make it possible to satisfy mobility needs in conjunction with a decrease in traffic levels. This mobility concept focuses on activities, whereby the idea of spatial mobility refers to the possibility of carrying out activities in different physical locations. An individual's mobility increases in proportion to the amount of physically separated destinations he can reach. Mobility is not to be conflated with traffic. Mobility does not increase in proportion to the distance travelled - if it did, then every detour taken, for example due to road works, would add to it. The same amount of mobility can be associated with greater or lesser quantities of traffic. The nearer departure point and destination are to one another – for example residence and place of work – the less traffic is generated with the same level of mobility (ibid. p170ff).

This is where the current work enters the picture, in that its intention is to identify the most important conditions behind the generation of traffic. Its aim is to render visible the whole nexus of social, cultural and economic developments associated with traffic, and to outline possible courses of action for preventing additional traffic from necessarily arising in the first place. The subject of traffic generation, whether in scientific discussion circles or in the awareness of important political actors, does not yet attract adequate attention. The aim of this contribution is to encourage discussion and provide an impetus in the quest for new solutions.

Four aspects will be discussed as significant determining factors in the generation of traffic: the development of settlement areas, the increase in integrated trade, changing lifestyles, and the expansion of transport infrastructure. Each of these aspects is not only simultaneously cause and effect of traffic developments, but also has an effect on every other determi-

nant. The aim of this contribution is to present an overview of the most important correlations. Considerable differences in traffic development and determinants can be established between private and freight traffic as well as according to the transport functions concerned. Thus, in the case of commuting and shopping traffic, settlement developments are the dominant factor, whereas the increase in leisure and holiday traffic is decisively connected with changing individual lifestyles. An appreciable factor in the growth in freight traffic – as in the increase in business travel – is the rise in supra-regional trade networks between businesses, which in turn are definitively dependent on transport costs.

Traffic reduction and shifts from one transport mode to another cannot always be strictly separated. Contemporary settlement development structures – one of the most important causes of high transport performance – could only come about in the wake of the shift over to private car use. If one were to create new settlement developments so as to be easily accessible by public transport then this would also have the effect of reducing traffic levels. Conversely, the physical proximity of various elements of settlement design (living space, production, supply, recreational facilities etc.) would provide the necessary condition for the maintenance of, or growth in, pedestrian and bicycle traffic levels. With this in mind the subject of transport mode shift will be touched upon but not dealt with exhaustively.

2 Settlement developments and traffic generation

Living, working and shopping locations in Germany have moved progressively further apart in recent decades. Settlement areas have expanded dramatically, with urban sprawl increasingly defining the landscape. This has gone hand in hand with the increase in motorised traffic. On the one hand, this development would have been impossible without the car, on the other; the continuous expansion of settlement areas has in turn made a significant contribution to the rise in traffic levels, with especial reference to private car use. Sprawling settlement and land use developments are associated with longer journeys and higher traffic levels. The received wisdom regarding sustainable development emphatically states that the expansion of settlement areas may not of itself necessarily come to a halt even with the expected future decline in population levels (Council for Sustainable Development - Rat für Nachhaltige Entwicklung 2004). It certainly cannot be assumed that compact, low traffic settlement structures will emerge naturally without measures being taken.

2.1 Expansion of settlement areas

Since the 1960s, improved transport networks and lower associated costs have led to a relocation of housing and commercial development in particular to the margins of cities and the

surrounding areas. What followed was the advent of large retail parks and - especially since the 1990s – office complexes and other service industries. Cities and local authorities have in the last few decades tended significantly to promote traffic generating urban sprawl. An increasing need for housing and commercial land, and competition between municipalities to attract extra tax payers have led to the exploitation and development of large amounts of land. The new fringe locations, favoured by lower land prices, demonstrate both in housing and in commercial construction significantly lower usage densities than those in city centres. The concentration of commercial and service companies in inner city areas is still high. At the same time, spatial networks have increased on a regional level (Apel et al. 2001, Holz-Rau und Kutter 1995).

In general, demands on space, both for living and for commerce, are increasing. 50 years ago every German citizen disposed on average over 15m² of living space (Dosch 2002); the figure is presently 42m² (Federal Statistical Office - Statistisches Bundesamt 2004). As past settlement developments show, the private home with garden is, for many, the most desirable living arrangement. A detached house takes up on average 8 times as much land area per dwelling as an apartment house (Penn-Bressel et al. 2004). Thus the increased construction of private homes in the old Federal states in the years 1993 to 2002 led to a per capita increase in land use for house building of some 14m², to 139m² (ibid.)

As far as commercial land use is concerned, the development is less uniform; indeed, several contrary trends can be seen to combine together: notwithstanding the falling numbers of businesses, total commercial land use is rising. Industry and commerce are also becoming more land intensive, whereby the principal trend is towards single-storey industrial units. On the other hand, the service sector is gaining in significance. Service companies such as banks, insurance companies, and software developers tend however to be located in less land intensive multi-storey office blocks.

As a consequence of strong economic growth, the development of land for new offices and business premises increased markedly in the years 1993 to 2002, by about 33 hectares per day (Penn-Bressel et al. 2003). As local authorities allocated significantly more land for development in this period than was necessary, fallow land, including ex-industrial waste land and that acquired for housing or commercial development but not yet exploited, increased by more than 10 hectares per day. This development initially took place in the new Federal states, but latterly also occurred in the north west of the old Federal territory. New development of housing or commercial land requires the construction of some 10 hectares per day of extra access roads (ibid.) In total, land dedicated to settlement and traffic development increased from 1993 to 2000 by on average 124 hectares per day. In 2002, under the influence of economic developments, this growth slowed to 105 hectares per day (Federal Statistical Office 2003).

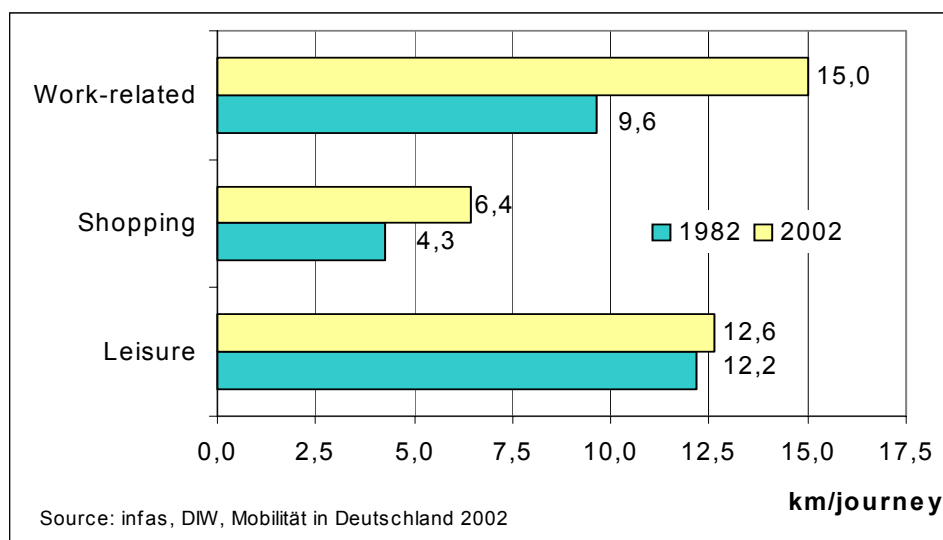
2.2 Retail concentration

A process of concentration in the retail sector, accompanied by falling numbers of outlets, has been underway for years. The number of self-service grocery outlets for example fell by nearly half between 1970 and 1990 (Hesse et al. 1999). Large retail markets have opened in out-of-town locations across the whole territory of the Federal Republic, especially in the new Federal states. These locations, whilst boasting good car accessibility and parking space, generally offer few, if any, public transport connections. In addition to ease of access, these markets provide a wide range of goods on extensive shop floors, largely due to low land prices. Because of their size they require fewer staff in relation to turnover. Retail markets on green field sites can therefore on the whole offer better value for money than inner-city shopping centres or small local shops. In general, the retail supply situation in settlement areas and city centres has suffered at the hands of the consolidation process. Residents without access to cars find their choice of retail outlets increasingly limited.

2.3 Effects on commuter and shopping traffic

Settlement developments have a great deal of influence on commuter traffic and shopping journeys, which together account for some 30% of all private traffic movements (BMVBW 2003). The proliferation of fields of individual activity over ever-wider areas implies an increase in distances to be travelled. Moving to the suburbs whilst working in the city centre on the part of large numbers of workers encourages growth in commuter traffic. It is rare for new suburban settlement areas to be adequately supplied locally or to have an attractive array of public transport options. Access is generally aimed at car users, and traffic loops, access roads and cul-de-sacs only increase transport performance in terms of distance travelled (Protze et al. 2000).

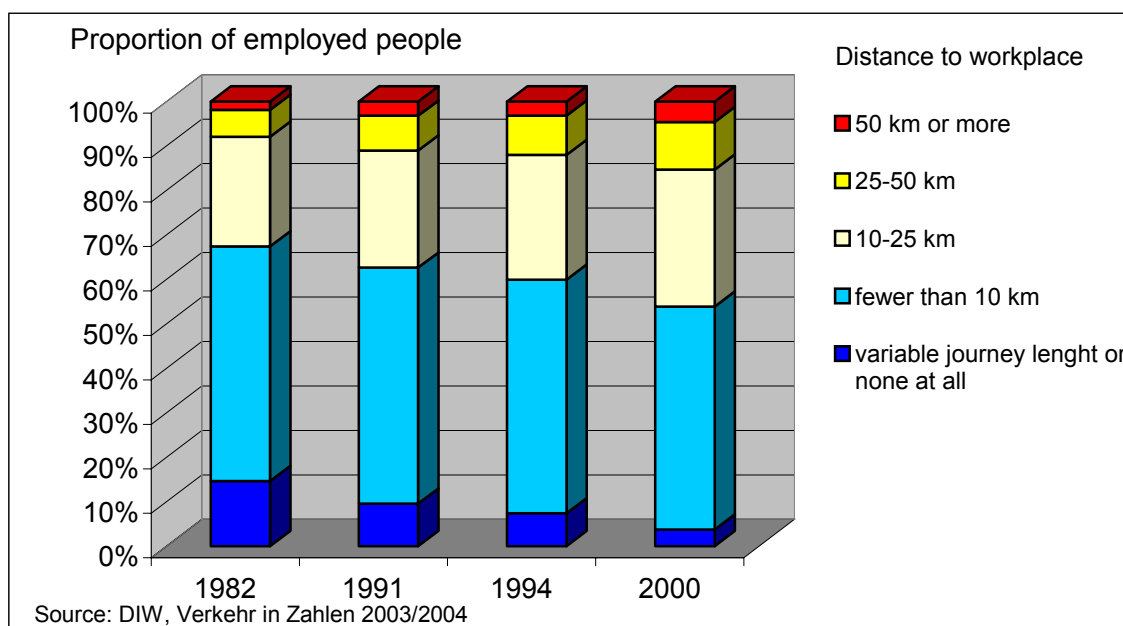
Fig. 2.1 Increase in distances travelled in Germany



The concentration in development on purely residential areas is definitively responsible both for the generation of traffic in general and in particular for motorised transport performance expressed in passenger kilometres (Gutsche 2001). The proportion of pedestrian traffic in the total increase in the number of trips is noticeably lower in areas of detached or semi-detached housing than in those where apartment houses predominate (Holz-Rau 1990).

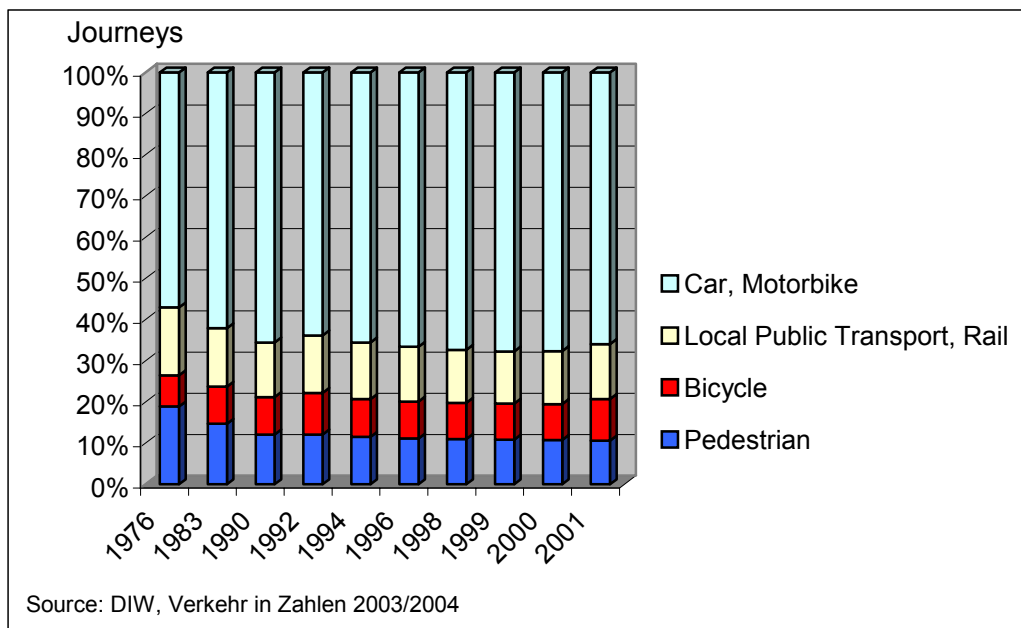
Commuter traffic totals increased by two thirds in the years 1976 to 2001. The new trend in commercial and service industry relocation from urban to regional sites does not automatically mean a reduction in commuter traffic totals; traffic patterns tend rather to become more complex. The workplace of the typical inhabitant of the area surrounding a city may well no longer be in the city centre, but in most cases is also not in the place where he or she lives. Even though a certain amount of decentralisation of workplaces is happening, ever fewer people work in the place where they live. The proportion of people who live more than 25km away from their place of work has doubled in the last 20 years (BMVBW 2002).

Fig. 2.2 Increased distances travelled to work in Germany



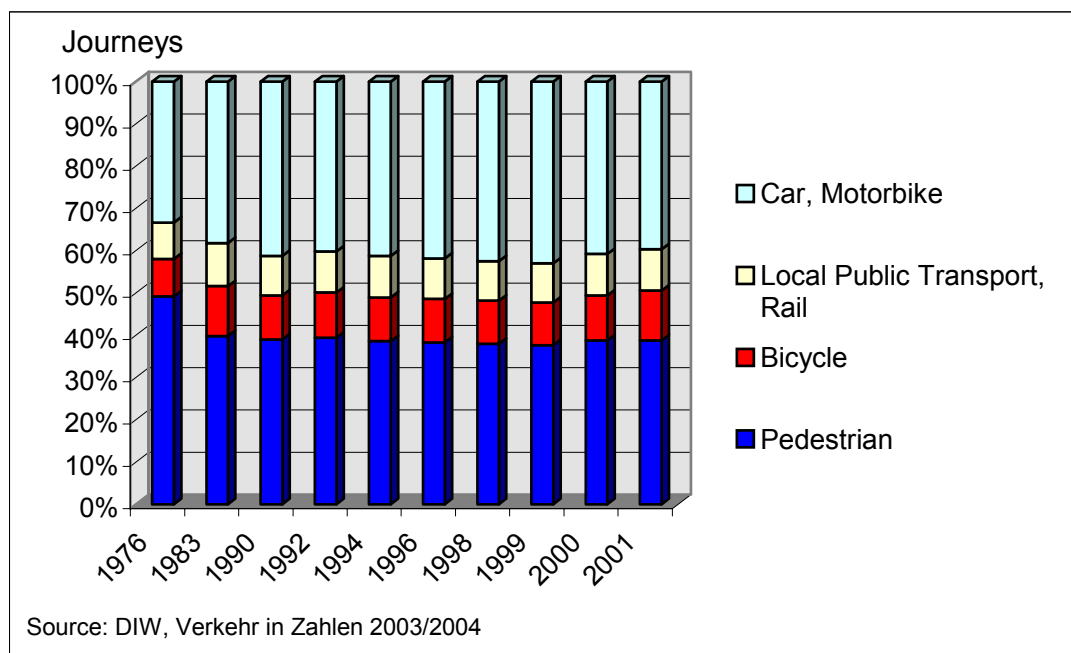
Most commuting is carried out in private cars. Work-related transport performance increased by 75% between 1976 and 2001. During the same period both the use of public transport and the number of journeys on foot declined steadily: whereas in 1976 nearly 20% of all employed people walked to work, by 2000 this figure had fallen to 10%. The proportion of commuter journeys accounted for by public transport fell in the same period from 16.5% to 13%. Both the low population density of new settlement areas and the imbalance in traffic flows (commuting out of the suburbs in the morning and back in the evening) make it difficult to supply local public transport service.

Fig. 2.3 *Distribution of commuter traffic modes in Germany*



Similar developments in shopping traffic could be discerned. Growth in transport performance of some two thirds was recorded in this area between 1976 and 2000. Both the number of journeys and the distance travelled to shopping centres rose by some 30%. The proportion of journeys on foot fell from about half of all shopping journeys to about 40%, whereas the proportion of journeys by private car rose from 33% to 43%.

Fig. 2.4 *Distribution of transport modes in shopping traffic in Germany*



The tendencies to retail concentration and relocation have led to an increase in shopping traffic. A study carried out on behalf of the Umweltbundesamt in the Leipzig-Halle region confirms this in this one case at least (Reutter et al. 2003). Urban district centres record less pronounced negative traffic and environmental effects than inner-city shopping areas or those in out-of-town locations; this is due to their higher proportion of shorter, non-motorised shopping journeys. Inner-city shopping facilities generate longer journeys and higher car usage, but are, from an environmental point of view - due to good local public transport access - still preferable to "green field" sites.

2.4 Strategies and measures for low-traffic settlement developments

The sustainability strategy developed by the government of the Federal Republic of Germany includes the goal of scaling back the exploitation of new land for settlement developments to 30 hectares per day by 2020 (Federal Government 2004). Strategies and measures appropriate to the achievement of this goal will also have a positive effect on traffic growth. The aim of reducing journeys and traffic levels will demand denser, more compact construction and a more developed integration of housing, workplaces and retail supply. As far as settlement development planning goes, this means first and foremost the further exploitation of already developed areas. If new settlement areas are to be built at all, then on the basis of that model of decentralised concentration, which seeks

- to contain the pressure for new developments in greater metropolitan areas within settlement nodal points that are blessed with good infrastructure,
- to reduce journey lengths, and
- to facilitate public transport access.

Improving urban quality of life

If cities are again to become attractive places to live, then they need to offer their inhabitants the same advantages that are currently sought after by those who move away. The stress caused by urban traffic is an important consideration in this regard. If car traffic could be kept in bounds, then people would have more scope for outdoor activity. This would be a great boon, especially for families with children. The qualitative improvement through renovation of city centres and other central districts could also provide attractive accommodation and environments for the middle and upper social classes. Federal urban development subsidies should therefore be concentrated on boosting the quality of existing housing stock, including the surrounding living environments (Penn-Bressel et al. 2004)

This would also be a contribution to the efforts to counteract the disappearance of city-centre housing and the looming tendency towards the “desertification” of city centres. The competition in the marketing of city centres as desirable locations tends to downplay the significance of living space, because housing is less profitable than commercial development, especially for service industry. The conversion observable in many cities of centrally located living accommodation into commercial premises demonstrates that the city authorities concerned do not have enough of an incentive to undertake measures to counteract this trend that is so damaging in terms of city centre quality of life and traffic developments.

Urban inner development

Further urban sprawl could be avoided if new settlement developments only came into being in areas already populated. A study carried out by the German Institute for Urban Studies (Deutsches Institut für Urbanistik - Difu) on behalf of the UBA established significant potential for urban inner development (Apel et al. 2000). For example, in the Greater Hanover Area, two-thirds of the need for new accommodation could be met by 2010 without the need to exploit new land, by building within the city. A high construction density does not exclude high quality standards or, for that matter, housing with gardens. At the cutting edge of this development are mixed-use buildings with flats in the upper floors.¹ It is above all the high demand on land of car parking and access roads, which militates against the adequate provision of green and recreational spaces in highly built-up areas. Consequently, a proportion of motorised individual traffic that is kept as low as possible is already an important element in land consumption reduction. Conversely, housing construction with minimum land use goes hand in hand with low traffic levels and a higher proportion of journeys by public transport, bicycle, and on foot.

Reconfiguring the terms of the private home building grant according to the criterion of economical land use could effectively support the cause of inner development. The recently instated equalisation of grants for new home construction and purchase of existing housing stock is a first step in the right direction. If the private home building grant is to be maintained then it should in future only apply to the purchase of existing stock and measures to extend or to modernise existing property. Savings in this area could work to the benefit of urban development subsidisation (Penn-Bressel et al. 2004). The building of new one-family detached houses should in any case no longer be subsidised (Holz-Rau et al. 2000).

¹ For purely residential developments, accepted practice has been to set construction density limits, using the total permissible floor area figure (Geschossflächenzahl – GFZ), at 0.8 to 1.2. Due to the distance between buildings determined by rules on light availability, further construction density in purely residential housing with a GFZ count of 1.2 will not lead to any net reduction in land consumption. The city of Munich has seen construction densities with GFZ figures of 1.6 to 2.5 upheld. (The GFZ determines how many m² of total floor area are permitted, whereby the floor area is the total sum area of all full floors.)

The Federal and regional subsidisation of social housing has been declining for years. Due to the adequate supply of housing stock – with the exception of certain areas – a large-scale expansion of subsidisation is unnecessary. Where subsidies are still granted, they should, as for example in North Rhine Westphalia, be made subject to the fulfilment of geographical and demographic criteria. In NRW higher subsidies are available for private home construction in the centre or at the margins of densely populated areas than outside them. For the construction of new rental accommodation to be approved, it must be built within a radius of 1.5km around local railway stations (Holz-Rau et al. 2000).

Incentives for economical land use

If the land purchase tax were to be converted into a new impervious surface tax or new settlement development tax, then the incentive to exploit new land for residential accommodation purposes would be greatly reduced (Penn-Bressel et al. 2004). A further incentive to the careful stewardship of plots and the economical sealing of undeveloped land would be provided by a tax on land consumption, based on the amount of land sealed (Bizer and Lang 2000).

Land consumption could be reduced in a significantly more targeted way than allowed for by a land use tax - with the implementation of an area allocation method. To this end, legally binding quantity targets for land consumption would need to be set. Local authorities would have a limited allocation at their disposal; in the context of such a strategy their freedom of action would be safeguarded to the extent that rights to land consumption were negotiable with other local authorities (Difu 1999).

Strengthening the position of urban districts

An urban organisational structure, which is divided up into districts with distinct centres, provides the best conditions under which excess traffic needs may be prevented from arising. It therefore makes a contribution to traffic reduction. A study commissioned by the UBA shows that newly developed district centres are capable of functioning as shopping localities, as in the example of Leipzig-Grünau (Reutter et al. 2003. Plate and Frehn 2000). The suggested strategy tries above all to market the location more effectively as well as to improve its attractiveness as a shopping locality. Aside from the range of goods available, what makes district centre shopping attractive are factors such as the shopper's freedom to move unimpeded by vehicle traffic, the ease of access by public transport and bicycle, and the availability of sufficient numbers of bicycle stands. In this way a qualitatively different range of mobility options can help tilt the balance away from shopping centres with car parking advantages, thus strengthening the position not only of district shopping locations, but also of city-centre ones. However, the renaturation of existing "green field" shopping centres will, according to expert

legal advice (Birk, Büchner 1998), be either impossible or only achievable upon payment of high levels of compensation. The only viable strategic route open is therefore to strengthen the development of city district centres and to promote inner-city shopping locations. In order to support the planning of low-traffic shopping locations, an instrument has been developed on behalf of the UBA to provide an environmental audit for prospective retail locations, which can be implemented at the preparation stage (Reutter et al. 2003, Frehn 1999).

Strengthening the regions

Agreements on development plans that go beyond municipal boundaries are an important prerequisite for economical land use. Those local authorities which, for example, work together to establish common industrial areas (inter-municipal industrial areas) act as exemplars. In this model, industrial areas are diverted to the most favourable locations in the region, a balance is achieved between areas of high demand and those of over supply, and communal control and marketing of the locations is made possible (Dressen 2004).

Approaches by which those involved in decisions about locations (government offices, businesses, housing associations etc.) come together and, with the help of a moderator, reach a solution acceptable to all parties, can also yield fruit (Kutter 2003). A management code of practice on regional co-operation was established in the context of a research project commissioned by the UBA with the aim of achieving regional ecological targets, which has been able to offer valuable support in terms of practical procedure (Schmidt et al. 2002). An ongoing model procedure for regional land management in the regional development strategy of the Federal Office for Building and Regional Planning (Bundesamt für Bauwesen und Raumordnung - BBR), which targets the preparation and deployment of strategies, instruments, methods and organisational forms, is also of interest. At the time of writing, possibilities for regional co-operation with regard to questions of land management and settlement development, and associated instruments, co-operative and organisational forms, are being tested in 13 different regions.²

As a rule, competition between local authorities to attract businesses and new inhabitants acts as a significant obstacle to the implementation of a settlement development policy geared towards sustainability criteria. A major reason for this is that legal requirements - for example, from the Federal building code – vis-à-vis economical land use are to an extent only partially observed. The Regional Planning Law (amended 1998) created the parameters for the drafting of regional land use plans. This instrument should now be implemented. Furthermore the parties responsible for regional planning e.g. the districts, do not necessarily represent the actual integration areas for which planning is required. Municipal associations or contracts of co-operation are only to an extent in a position to resolve conflicts of interest

arising between parties involved. Democratically accountable local territorial authorities, such as “Region Hannover”, which are oriented towards actual integration areas and dispose over their own means, may be in a position to offer much more favourable conditions for consensual settlement development policy (Thermann 2000). The German Institute for Urban Studies (Difu) in particular has repeatedly emphasised the need to strengthen the hand of the regions both politically and economically (Apel et al. 1995)

A significant precondition for the reduction in inter-municipal competition and the promotion of co-operation is the placing of local authorities on a sound financial footing. Income should however be congruent with the functions and obligations of the local authorities and should ensure the fulfilment of those obligations as far as possible without reference to further population growth and the inward relocation of new businesses.

Increasing transport costs

Higher transport costs make an especially important contribution toward efforts to slow down uncontrolled development (Apel et al. 1995). The introduction of an ecology tax on fuels represented an important first step in this direction. Further phased increases in this tax will not only encourage short-term fuel economy but will also help to slow down urban sprawl and to reduce journey lengths. The blanket tax break for commuter journeys, which provides a tax incentive for longer commuter journeys – counterproductive with respect to the issue at hand – was reduced at the beginning of 2004. However, it still works in favour of long-distance commuters, who benefit from the relatively low property prices at the margins of cities and in the surrounding areas. As long as costs generated by travelling to work continue to be tax deductible - whereas higher property prices and rents, and shorter journey lengths in city centres are not - additional traffic will be generated. From the points of view of traffic developments and environmental policy, the tax breaks for commuter journeys should be entirely abolished. In individual cases, in order to avoid social deprivation, costs incurred by travelling to work could be treated as a tax credit if they could be demonstrated as causing undue hardship. According to an investigation carried out by the German Institute for Economic Research (DIW), the abolition without compensation of the blanket tax breaks for commuter journeys could lead to an appreciable decrease in disposable income for some 170,000 low earners who travel long distances to work (Kloas and Kuhfeld 2003). 180,000 employed people who travel long distances to work cannot even claim the tax breaks because their income is so low that they pay no income tax to start with (ibid.).

² <http://www.bbr.bund.de/moro>

2.5 Conclusion and action required

Settlement developments have over the last few decades greatly influenced the growth in traffic levels. The transport performance can be influenced by measures to shape settlement development policy. There is already a whole raft of proposals to this end. The fiscal instruments and incentives outlined can, if formulated in a target orientated way, reduce the development of virgin land for settlement purposes, promote the redevelopment of fallow land and increase construction densities. As priorities, the subsidies for the construction of private homes should be ended and the tax-deductible status of commuter journeys be abolished or at least significantly scaled back. As a positive move, the ecology tax on fuels should be further extended. In line with the principle of taxing exploitation of the environment and thus easing pressure on labour and production costs, the next few years should see further moderate phased increases in mineral oil tax which can be planned for in the long term. In the light of price developments of fossil-fuel energy carriers, this should be carried out to the extent that energy users are able to adapt. As the irreversibility of the designation of new building land must be accepted as fact, the development of virgin land should be made noticeably more expensive. This could be achieved, for example, by transforming the land purchase tax into a new settlement development tax (Penn-Bressel et al. 2003). The land tax should be transformed into a land consumption tax based on the area sealed (ibid.) The instrument “trade with area allocation” should be developed and put to the test.

The Federal building Code, Federal Regional Planning Act, Federal Ordinance of Utilisation of Buildings, and Federal Nature Conservation Act create a framework for the support of sustainable settlement development policy. The Federal government has improved the general conditions for the safeguarding of natural habitats by amending the Federal Nature Conservation Act. The designation of natural habitats, protected areas and areas of primary ecological importance is within the aegis of the Federal states, the preservation of areas of special natural interest within that of the local authorities. On a Federal level, instruments, which can have a concrete influence on settlement developments –i.e. concentrating home building in existing areas of high-density development and near local public transport nodal points, and, conversely, preserving natural landscapes –, are not available. The Federal states and local authorities should, by means of a republic-wide regulation on the drafting of new regional planning measures, be obliged to set quantifiable targets for the development of virgin land. The meeting of those targets should be recorded in the Federal regional planning report (Council for Sustainable Development 2004). The impending reform of municipal finances should militate against municipal competition with its corresponding incentive to use land for development. Local authorities need a sound income basis, which is not associated with growth in population or inward relocation of businesses. The UBA has initiated the first deliberations on this point (Penn-Bressel et al. 2003). The key allocations in municipal fiscal ad-

justment should be made according to the central importance function of the municipality rather than the number of inhabitants. It would also be conceivable to take into account in the municipal fiscal adjustment certain services provided by a local authority that go beyond the call of duty e.g. special efforts in the field of nature conservation, of which the renaturation of developed land could be one.

In addition to setting fiscal and legal frameworks, the Federal government should also support the social communication process which needs to accompany any changes; for example, new models of living and property ownership. Good examples of inner development and urban living should be brought into public awareness and established as attractive lifestyle models. Guidelines and handbooks, which show possibilities for low-traffic and public transport-based settlement development and thus offer practical assistance, will be useful for local administrations. The results of research already being done in these areas should be collated and made available to the public in an easily accessible form.³

3 Trade integration and traffic generation

Trade is growing across the globe. Global trade in the last two decades (measured by the value of the traded goods) has increased more than three times faster than global economic product. Whilst the latter grew by 50% between 1982 and 2000, trade in the same period grew by 175% (OECD 2003). The extent to which regions trade with other regions has both direct and indirect effects on traffic patterns. Whilst freight traffic represents the actual physical dimension of trading with products, service sector trade e.g. in information and know-how makes itself felt especially in commercial travel and business trips. Freight traffic is indispensable for the provision of consumers with basic and consumer goods and the supply of raw materials and primary products to businesses. It is an essential prerequisite for a broad range of goods and production based on the division of labour. The more integrated the trade between regions and the further apart they are the higher the levels of freight traffic as well as of business travel and trips. All measures, which favour trade, e.g. the liberalisation of markets and the lowering of trade barriers, typically generate additional traffic. As long as the costs associated with transport – including those for transport infrastructure, accident risks and other external costs – are not fully borne by those who cause them, extra trade in general economic terms will not necessarily have a positive effect. This is because production cost advantages and greater production diversity are balanced out by external costs.

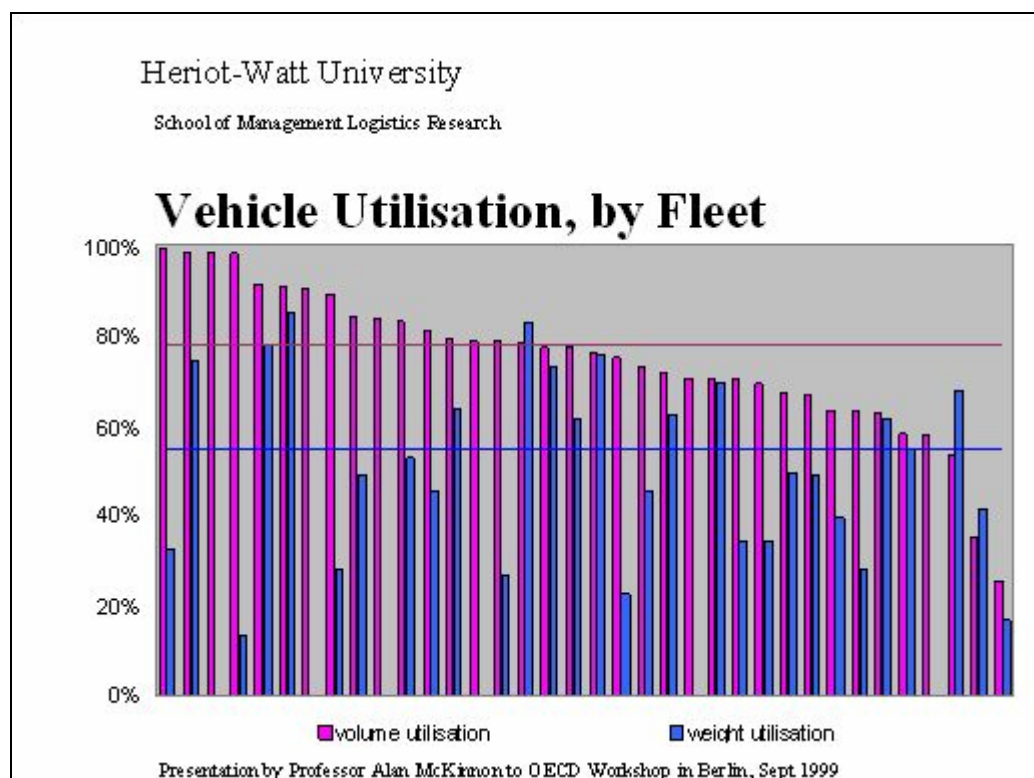
³ The ExWoSt research area “Urban development and traffic” contains among other things model proposals for public transport based settlement development. The FOPS Project RAVE (sustainable spatial and traffic planning) cf. Holz-Rau et al. (2003) compiled action recommendations for an integrated settlement development policy cf. Also Ulrike Holtel and Bernd Wuchansky (2002)

2.6 Developments in freight traffic

Three indicators from ongoing traffic statistical records describe the growth trend in freight traffic: transport volume, measured in tonnes, the transport distances in kilometres, and the transport performance as a product of both values, referred to as tonne-km. Because of the orientation of this last measure to goods weight, the increase in goods mobility is underestimated in traffic statistics. Goods have in many cases tended to become lighter over the years. Additionally, goods production has gone over more to products with a higher value-weight ratio. This means that more goods of a higher value are transported at the same tonnage. Packaging materials have both become lighter and gained in volume.

In an investigation of 36 British goods vehicle fleets used for foodstuffs transportation, McKinnon showed that, in 1998, the average utilisation of goods vehicle capacity, measured by weight, was about 55%, whereas by volume it reached some 80% (McKinnon 2001, see Fig. 3.1). German investigations have given rise to similar conclusions (cf. Arndt et al. 2000, Leonardi et al. 2003).

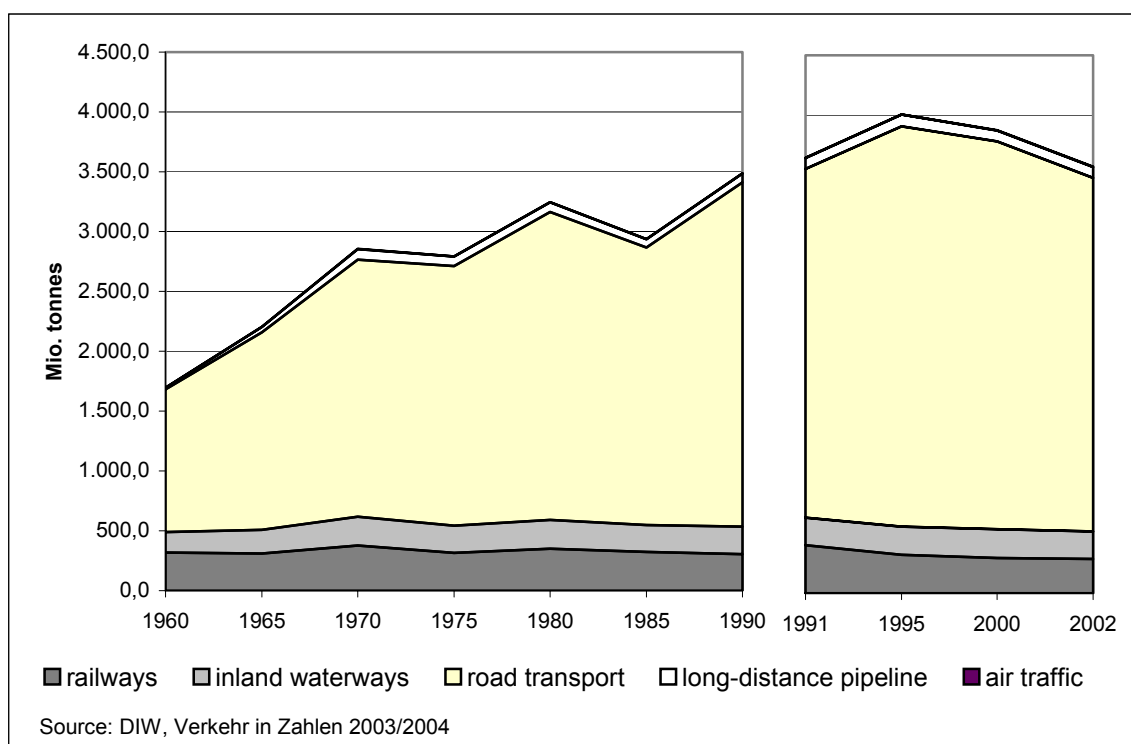
Fig. 3.1 Vehicle utilisation by goods vehicle of British goods vehicles involved in foodstuffs transport



Traffic growth

Increases in integrated trade result directly in higher levels of freight traffic. Freight traffic levels have doubled since 1960, although the development has not been a consistent one. The levels started to increase in the 1990s, but then declined again, returning in 2002 to a level just below that of 1991. Decreases of similar order have been a feature of all economic crises since 1960.

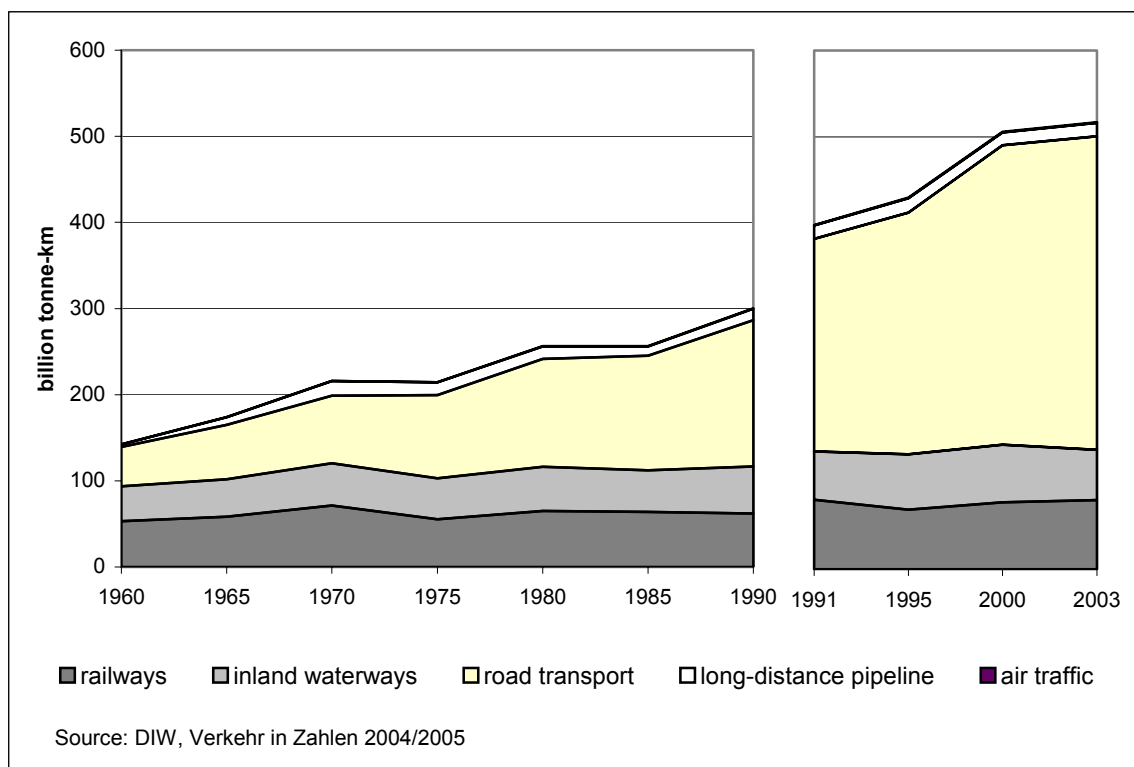
Fig. 3.2 Developments in German freight transport volume (until 1990 old Federal states only)



Transportation distances have increased yet more noticeably in recent years. The average distance per journey travelled by commercial goods vehicles increased by 44% from 88km to 127km in just seven years (1995-2002). The average rail goods journey increased in the same period by 18%, from 214km to 258km (BMVBW 2002). Goods transport performance has increased much more sharply than goods volume itself, having more than tripled since 1960. The 1990s in particular saw a great leap; growth only slowed after the turn of the century.

At the same time, international and transit traffic increased significantly, representing between them over 30% of freight transport performance and 20% of freight transport volume in Germany. Between 1994 and 2001, inter-regional traffic grew by 24% and transit traffic by as much as 75%, whereby goods vehicle transit traffic more than doubled (ibid.)

Fig. 3.3 **Developments in freight transport performance (tonne-km) in Germany (old Federal states only to 1990)**



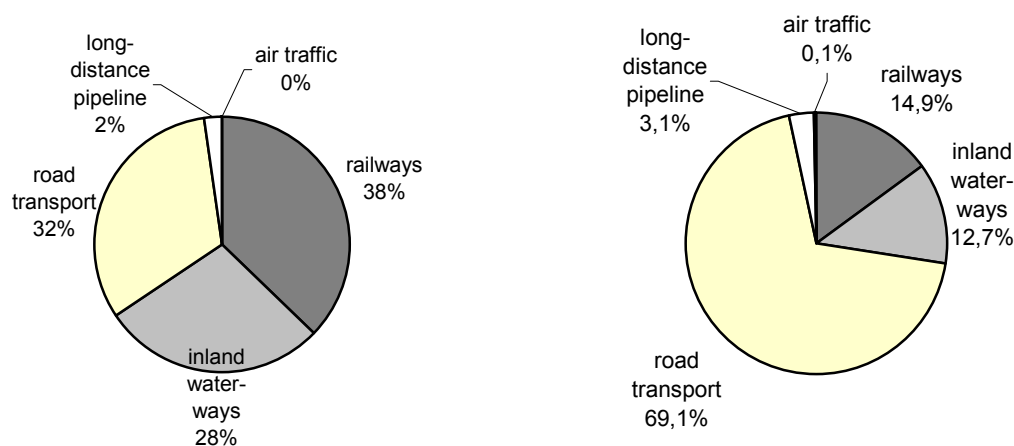
The developments in business-related traffic are closely associated with those of trade integration and freight traffic. Business travellers account for 9% of all distances travelled in Germany and 16.5% of transport performance, with figures of 8.3 million journeys and 163 billion kilometres travelled (Bracher et al. 2002). The traffic total in business travel has grown since the start of the 1990s by about 7.5%, more steeply than other areas of individual travel. Not least as a consequence of the increases in nationwide trade integration, the proportion of business travel by air increased between 1992 and 2000 from 7% to 11% of all business journeys undertaken. The proportion of rail journeys increased in the same period from 4% to 5% (ibid.). With these figures one needs to take into consideration that they only include the journeys made in Germany, which represent only a fraction of all air travel (cf. Chapter 4.2).

Modal split

In 1960 the total traffic totals was shared almost equally between goods vehicle, rail and inland waterways transport. Whilst smaller quantities were transported by rail and inland waterway, they accounted between them for significantly greater distances. In 2001, however, goods vehicle transport accounted for 70% of the total, whereas rail and waterway took shares of only 15% and 13% respectively (BMVBW 2002). In the case of volume goods, for the transport of which rail and inland waterway claim a particularly high share, a decline has

long been in evidence. It can be assumed that this trend will continue (Hopf et al. 1994). The losses incurred in the rail and inland waterway transport sectors can only be partially explained by this decrease in mass goods volume, because shifts have also taken place in every goods category to road transport, the role of which looks set only to increase (ibid.).

Fig. 3.4 *Developments in the modal split in Germany (old Federal states only in 1960)*



Transport intensity

An investigation commissioned by the UBA and carried out by the DIW demonstrated a significant increase in transport intensity in the 1970s and 80s. According to an index based on the amount of goods produced, the transport intensity (measured in tonne-km per tonne produced) increased by an average of 40% in all goods categories in the years between 1970 and 1988. Transport intensity grew in all goods categories, with the exception of solid mineral fuels. The categories of motor vehicles, machinery, semi-finished and finished goods demonstrated above average increases, at 80%. Foodstuffs and luxury goods increased by nearly 60% (Hopf et al. 1994).

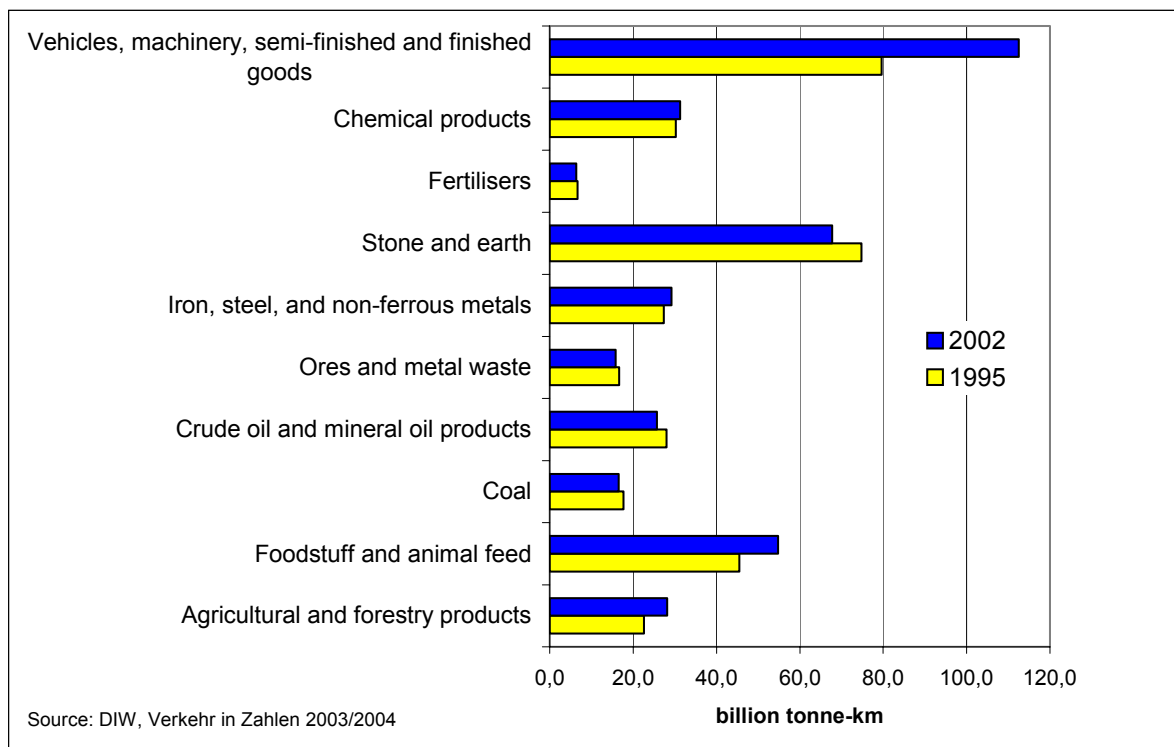
Since 1991 macro-economic transport intensity in the freight traffic sector (measured in terms of freight traffic totals per unit of GDP) has risen by about 10%. The sustainability strategy of the Federal government has established the target of reversing this trend and achieving by 2020 a reduction in freight transport intensity of 5% below 1999 levels (Federal Government - Bundesregierung 2002, 2004)⁴.

⁴ The index tkm/GDP does not say anything about real freight traffic growth. For example, US transport intensity decreased by more than 30% between 1970 and 2000, whereas freight traffic performance almost doubled in the same period.

Traffic intensive goods categories

As the trends in transport intensity show, traffic totals varies from category to category. Goods, which are moved in large quantities, or over long distances, or both, generate high transport performance. Stone and earth account for almost half of the total goods transported. These, however, are only moved over short distances and account accordingly for only 15% of freight traffic totals⁵. Over 20% of the total freight transport performance is attributable to vehicles, machinery, and semi-finished and finished goods. Goods in these categories tend to be transported over long distances. In these cases, the growth in transport performance significantly outstrips the average rate (Hopf et al. 1994)

Fig. 3.5 *Transport performance of goods vehicle, rail, and inland waterway modes by goods category.*



According to an analysis carried out by the OECD, goods in the “machinery and products” category demonstrate the highest EU-wide growth, measured in tonnes transported (OECD 2003) Iron, steel and non-ferrous metals are transported over similarly long distances. As these latter goods make up only a very small proportion of the total freight traffic volume they are of little consequence in the total traffic totals.

Agricultural and forestry products, and foodstuffs and animal feed account for more than 15% of traffic totals in Germany. Foodstuffs in particular demonstrate a trend towards growing transport intensity i.e. increasing traffic totals per quantity produced. This trend can be expected to continue (Hopf et al. 1994). Among the causes for this are the increasing refine-

ment of foodstuffs, higher packaging volumes, lower and correspondingly larger production units, and changes in consumer habits. Some product categories bear this out quite dramatically. For example, between 1970 and 1990 the transport quantity of non-alcoholic beverages increased more than fourfold, from 1.9 million to 8 million tonnes (ibid.) More than 30% of the total amount of freight traffic (tkm) across the EU is attributable to agricultural produce and foodstuffs (OECD 2003).

3.2 Causes behind the growth in integrated trade networks

The lowering of trade barriers

The causes behind the in some respects stellar growth in trade integration and freight transport performance, especially in the 1990s, are many and complex. One significant factor has been the lowering of trade barriers with the concomitant spatial expansion of markets. Important political events, such as German reunification, the creation and expansion of the single European market, and the opening up of the former Communist states of central and eastern Europe, have played their part in the increases in trade relations and goods flow. These factors have accelerated the process of pan-European economic integration, markets have grown, and trade relations and opportunities for spatial division of labour have increased. This development is particularly apparent in the markedly accelerated increase in freight traffic levels in Germany after the fall of the Berlin wall (BMVBW 2003). Average transport distances as well as goods volume have risen significantly, firstly because of the greater distances within the country and secondly because of the market enlargement for western German companies. International transport into and out of Germany as well as transit traffic increased substantially after the fall of the wall (Ifo 2002).

Falling transport costs

The extent of nationwide trade and division of labour clearly depends on transport costs. A business will only bring in goods from an outlying region if the difference in production costs to the home region exceeds the transport-related costs. From a macro-economic point of view this is thoroughly efficient and conducive to business health, just as long as the transport costs in their entirety are included in the decision-making calculations of the business concerned.

Road traffic costs have fallen appreciably. According to a French study, the costs of road freight transport in France fell by 38% between 1978 and 1993. The reasons are to be found in increased goods vehicle fuel economy, reduced repair costs, longer vehicle life, and time

⁵ All figures, unless otherwise specified, from BMVBW 2002

saving resulting from expanded infrastructure (quoting Ifo 2002). These results are also broadly applicable to Germany. Other transaction costs, including communication and organisational expenditure, have fallen significantly due to modern communication methods. The liberalisation of the freight traffic market has accelerated this development: the consequence has been appreciably lower transport tariffs in road freight, which have given rise in their turn to further trade flows and goods transportation.

The real costs of freight transport include, in addition to the costs of vehicles, fuels, truck drivers, and other costs accounted for in business management calculations, costs for infrastructure use, environmental costs, and other costs that are not met by those who cause them. These external costs do not figure in freight traffic supply and demand calculations and therefore represent a significant factor behind the, macro-economically speaking, excessive levels of freight traffic.

Lower levels of vertical integration

Another factor behind the growth in freight traffic can be found in the changes in production policy on the part of many businesses. Outsourcing and lean management are increasingly leading to the replacement of internal production through external procurement. Increasing division of labour between businesses and the outsourcing of certain steps in the production process imply that manufacturers are increasingly resorting to preliminary products from other suppliers for their own production purposes. This reduces vertical integration in production. The share in the total manufacturing production value of bought-in products has been rising steadily since 1970. This trend is evident in all areas of industrial activity, with the exceptions of trade and agriculture and forestry. In macro-economic mean terms, however, it is hardly visible, because the services sector, with its lower than average quota of bought-in services is gaining in significance (Ifo 2002). Increasing division of labour in businesses is leading systematically to higher freight traffic performance, because extra journeys are necessary for the delivery of production components. If these are bought in "globally", significant transport distances become necessary (University of Hamburg - Universität Hamburg 1997). If, on the other hand, suppliers relocate to the vicinity of the customer, perhaps even to the same site, the additional traffic performance is kept to a minimum. In the well-known example of strawberry yoghurt, the whole process from the manufacture of the individual foodstuff components via packaging and the production thereof to the end user entails a total journey length of some 3,500 km (Böge 1993). There is no consolidated balance of the traffic thus generated. A comparable analysis of all such goods would be very costly. The traffic performance associated with bought-in production components, related to certain economic sectors, can be estimated using a method of calculation devised by the DIW (Fraunhofer Institut

and DIW 2003). As no time series is available for these data, no statements can be made about developments over time.

Centralisation of warehousing and just in time delivery

A trend towards centralisation can be ascertained in many economic areas. Decentralised warehouses in close proximity to customers are being replaced by fewer larger distribution centres, which supply a wide area (the hub and spoke system). With the disappearance of one link in the storage chain, goods must be transported over greater distances. At the same time, producers go to great lengths to keep their inventories as low as possible, which means taking deliveries at exactly that point in time at which the components become necessary. This is associated with larger numbers of transports of smaller amounts – to the extreme example of flying in individual screws, in which case the supplier has to meet very exacting standards of delivery punctuality. However, even an increasingly overloaded road network has not yet enabled the railway system to press home its built-in structural advantages in punctuality-based competition.

E-commerce

The Fraunhofer Institute for Integrated Circuits, in co-operation with the German Institute for Economic Research (DIW), carried out an investigation in selected sectors to find out whether electronic trade (e-commerce) at business level is leading to an increase or to a reduction in transport performance (Fraunhofer Institut und DIW 2003). This was commissioned by the Federal Ministry of Transport, Building and Housing. The use of e-commerce in business improves market information, which can lead to changes in supplier relationships and the opening up of new sales markets. The radius of purchasing and sales potential expands, so consequently do the distances travelled by freight traffic. Delivery quantities decrease whilst delivery frequency goes up. At the same time, e-commerce makes possible the bundling of goods streams and enhances the capacity utilisation of vehicles. In the final analysis, the investigation has established appreciable savings in communication costs between businesses and in the execution of order transactions. This is an indication that electronic trade contributes to an increase in trade integration via a reduction in transaction costs. The interviews conducted in study have however not established the existence of any traffic generating effect of e-commerce (ibid.)

3.3 Measures for the uncoupling of economic growth from rising traffic levels

True transport costs

The most important instrument for lowering transport intensity is that of raising transport costs. Reducing vertical integration would be less worthwhile, whereas more opportunities for closer sources of supply would present themselves. Incentives for an improved freight vehicle capacity utilisation would also be created. The consumer would ultimately be able to recognise and compare different transport performance values based on the prices of goods (Hopf and Voigt 2002).

The originators are not held accountable for most of the damage and nuisance caused by freight transport. In other words, the greater part of the transport costs is externalised. If one takes two recent and reputable cost estimates as a working basis, it can be maintained that road freight alone generates environmental and accident damage costs in Germany to the tune of between 9 billion euro (Link et al. 2002) and 32 billion euro (INFRAS und IWW 2000) annually⁶.

Transport costs as a proportion of production value remain relatively low. Even when bought-in production components are taken into account, the proportion of long-distance freight transport costs remains in most cases below 3% (Hopf und Voigt 2002). Transport tariffs would have to be increased massively to bring freight traffic volume into line with macro-economic costs. The DIW has estimated that, in the road freight sector, a 40% increase in transport prices would bring about a decrease in transport performance of only 4% (ibid.). The most pronounced reductions would occur in the sectors of agricultural produce, foodstuffs, and consumer goods.

A new investigation into goods vehicle road pricing by the Institute for economic research and policy at the University of Karlsruhe has identified substantial traffic reduction potentials. A pricing level of 20 eurocent per km for goods vehicles over 12t with a weight surcharge of 5 eurocent for goods vehicles over 18t could be expected to result in an overall decrease in road freight levels to the tune of some 3% of total goods vehicle transport performance. This

⁶ Whereas Infrac/IWW (2000) gives market prices for the year 1995, Link et al. (2002) enters factor costs for the year 1998 into the balance. These are about 20% below the market prices, as indirect taxes and subsidies have been factored out of them. Link et al., in contrast to IWW/Infrac, do not take the emissions generated in vehicle and infrastructure provision, effects on the natural environment and landscape, or urban effects into consideration. Additionally they assume the lowest rates in the respective cost unit ratios. The inclusions in the financial statement adopted by IWW/Infra related to climate costs are generally seen today as being too high.

potential could be further increased by some 15% by following the Swiss model⁷, according to which the nationwide toll of 69 eurocent per km on goods vehicles of over 3.5t will be raised to 1.05€ in 2010. As far as road haulage goods are concerned, a reduction could be achieved by enhancing vehicle capacity utilisation through improved scheduling. Optimised storage planning could effect reductions in transport performance in long-distance road haulage.

Regional economic circuits

The Ifo Institute for Economic Research undertook on behalf of the UBA to establish to what extent the regionalisation of economic circuits might represent a potential for traffic reduction (Ifo 2002). The study demonstrates the connections between regionally specialised production, productivity, and transport volumes. Highly specialised regions show higher productivity and more intense transport streams. From an economic point of view, it would be counter-productive to take measures against regional specialisation in order to reduce traffic levels. However, inter-regional trading in products of the same class (intra-industrial trade) offers a potential for traffic reduction, which does not conflict with economic productivity aims. A case in point would be goods, which are almost interchangeable, and whose physical characteristics and production processes hardly differ. The skills needed to produce the traded goods already exist in the regions in question, and there are no factor price differences between them i.e. no one region can manufacture the product significantly cheaper. The reasons why these products find nationwide sales markets are low transport costs and the consumer's desire for choice. Thus, for example, Perrier, Vittel or Pellegrino are on offer in addition to Rhön-Sprudel, and Oldenburger, Irish or Danish butter are to be found alongside Brandenburg butter. An analysis of intra-industrial trade streams in the old Federal states shows that they take place less between neighbouring regions than between those at middle distances from one another. Middle-distance intra-industrial trade as a proportion of total trade volumes within the areas under consideration is quite high, at 60%. Significant potential therefore exists in general for the regionalisation of economic circuits, the fulfilment of which would not run counter to the aims of improving economic social welfare. The above-mentioned characteristics of intra-industrial trade – similar products, low factor price differences – mean that this trade segment might react particularly strongly to changes in transport costs.

Regional marketing

The UBA has estimated, based on various studies, that strengthening regional marketing could mean a traffic reduction potential of some 5% (Umweltbundesamt 2002). Regional

⁷ The cost unit rates should cover the infrastructure costs, as well as those generated by air pollution, noise, and accidents; the latter were raised for 1993 by the Swiss department of transport, acting for the Federal Council of

markets with good prospects could be created or expanded above all for agricultural produce. More than 300 regional initiatives have so far been launched, partly with UBA financial support. The UBA supports the networking of initiatives⁸, subsidises the development of information materials⁹ (cf. NABU and DVL 2003), and initiated the competition “Naturally regional” (“natürlich regional!”) in the context of a consortium project “create networks – set a trend” (“Netze knüpfen – Zeichen setzen”) led by NABU with the help of the German Association for Rural Preservation (DVL).¹⁰

To what extent the initiatives taken thus far have actually led to any appreciable transport economies it is not yet possible to say. On the whole, regional marketing remains a niche affair, whose future significance can certainly be regarded with scepticism. Regionalisation runs counter to the current trends in economic development. Regional production and distribution networks can barely have any impact in global competition. Large businesses can exploit economies of scale and better maintain their market position. The same is true for commercial chains and transport businesses as well as for the production sector (Hesse 2002). Regional businesses are also not necessarily in a better position vis-à-vis transport efficiency, as the vehicles used by nationally operating firms carry a higher payload and can reduce the amount of unladen trips made (ibid.). In addition, an environmental balance sheet of local food production would show that local production of foodstuffs is not necessarily more energy efficient than production in other countries, even with the resulting transportation over great distances. The University of Giessen demonstrated this with reference to fruit juice and lamb. The production and distribution of locally produced and marketed fruit juices can, if one takes all associated transport performance into account, consume up to eight times more energy than importing the raw materials 10,000 kilometres from Brazil.¹¹

Findings made thus far do not allow for any simple recommendations to be made. Efforts towards regionalisation and regional marketing can contribute to the abatement of traffic growth inasmuch as they harmonise with market tendencies or come into play at the point where the market reaches its limitations, rather than working against economic trends. Local markets have their best opportunities where long distances and supply risks cause quality to suffer. A policy of encouraging regional marketing should at the same time support the development of energy efficient local production conditions, so as not to come into conflict with climate protection and energy efficiency goals. Traffic-related issues aside, an argument for

Switzerland (ARE o. J.)

⁸ see Internet-Portal www.reginet.de

⁹ State subsidisation of regional marketing must satisfy the terms of EU competition law. Regional products are only eligible for financial support if they meet specific quality requirements, which may include short transport distances (Karpenstein und Herchenhahn 2004).

¹⁰ See www.reginet.de

¹¹ DFG Project “Vergleichende Ermittlung des Energieumsatzes der Lebensmittelbereitstellung aus regionalen und globalen Prozessketten” of the University of Giessen, quoted from the Council for Sustainable Development: http://www.nachhaltigkeitsrat.de/aktuell/news/2003/12-11_10/index.html

the promotion of regional networks is that they contribute to regional stabilisation and are thus in line with social objectives that go far beyond traffic policy.

Policies relating to the settlement of companies

The targeted settlement of the manufacturers of dovetailed product components can counteract the traffic generating effect of decreasing vertical integration. The physical proximity of manufacturers of primary and part products (regional clusters) saves transport and other transaction costs and is therefore, from the business perspective, of interest. At the same time, such a targeted settlement policy can contribute to regional development, as demonstrated by an example from Styria. With the help of intensive consultation and support on the part of the local authorities involved and those businesses from the timber industry willing to relocate, the aims of close physical proximity of sawmill and timber processing plant, and the boosting of regional economic power, have both been achieved.¹² The InnoRegio programme of the Federal Ministry of Education and Research (Bundesministerium für Forschung und Bildung – BMFB) is an example of how regional co-operation can be supported by Federal programmes.¹³

As clusters are highly competitive and demonstrate particular strength in the field of export, they can by the same token lead to expansions in sales markets and concomitant increases in transport distances (Ifo 2002). To date no data or mechanisms exist to admit a consideration of whether the transport activities saved in production or the expansion of sales markets carry more weight. Should this become possible, product groups or areas could be identified, for which cluster formation, viewed from the perspective of traffic reduction, would be especially worthwhile.

Testing the effects of traffic

Government measures, laws, and directives, which have nothing explicitly to do with traffic, can still have an effect on it. 80 to 90% of all decisions on European, Federal, regional and local authority level have some bearing on traffic (Bruckmann et al. 2000). The IFEU Institute for Energy and Economic Research, commissioned by the Federal Ministry of Transport, carried out an investigation into possible methods of testing traffic effects, and developed a catalogue of test questions (IFEU 1993, 1995, 1995a). The test questions have not yet been comprehensively deployed, and their practical value remains unevaluated. Traffic effects testing was on the Federal government's common legislative agenda from 1995. In the common agenda for Federal ministries of 2000, however, this clause was missing. The cur-

¹² Stephan Brückl, Süddeutsches Institut, Augsburg. From a talk at the OECD-EPOC-WGT meeting in Paris on May 27th 2003.

¹³ <http://www.unternehmen-region.de/>

rent formulation provides for the intervention of the BMVBW if effects on traffic are to be expected.¹⁴ An examination of the effects based on an established procedure is not envisaged.

A study commissioned by the UBA attempted to quantify the traffic-related effects of selected laws and regulations (Holz-Rau and Hesse 2000). Among others, the common task of “Promoting Regional Economic Structures” was investigated. Financial assistance can give businesses the opportunity to outsource their production, as long as the relocation of sections of production into the area to be promoted is economically viable. This generates extra traffic. In order to keep traffic generation effects to a minimum, the assistance should be dependent upon conditions e.g. certification of the business according to EMAS or ISO 14.000. The formation of regional clusters through the settlement of suppliers and service companies could also be given preferential assistance. The promotion solely of businesses with mainly national sales markets needs to be rethought (ibid.). Similarly, the Ifo Institute recommends conceiving programmes of assistance and regional political measures in such a way as not to favour companies with mainly national or international sales markets ahead of those that have a predominantly regional marketing strategy (Ifo 2002).

According to an investigation carried out under the auspices of the European Commission, the Common Agricultural Policy has significant traffic generating effects (NEA 2003). Agriculture only amounts to 1.8% of total EU GDP and 4.5% of jobs, but it absorbs 45% of the EU budget (ibid.) EU agrarian subsidies contribute significantly to the development of larger farms and monocultures. As a result, regional self-sufficiency is declining, whilst traffic intensity is increasing (ibid.). If they were to be reshaped, regional development programmes would provide a particularly good basis for the integration of agrarian, environmental, and social policy (Ifo 2002).

Improved logistics

Current freight transport performance could be realised with fewer kilometres travelled – i.e. with less traffic – if existing transport capacities were better exploited. According to a handbook published by the UBA on the subject of traffic and transport in environmental management (UBA 2000), increased exploitation of goods vehicle carrying capacity and optimisation of goods vehicle route planning could reduce kilometres travelled by up to 20% and 10% respectively. Current commercial environment management practice only occasionally takes traffic-related aspects into account. This too is a consequence of lower transport costs, which favour traffic-intensive production and distribution structures.

Baumgartner and Leonardi (2004) reach similar conclusions in their investigation of the use of EDP-supported despatch and data transmission systems. The use of EDP for despatch,

¹⁴ Common agenda of the Federal ministries. Federal cabinet decision of 26.07.2000. Annex 8 to §45, para. 1,

data transmission, position finding, and navigation in road freight traffic can increase transport efficiency by 8 to 10%. Businesses can profit from savings in despatch wages and fuel costs. According to the authors' findings, the EDP-supported despatch systems will pay for themselves in 1 to 1.5 years, data transmission systems in 2 to 2.5 years. Notwithstanding these advantages, fewer than 30% of the businesses under investigation had at the time of the study introduced EDP-supported systems (Baumgartner and Leonardi 2004, Leonardi et al. 2003).

Many cities in the 1990s made attempts to reduce delivery traffic through improved co-operation levels between haulage companies. (City-Logistik). However, the high expectations entertained with respect to the traffic reduction potential of City-Logistik have not been fulfilled. Most of the projects launched initially have since been abandoned (Koch et al. 2004). It has to be said that City-Logistik did lead to some significant traffic reduction effects – for example, taken across 30 City-Logistik projects, the payload per trip more than doubled, whereas the number of journeys and distances travelled were slashed by nearly half (Arndt and Flämig 1999). However, such has been the resistance to co-operation on the part of the transport industry that it has so far proved impossible to overcome (Koch et al. 2004 p.38)

If, however, logistics and transport were increasingly to be divided up between different companies, then the use of logistics to reduce freight traffic could be given another chance (University of Hamburg 1997). The interest on the part of the logistics company in cost-effective transport favours higher load densities and route planning optimisation, without, in contrast to the case of transport companies, there being any need to worry about competition on individual routes.

Modernisation of travel expense laws

The state only has a limited range of options to influence business and official trips arranged by private companies. In addition to the raft of traffic policy measures, which have an effect on traffic demand, the primary means here is the promotion of modern communications technology (e.g. telephone and video conferencing). Official trips undertaken by employees of Federal offices are subject to the Federal Travel Expenses Law (Bundesreisekostengesetz - BRKG), which could be extended in a targeted way to take aspects of traffic reduction policy into account. The BRKG admittedly only applies to Federal employees and those of some Federal states, but the other states, as well as an unknown number of local authorities, societies and associations, including social insurance companies and many businesses are also geared to it. Seeing as the application and billing system is in any case to be simplified with a view to the Federal travel management system currently being devised, it stands to

reason that the travel expenses law should be restructured with environmental and traffic reduction aims in mind.

A study carried out by the German Institute for Urban Studies, commissioned by the UBA, recommends extending interpretation of the basic principle of economic prudence to include the economy as a whole. The study proposes a simplification of the process of reimbursement by which administrative and travel costs could be reduced. The cost reimbursement rates for car use would be reduced to the level of the average distance-related costs of a medium-class car. They should also apply to business travel on foot or by bicycle (Bracher et al. 2002).

3.4 Conclusion and action required

The Lower House of the German Parliament's Enquete commission "World economic globalisation" has reached a two-edged conclusion concerning the effects of globalisation-related traffic growth. On the one hand, the expansion of division of labour related to falling transport costs has in an economic sense led to a general increase in social welfare. However, this increase in social welfare does not always manifest in those areas most affected by the associated traffic growth and nuisance levels (Lower House of the German Parliament - Deutscher Bundestag 2002. P.140). The danger for Germany, as the European country most exposed to transit traffic, is that the increases in social welfare in the neighbouring countries brought about by globalisation will have traffic-related deleterious effects on social welfare in Germany itself. The same can be said for the individual German regions. Policy has thus far always been aimed at providing the infrastructure necessary for trade streams, whereas no reliable processes for examining the effects of this policy on regional development have been available (see Chapter 5.2).

It has widely been accepted that traffic costs are too low, because road users carry only a proportion of the costs themselves and pass the rest on to society at large. However, that this should represent an erosion of social welfare has not been recognised, because the definition of the above is still largely restricted to economic performance. An ecology tax on fuel and the decision to introduce road pricing for freight vehicles are significant moves in setting a course for a policy, which will ensure that those parties who give rise to costs must also bear them. Goods vehicle road pricing could lead to an improvement in such cost allocation, as long as external costs are also taken into consideration. So far the road pricing system has only covered infrastructure costs, and the currently applicable EU guideline on freight transport distance charges does not provide for the inclusion of external costs.

As the expansion of trade relations as a political aim is not in question, ways must be found to exploit the existing transport networks and means more efficiently, and to exhaust the op-

tions for reducing distances travelled that already exist. In addition, environmentally friendly transport options should be promoted, in order to reduce the strain on the environment brought about by traffic.

Options for improving efficiency lead to classic win-win situations. It is not just the environment that benefits from improvements in transport efficiency, but also the transport industry itself. However, instruments for improving logistics are only employed by a fraction of businesses. Efforts to promote environmental business management and to uncover potential means of reducing transport use or shifting to other means of transport have only met with moderate success. Investigations need to be carried out to establish which obstacles stand in the way of their implementation, in order to create a basis for the development of a promising implementation strategy. Methods that might be considered would include offering information and training in co-operation with business associations or chambers of commerce and industry.¹⁵

As far as the settlement of businesses is concerned, the topic of traffic generation is only raised when regional difficulties occur. When it comes to encouraging regional clusters and the settlement of complementary businesses – e.g. a manufacturer of primary products for regional developed product – it would appear a promising move to bring all the players involved in location decisions around a table, and, with the help of professional support, to negotiate an acceptable way forward (cf. Chapter 2.5). There is a need for research into processes to identify the traffic reducing potential of regional clusters, with reference to all traffic streams in the region concerned.

The introduction and marketing of a transport label for consumer goods could both boost the market position of regional consumer goods and increase the interest of manufacturers in primary products from the region.

National assistance programmes must not thwart the efforts towards traffic reduction by favouring additional freight transport and longer transport distances. It has repeatedly been established that measures to promote regional and economic development generate traffic as a side effect. To date, however, no conclusive concepts have been developed to redefine this set of instruments in order to achieve the aim of restricting extra traffic growth, without thereby neglecting the aims of social and economic policy. Those measures for regional assistance, which are intended to iron out economic disparities and to reinforce areas of structural weakness in economic performance, should in particular be examined vis-à-vis their traffic generation effects and reformulated with the objective of traffic reduction in mind (see also chapter 5.2). In addition, it would be worthwhile starting anew to test all Federal meas-

¹⁵ The series of workshops on fleet management being run by co-operating regional chambers of commerce and industry might serve as an example to be followed.

ures, laws and ordinances for their effects on traffic, and testing the necessary processes in a pilot procedure prior to developing them further.

4 Lifestyle and traffic generation: leisure and holiday traffic

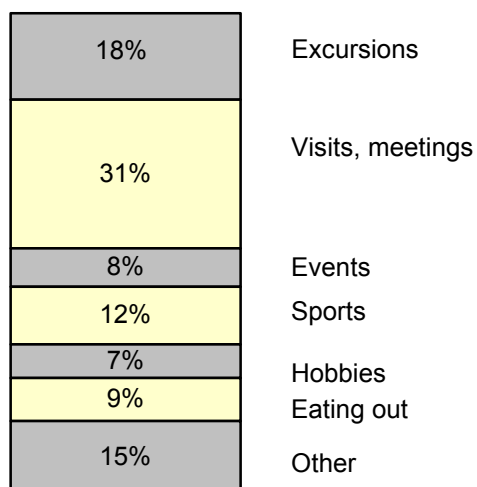
Changes in lifestyle in a society can be deduced from consumer and recreational behaviour. Recreational and holiday mobility is in turn strongly influenced by individual lifestyles. A whole conglomerate of different purposes stands behind the term "leisure traffic", e.g. week-end breaks, visits to relatives and friends, cultural outings and trips undertaken in pursuit of a hobby. Traffic statistics define holiday traffic as the sum of all leisure trips with duration of 5 or more days. Nearly half of all private traffic performance in Germany can be attributed to leisure and holiday traffic (BMVBW 2003). In 2000, more than 350 billion person kilometres were travelled by car, about half of the total private car transport performance (ibid.). Leisure and holiday traffic is the largest traffic segment and, therefore, the most significant in environmental policy terms.

4.1 Development of leisure traffic

Contrary to popular belief, leisure traffic levels have not seen above average rises in Germany in the last quarter-century. They have however steadily increased in line with all other traffic areas. The local area is of particular significance in leisure terms. In 2000, German citizens did over 40% of their leisure travelling on foot or by bicycle. This did not represent a change of any significance from the 1970s (BMVBW 2002).

Over 30% of all leisure journeys serve to maintain social relationships. The share of visits to cafes, pubs and restaurants and to cultural or sporting events is just about as large. Walks and excursions account for 18%, with walks taking the lion's share. Day trips, which are commonly associated most strongly with leisure traffic, in fact only account for 2% of all leisure distance travelled (infas and DIW 2003, 2004).

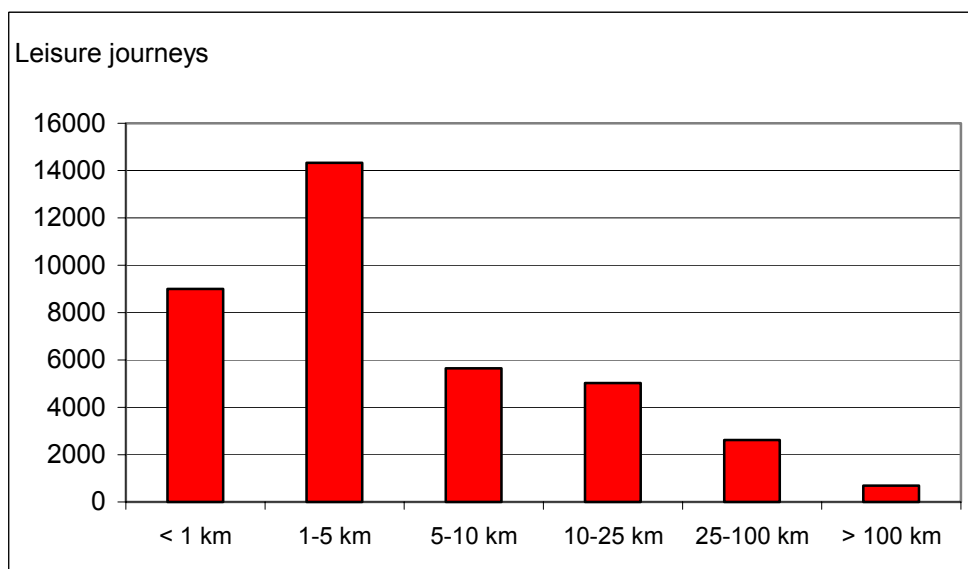
Fig 4.1 **Distribution of leisure journeys in Germany by purpose**



Source: Infas, DIW (2004): *Mobility in Germany (Mobilität in Deutschland) 2002*

Two thirds of all leisure journeys in Germany are less than 5 km. Day trips are rare, but amount to a disproportionately great distance travelled.

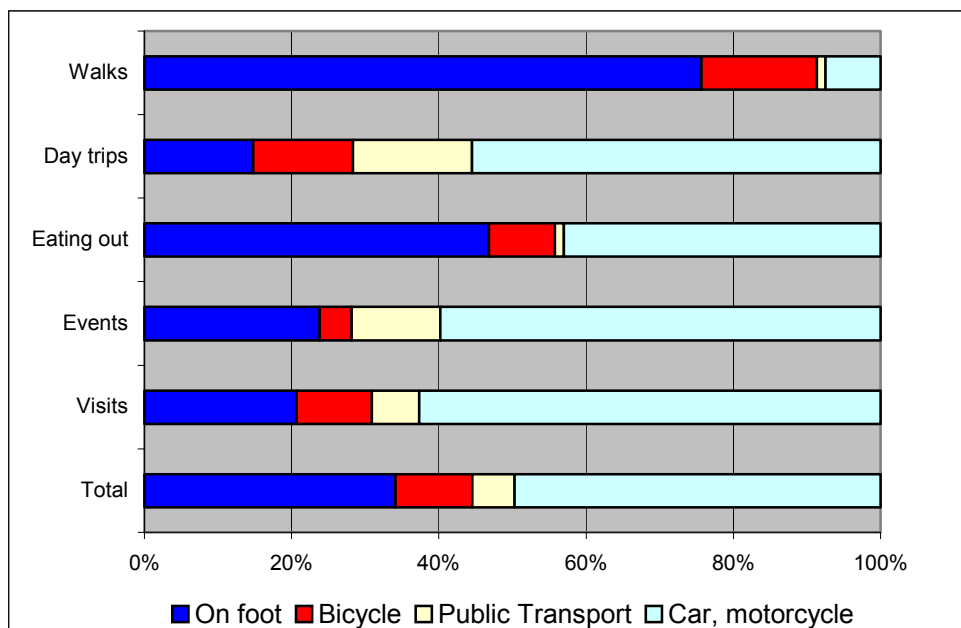
Fig. 4.2 **Leisure distances travelled in Germany**



Source: Infas, DIW (2003): *Tabellenband Mobility in Germany (Mobilität in Deutschland) 2002*

Over half of all excursions are made by car (ibid. cf. Also Reutter et al. 2003). According to an investigation carried out in the Stuttgart area, a relatively small number of people contribute disproportionately to leisure transport performance. About half of all car kilometres travelled for leisure purposes are attributable to just 10% of the population in the areas under investigation (Holz-Rau and Kutter 1995).

Fig. 4.3 *Distribution of transport means for selected leisure purposes in Germany*



Source: *Infas, DIW (2003): Mobility in Germany (Mobilität in Deutschland) 2002*

The role of the aircraft in leisure traffic development has thus far been restricted. In 2000, short leisure trips by air accounted for less than 1% of all journeys made. From the perspective of air traffic, however, a definite trend towards growth can be discerned from 1998 onwards. In 1996, 2% of air journeys were short recreational ones; in 2000 the figure was as high as 6%. As far as recreational flying is concerned, exact data on the destinations (Germany, Europe, non-European occident), purposes (“shopping in New York”), and clientele, are not available. Just as unknown is the extent to which it is a question of additional journeys, or extensions to train or car journeys. The extent of strain on the environment cannot therefore be assessed. Without additional information, it will be impossible to work out strategies to influence this development.

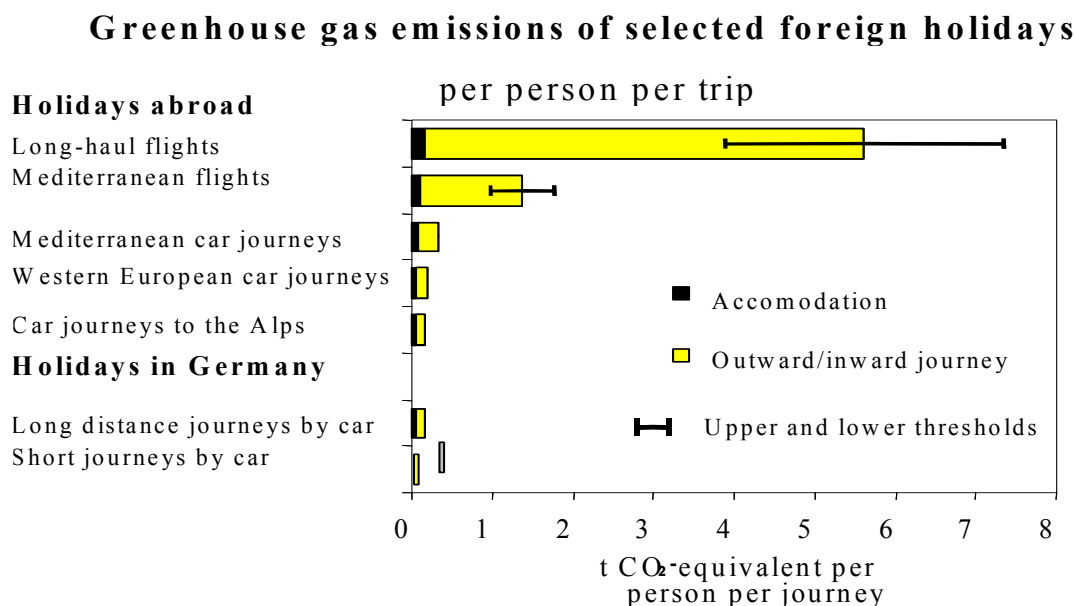
4.2 Developments in holiday traffic

According to figures from the Federal Ministry for Transport, holiday traffic accounts for 7% of the total traffic performance in Germany (BMVBW 2002). This share would not of itself merit particular attention to this traffic segment, were it not for the fact that the statistics only record journeys made within Germany (the so-called territoriality principle). In contradistinction to other traffic functions, the proportion of kilometres covered abroad is very high in this particular segment, which means that a large proportion of holiday traffic journeys is simply not recorded in the statistics. An indication of the degree of under-reporting can be seen in the comparison of air passenger kilometres made in the document “Traffic in Figures “ (“Verkehr

in Zahlen" BMVBW 2002), collated according to the territoriality principle, with the figures compiled in the UBA model TREMOD. With TREMOD, the distance travelled to the point of first landing is considered. In the first instance, a figure for 2001 of 42 billion pkm is given; in the second, 140 billion pkm.

The number of holiday journeys, measured by head of population, has increased by nearly 60% since 1976. 2001 saw not even a third of holidaymakers staying in Germany, with non-European destinations accounting for 13% of market share (F.U.R 2003). Long-haul journeys give rise to the greatest degree of environmental damage of all foreign trips. According to a study carried out by the Öko-institut, long-haul journeys account for fewer than 10% of all private trips abroad, but are responsible for half of all greenhouse gas emissions from foreign holidays (Schmied et al. 2002). Not only this, but an above average growth rate of 86% is also expected in the long-haul sector (ibid.)

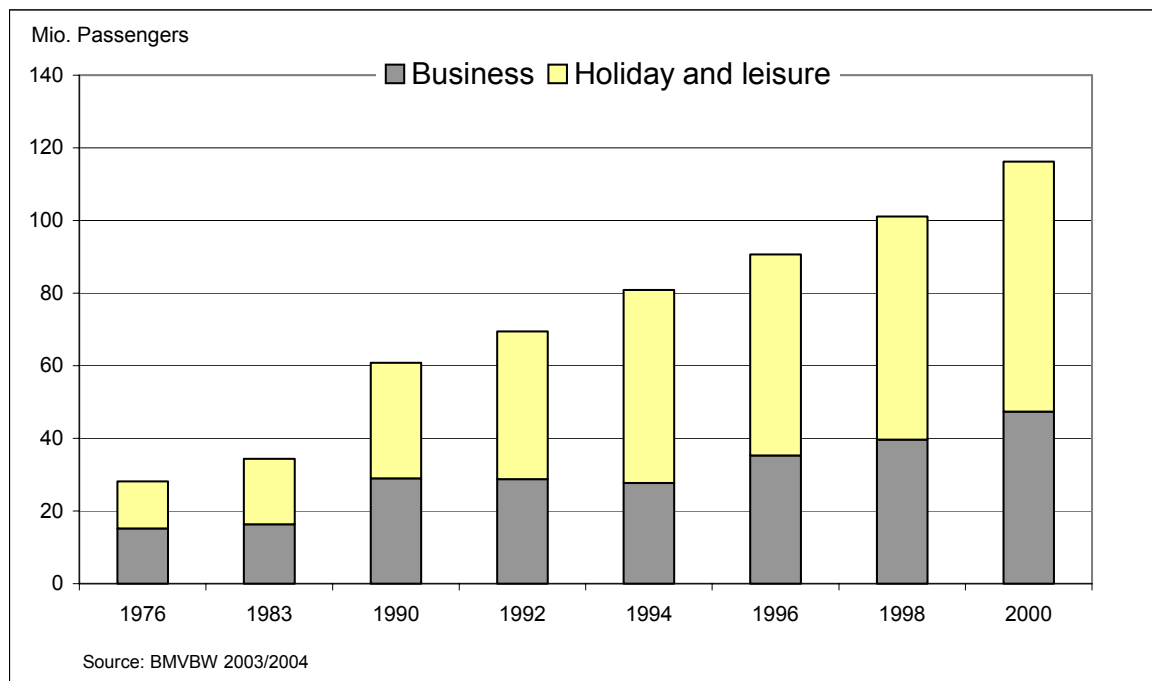
Fig 4.4 **Damage to the climate caused by foreign holidays taken away from Germany**



Source: Öko-Institut

The railways have lost ground in the holiday traffic market, being used by ever fewer holidaymakers (BMVBW 2003). Over half of all holiday journeys are made by car, a third by air, whereby the latter is gaining in significance. In 1990 every fifth holidaymaker flew to his destination; by 2000 it was every third. Holiday traffic is the principal engine of air traffic growth. In 2000, holidays accounted for some 60% of all air journeys. Between 1999 and 2000, holiday air travel grew more than two-and-a-half fold, significantly faster than business travel (BMVBW 2003).

Fig 4.5 *Developments in air traffic in Germany*



Source: BMVBW 2003/2004

The advent of budget airlines has seen the establishment of a new growth market. Cheap offers are increasingly causing customers to abandon the established carriers as well as opening up new areas of customer potential. This has been a roaring success: in 2002, 2.2 million passengers took advantage of these cheap offers. The travel industry estimates the final potential at some 19 million passengers (F.U.R 2003).

Analysis of the recent developments shows that the number of holidaymakers fell slightly in 2002 on the year before (ibid.). A small percentage increase in domestic holidays could be determined, whereas the share of long-haul journeys fell significantly and that of air journeys slightly. The difficult economic situation and fear of terrorism made themselves felt at this time. There have, however, been no drastic changes, and no end of air travel growth is to be expected.

4.3 Causes of growth in leisure and holiday traffic

Little is known about the development of the different travel functions in the leisure sector, because such data are only irregularly collated. This makes the quest for factors in leisure traffic growth difficult. One important factor is settlement development. The distances travelled for recreational purposes increase in direct proportion to the distances between places to eat, cultural and sporting events, and local recreational areas (Reutter et al. 2003). The

hypothesis that happiness at home or in one's neighbourhood leads to decreases in leisure traffic has not yet been substantiated (Götz et al. 2003). Nonetheless, the results of the UBA model project "Car-free life in existing housing stock" ("Autoarmes Wohnen im Bestand") (Reutter et al. 2003) and those of the substantial model project carried out in the 1980s on "extensive traffic calming" (Federal Ministry of Regional Planning, Building and Urban Development 1992) indicate that a low-traffic-density neighbourhood tends to be more extensively frequented and associated with higher levels of living satisfaction.

The degree of motorisation i.e. the availability of cars has steadily increased in recent decades. As a consequence, not only have non-motorised leisure movements lost ground, but also short trips, otherwise undertaken on foot or by bike, have been replaced by long-distant car journeys. This trend has been made possible by falling transport costs and may even have been brought into being by them in the first place.

The development towards smaller households has also contributed to increased levels of leisure traffic. The fewer the people under one roof, the more important social contacts outside the home become. Friendships and acquaintanceships have for many years no longer been restricted to the local area, especially since good-value transport options are so readily available. It is a thing of the past for all family members to live in the same place or region. Grown-up offspring tend not to stay where they have been brought up, near parents and siblings, preferring instead to move to places where they can find work or a partner. At the same time, however, family connections remain important. The higher numbers of working women and increasing demands from employers on workers to be mobile is leading to a rise in the numbers of couples living separately, who, for example, see each other at weekends. The latter is a relatively new trend in the organisation of social relationships. To what extent it will develop, and whether it is passing phase in the affairs of individuals, or a new, lasting form of cohabitation, remains to be seen.

The charted growth in holiday travel is to a great extent attributable to second or third journeys per year (Schmied et al. 2002). The trend towards more frequent and shorter holiday trips continues as before. The number of holidaymakers will not, however, continue to rise quite as strongly (ibid.). Package tours, which have become ever cheaper in recent years, are an important factor behind the proliferation of long-haul holidays. Domestic offers can hardly compete against the last-minute bargains that have long been part of the standard range offered by tour operators. Whereas long-haul holidays used to be an expensive affair, out of the price range of many, the plenitude of holiday agents now offer good-value long distance deals tailored to nearly every budget (ibid.).

4.4 Promoting sustainable leisure and holiday mobility

Breadth of local portfolio

Local supply is an essential prerequisite for the promotion of short distance leisure travel. A varied local portfolio, with a wide range of options for eating out, attending cultural and sports events, and recreational facilities, can help to maintain and increase the share of non-motorised travel in the total leisure traffic sector. Not only that, but an attractive-looking city will have better chances of getting people to stay (Reutter et al. 2003). Opening up closer leisure destinations will contribute to efforts to slow the growth in long distance journeys. For example, the Cospudener See, only half an hour's bike ride from Leipzig city centre, developed a cult following amongst the local population, even when still a building site with rising water levels (ibid. Thiemann-Linden and Kaufmann 2000). Allotment gardens represent an attractive local recreation option for large population groups, especially for those who live in apartment blocks. Allotment gardening accounts for a large proportion of the total amount of outdoor leisure time usage, and acts as a substitute for longer distance day trips (ibid.).

Improved rail and local public transport services

Local public transport networks tend to be geared towards the needs of business and school travel. Enhancing them so as to fit in more with leisure requirements could lead to significant shifts in leisure transport patterns. Götz et al. (2003) estimated that a local public transport service targeted at particular user groups could reduce the share of car and motorcycle traffic in the total leisure transport performance by more than 10%.

The railways could be an equally good, or even a better alternative for trips within Germany and to neighbouring countries. Amongst the preconditions for this would be attractive offers on the part of the railways themselves (good-value fares, especially for families and groups, comfort, good connecting services, convenient conveyance of bicycles, convenient and good-value luggage despatch), and also the maintenance of high levels of mobility at the destination (good public transport, car-rental services, bike hire) (OECD 2005). For example, the share of holidaymakers travelling by train to the Austrian Alpine district of Werfenwang rose from 9 to 25% after the district, acting as a model for the EU Project "Soft Mobility" ("Sanfte Mobilität"), improved its public transport service and engaged in a marketing offensive on behalf of the model¹⁶. Deutsche Bahn has, since December 2002, significantly reduced the fares for families with children and thereby fulfilled an important prerequisite for the role of the railways in leisure and holiday traffic to increase.

¹⁶ See the presentation given by Robert Thaler at the UBA/OECD workshop "Leisure travel, tourism, and the environment", held on November 4th–5th. The presentation is available on the homepage of the OECD: <http://www.oecd.org/dataoecd/38/17/34027558.pdf>, s. a. <http://www.igmobil.at/skipindex.htm>

Deutsche Bahn offers in co-operation with several environment associations a special deal for holidaymakers and those in search of recreation in the scheme “Destination Nature” (“Fahrziel Natur”). The declared aims of this co-operation are to encourage leisure travel by rail and to promote recognition of the large nature protection areas.¹⁷

The railways need to develop and market significantly more such targeted offers in order to attract larger numbers of holidaymakers back on to the network. Not only railway package tours, where everything is included, show promise of success, but also other offers that combine travel to the destination with a flexible range of mobility options once there (bike, rental car, public transport pass). It is hard to grasp why Deutsche Bahn does not actively do more to exploit the growing trend in bicycle tourism. Instead, it tends to experiment with a range of ever-changing offers, which causes customer confusion. Rail connections for travel by bike present an unattractive option for many relations, because the fast ICE trains make no provision for bicycles.

Attractive holiday destinations in Germany and Europe

Influencing the choice of holiday destination would appear to be significantly harder than encouraging shifts of traffic mode. There are, however, some promising starting points. For example, according to the “Spiegel Online” edition of 30.7.03, it has in recent times above all been young holidaymakers who have increasingly been looking for exotic options in their own country. “For a long time now, the Golf generation has been more familiar with Gomera than the Spreewald – which is precisely why it is discovering leisure destinations around the corner.” Undefined risks, overcrowding, and stressful outbound journeys put holidaymakers off. Also “the travel industry has polished most destinations to such a high state of shine that they can hardly be distinguished from one another. Plane, shuttle service, hotel and beach are all the same, to the extent that the holidaymaker hardly knows whether he is in Antalya, Djerba or Palma.” According to “Spiegel Online”, improving the comfort standards in German tourist areas would win back many more holidaymakers for the domestic market.

One of the aims of the combined development proposal “Innovative marketing concepts for sustainable holiday deals” (“Innovative Vermarktungskonzepte nachhaltiger Tourismusangebote - INVENT”), subsidised by the BMBF, is to investigate the possibility of substituting long-haul for European holidays. The project is to be carried out in association with the practice partners AMEROPA-Reisen GmbH and DB Reise und Touristik AG, and in co-operation with the German Association of Travel Agents (Deutsches Reisebüro) and the German Association of Tour Operators (Deutscher Reiseveranstalterverband DRV). It seeks to develop, mar-

¹⁷ <http://www.fahrziel-natur.de/>

ket and evaluate selected examples of target group orientated tourist deals for the package tour and mass holiday markets.¹⁸

Improved marketing of environmentally friendly holiday deals

With the aim of strengthening the position of environmentally friendly tourism in Germany, the Umweltbundesamt and the Federal Ministry of the Environment (Bundesumweltministerium) have launched the environmental umbrella brand name “Viabono – enjoying sustainable tourism” (“Reisen natürlich geniessen”). This brand was developed jointly with tourist, environment, consumer, and local authority associations and is intended to market environmentally friendly tourism. Viabono aims to give a competitive edge to those holiday accommodation companies, local authorities, and nature parks which distinguish themselves through their engagement with environmental and consumer protection. Their objective is to increase the number of appropriate deals on offer. The brand undertakes to make the search for environmentally friendly deals easier in all tourist segments.¹⁹

The initiative from the Verkehrsclub Deutschlands “Wanderlust – new ways to go on vacation” (“Reiselust – neue Wege in den Urlaub”), likewise supported by the FME and the UBA, is entirely geared towards sustainable mobility. Those tourist regions involved in the project have, in co-operation with the VCD, set themselves the objective of developing attractive holiday destinations in Germany for people without cars. These deals are to be marketed in co-operation with hoteliers, transport companies, tourist associations, and tour operators. At the International Tourist Exchange (Internationaler Tourismusbörse ITB) in Berlin in March 2004, the tourist regions declared their readiness to expand and to improve the range of mobility options for carless holidaymakers by signing co-operation agreements with the VCD.²⁰

4.5 Conclusion and action required

Because of its sheer scope, leisure traffic is, in environmental policy terms, a particularly significant segment. Local supply of goods and services is a very important factor in the realisation of a shift to short-distance leisure travel. A good combination of accommodation and locally available recreational activities helps to maintain and further to increase the high share of non-motorised transport in leisure traffic. Opening up local leisure destinations also serves to limit the growth in long-distance travel. Beyond this, the existing projects offer little in the way of concrete starting points in the reduction of traffic in the area of leisure travel.

¹⁸ Further project information at www.invent-tourismus.de.

¹⁹ See also www.viabono.de

²⁰ further project information at www.reiselust-deutschland.de

The possibilities of influencing traffic developments are much more readily observable in the area of modal split. A targeted enhancement of the services offered by local public transport networks to meet leisure demands could lead to significant shifts of use towards those networks. The Federal government has the chance to exert influence on the quality of service of local public transport by setting the parameters for their financial support. As far as the concrete manifestation of these services is concerned, however, the ability of the Federal government to act is limited. Model schemes are a suitable instrument for the promotion of tourism and leisure activities in a given region, together with improvements in public transport and the effective marketing of those activities. By the use of such model schemes, examples can be put into effect, which, although locally circumscribed, can, with vigorous communication of their results, serve an educational purpose, at least up to a given extent. The target group specific measures developed by Götz et al. (2003) make a good case for being put to the test.

A long time is needed to put exemplary concepts into practice on a large scale. An area-wide spread of such concepts has only occurred in isolated cases. More determined use of the results from political science could support the faster spread of such innovations. Improvement measures could also be more efficiently and easily put into practice if the potential of individual measures were better evaluated in advance. A structured evaluation of past and present actions is therefore necessary.

In terms of environmental protection, the segment of holiday traffic made up by flying and the increase in long-haul travel, are of especial relevance. Measures to reduce damaging effects on the environment, especially on the climate, caused by holiday traffic could be tied up with questions such as the choice of destination, the frequency of holidays, and the choice of transport options. As holidays are seen as an important element in the overall quality of life, measures that can be interpreted as restrictive should be avoided. Instead, holiday offers which meet the needs of both people and the environment should be developed. As a precondition for this, significant research still needs to be done into the motivations behind holiday travel.

The air travel market is currently being massively fuelled by cheap flights. These offers, in conjunction with associated huge advertising campaigns, not only generate more air traffic, but also make flying attractive to whole new strata of society. If new counter-strategies are to be developed and convincing arguments to be made, then, first and foremost, the motivations, expectations, and experiences of budget fliers need to be investigated. The marketing of Germany or Europe as holiday destinations requires differentiated concepts. The primary target groups need to be those who particularly incline to long-haul holidays. Long-haul holiday deals should be developed which draw together a number of different motivations for go-

ing on holiday – such as recreation and education – in order to set a counter-trend to the tendency toward ever more frequent holiday journeys (Buchert et al. 2001).

Model projects for environmentally friendly transport structures at holiday destinations could play a role in raising the share of the railways in holiday traffic.

Further-reaching strategies to influence the choice of holiday destination and concomitant environmental effects could be developed on the basis of a systematic analysis of options at EU, Federal and local authority level. These could, for example, include changes in the law and in subsidy guidelines, campaigns aimed at specific target groups, compulsory designation of the climactic effects associated with a particular holiday offer etc.

One thing should, however, already be clear: as long as prices send the wrong signals, any efforts to influence the growth in holiday traffic will only have limited effects. It is therefore crucial to impose a sales tax on cross-border air traffic, as well as on other cross-border types, and to end the exemption of kerosene from mineral oil tax. Additionally, air traffic should either be included in the emissions trade regime, or a route-related emissions duty should be raised to put holiday traffic on a more environmentally acceptable footing.

5 Transport Infrastructure and traffic generation

“He who sows roads reaps traffic” has long been the pithy formula which citizens’ initiatives on traffic use to draw attention to the traffic generating effects of infrastructure expansion. “Serious” transport science and policy bodies have equally long disputed the existence of such an effect. In the meantime, however, various studies have unambiguously established the connection, and “traffic induction” was adopted as a criterion in the evaluation procedure for the Federal Transport Infrastructure Plan of 2003. An effective infrastructure can be seen as a prerequisite for a functioning modern society. There are, however, many indications that further expansions of infrastructure in highly developed societies already blessed with good transportation routes lead at best to negligible benefits, in some cases even to detrimental effects on regional economic development.

5.1 Induced Traffic

What is induced traffic?

The phenomenon of “induced traffic” finds support in both market economic and transport planning theory. According to economic theory, the demand for a good increases as its price falls. If this statement is true, then transport demands also increase with falling prices, whereby expenditure in terms of time also needs to be factored into the traffic performance

price equation in order to establish the true user costs of transport demand. Transport planning theory in its transport distribution model states a close relation between the chosen destination and the so-called spatial resistance, whereby the latter defines the accessibility of a destination in space from a particular point of origin. This means that, in the calculations of traffic streams, a regional unit (traffic cell) attracts more traffic and traffic from greater distances in inverse proportion to the spatial resistance between the cells. Both theories unambiguously state, then, that improvements in infrastructure lead to additional traffic to the extent to which improved accessibility (reductions in journey times and transport costs) comes with it.

Therefore, if the construction or expansion of infrastructure leads to an increase in traffic levels that would otherwise not have taken place, then it is appropriate to talk in terms of “induced traffic”. This includes

- Additional journeys to new destinations
- More frequent journeys to existing destinations
- Changes in destination and
- Changes in location

Chapter 3.2 described the mechanisms by which falling transport costs influence freight traffic e.g. by expanding the sales market or reducing vertical integration with simultaneous increases in the transportation of part products. Inasmuch as these transport cost reductions can be attributed to infrastructure expansion, then these developments are also a consequence of induced traffic.

Reductions in journey time in certain origin-destination relations due to the construction and expansion of infrastructure are also observable in the area of private travel. The time saved seems to be used for further travel: the actual time spent travelling has hardly changed in years (in this instance one speaks of the constant journey time budget); if anything it has somewhat increased rather than decreased. With improved accessibility, further distant destinations also come within reach and the distances travelled increase (see chapter 1 and Fig. 2.2).

What remains a matter for dispute is whether new transport routes only induce longer journeys or whether additional journeys also come into being. The statistics on private travel show that the number of journeys undertaken per person per day has remained broadly the same since 1976. This indicates that no extra journeys have been induced. Specialist literature, however, also includes in induced traffic those journeys that were formerly undertaken by bicycle or on foot, and which have shifted to cars or public transport (e.g. Heimerl et al. 1993).

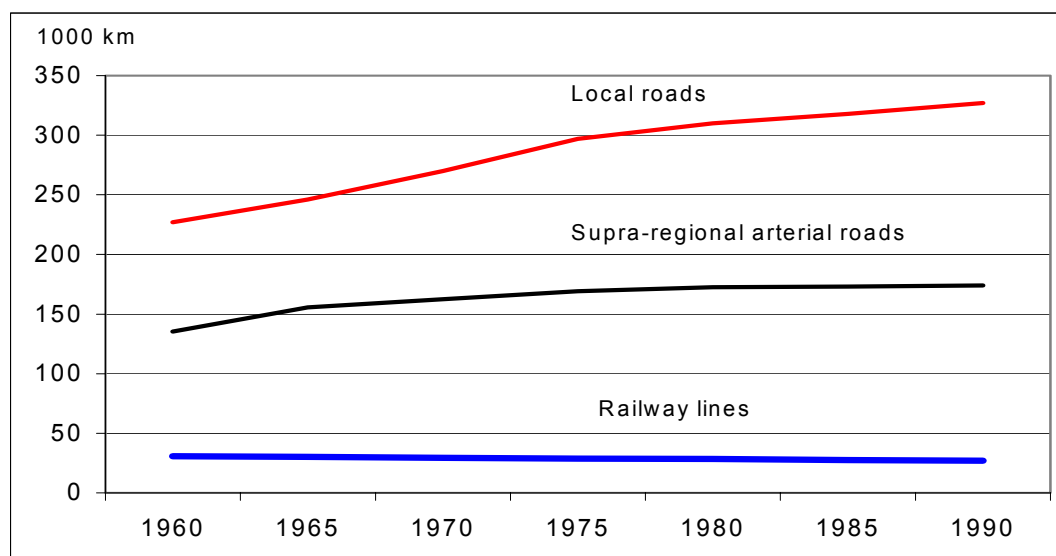
Primary and secondary induced traffic

One talks about secondary induced traffic when improvements in accessibility influence choices of residence or business location, thereby leading to new settlements. Primary induced traffic, on the other hand, is new traffic arising without changes in settlement structure. Private traffic, which arises out of the drifting apart of home and workplace or out of the concentration of retail on “green field” sites, can at least partially be attributed to improvements in infrastructure. So can freight traffic that arises out of the settlement of businesses in areas of better accessibility. If the settlement of a business is just a matter of relocation, then one can only talk of induced traffic if additional traffic is actually generated when observed over a wide area, e.g. because the distances have become greater. Business relocation does always have an effect on *regional* traffic performance, but it does not necessarily impact on *total* traffic performance, as long the increase is balanced out by a corresponding reduction elsewhere.

Induced or shifted traffic

Expansions in infrastructure do not just generate new traffic, but also occasion shifts between transport modes. Such a shift to public transport is particularly desirable, but the reverse trend can instead be observed. A significant proportion of the total shift to motorised road traffic can be ascribed to the constant expansion of the road network. Between 1960 and 1990, the length of supra-regional roads alone in Germany increased by nearly 30%, whereas, at the same time, the railway network lost 12 % of its length. Another 12% of the railway network was lost after 1990, whereas the supra-regional road network increased further.

Fig 5.1 ***Developments of road and railway networks in the Federal Republic of Germany 1960 – 1990***



As a model calculation carried out by the office of Kessel and Partners shows, 100,000 passenger kilometres will be transferred from public transport to the car as a consequence of the construction of the Hamburg port link road A252. This road is intended to connect the two north-south motorways A7 and A1 (Kessel + Partner 1997). If all road building measures contained within the Federal Transport Infrastructure Plan of 2003 are executed, then the railways will lose some 5 million individual journeys per year, which represents 1.5% of their total traffic performance per person (Lohrberg 2003). The projected losses of freight traffic are some 1.9 million tonnes (about 0.5%). Local public transport will also lose out in the expansion of the road network; the losses on some networks could amount to 5% to 8% (ibid.).

Shifts can also occur between individual routes. In order to determine the level of induced traffic, the traffic flow on a new or expanded section of road needs to be balanced out by reductions on other sections. Traffic performance can increase through route shifts if detours made to gain access to faster sections of road are taken into account. This additional traffic performance can also be ascribed to induced traffic. In the investigation into the A252 cited above, changes in route alone account for some extra 450,000 person kilometres daily (Kessel + Partner 1997). These changes in route account for most of the additional traffic performance in the case under investigation.

Scale of induced traffic

Statements about the scale of induced traffic vary widely, according to which infrastructure project is being considered. In the wake of the upgrade to quasi-motorway status of the Rhine Bridge in Karlsruhe, an increase in traffic performance of 2% was measured (Uricher 1990). Large-scale improvements in the Swiss road network led to a 20% increase in traffic levels (Meier 1990). Kessel + Partner summarised the results of their work for the Federal Highway Research Institute (Bundesanstalt für Strassenwesen - BASt) as follows: with respect to the extent of the geographical basis concerned – in the case of urban measures, traffic in the whole city, or in that of new long-distance connections, long-distance transport across the state in question – the proportion of induced traffic in total traffic performance is around 5 to 8% (Kessel + Partner 1997 p.13)..

The OECD has collated investigations into induced traffic from various countries. Its report quotes a study carried out in France, which claimed that a road building project led to a short-term rise in traffic of 20%, and that, after 10 years, traffic levels had risen by as much as 40%. The construction in Norway of a road link between Kristiansund and the mainland induced a similar rise of 20%, most of which was ascribable to commuter traffic (OECD 2001).

The results mentioned above are unsatisfactory in that they do not establish a direct link between the quantity of induced traffic and a quantitative component of the road-building

measure. More recent studies do, however, establish a direct correlation between the journey time saved as a result of a building measure and the generation of additional traffic. A much quoted study by the British Standing Advisory Committee for Trunk Road Assessment (SACTRA) calculates an amount of 5 to 10% additional traffic per 10% of time saved. This corresponds to an elasticity coefficient of -0.5 to -1 (SACTRA 1994). Noland and Lem (2002) report similar results from the USA, with an elasticity coefficient of between -0.3 and -1.1 . Half of these effects can be traced back to changes in settlement structure and is therefore secondary induced traffic. Haag et al. (2000), in a study carried out for the Federal Ministry of Transport, report an equally high correlation between journey time and induced traffic performance. A journey time saving in private traffic of 1 million passenger hours per annum leads to an average increase in traffic performance of 18 million vehicle kilometres (Haag et al. 2000, p.53). The increase is significantly lower in densely populated than in rural areas (ibid.).

It is not just road building, which leads to increases in traffic, but also the construction of railway lines. For example, a significant downturn in retail takings was recorded in the areas adjoining the Munich City railway after its completion, because local residents were driving more frequently into Munich city centre to go shopping. In the case of Hamburg, the extra traffic generated by the extension of the U3 underground line was estimated at 4% of the total traffic in the catchment area, whereby most of the newly generated traffic replaced journeys on foot and by bicycle (Kessel + Partner 1997).

As a preparation for the Federal Transport Infrastructure Plan of 1992, Intraplan Consult (ITP) and the Institute for Applied Transport and Tourist Research (IVT) carried out an investigation on behalf of the Federal Ministry of Transport into the effects of the transport projects German Unity (Verkehrsprojekte Deutsche Einheit) on private traffic (Mann et al. 1991). The destination choice and modal split calculations for the private traffic prognosis for 2010 were made both with and without the German Unity Projects, so that any differences arising could be ascribed to this infrastructure project. The programme envisages new construction and expansion in the road and rail networks of 1,930km and 2,130km respectively. As a consequence of these measures, an increase in private motorised traffic volume (motorisierter Individualverkehr – MIV) of some 13 million journeys, with an associated rise in private motorised traffic performance of 2.4 billion passenger kilometres, is assumed. Expressed as a percentage, this means in terms of MIV a growth in volume of 0.4% and of traffic performance of 0.7% taken across the German road network as a whole. Part of this increase can be traced back to modal shifts away from the railways, which stand to lose 2.8 million passengers in eastern Germany when the figures for the traffic programme German Unity are considered, even though rail connections form part of the programme. The new rail connections cannot compensate for the shift effects generated by new road access.

Wagner et al. (1996) determined on behalf of the Federal Ministry of Transport the scope of the secondary traffic induced by the A81 in the Stuttgart area. The volume of journeys occasioned by the A81 in the area under investigation grew by 22% and the mean distance travelled by 12%. The effects are largely primary induced traffic. Significant changes in population numbers and in the settlement of new businesses can however be attributed directly to the A81. These settlement-structural changes also generally lead to increases in traffic levels. The effects are, however, subject to regional variations, to the extent that both increases and reductions in traffic levels can be observed.

Induced traffic in the evaluation procedure for the Federal Transport Infrastructure Plan 2003

Earlier plans, including the Federal Transport Infrastructure Plan of 1992, assumed constant traffic values for both calculations including the effects of new infrastructure and those not including them i.e. it was assumed that the infrastructure to be built would not have a traffic generating effect. The problem of induced traffic has now been taken into account in the evaluation procedures for the Federal Transport Infrastructure Plan (Bundesverkehrswegeplan – BVWP) for 2003. The Federal Ministry of Transport commissioned a consortium under the leadership of the Steinbeis Transfer Centre (Steinbeis-Transferzentrum – STASA) to develop an evaluation yardstick for induced traffic. The study conducted to that end revealed a close correlation between the car journey time reductions aimed at by the infrastructure measure and the traffic performance in the area under investigation (Haag et al. 2000). The evaluation yardstick for the BVWP procedure is not however based on these empirical results. Only 7.7% of the total car traffic is drawn upon in order to establish an addition factor for mapping traffic induction in the evaluation procedure. The justification for this is that free choice of destination is only a factor for a proportion of the activities that give rise to private travel; as far as work and education-related traffic is concerned, for example, the destinations are fixed from a short or medium term perspective. Induced traffic only therefore enters the equation for leisure and shopping traffic. These do account for nearly 60% of all journeys, but, with recourse to “experience values”, only 5.6% of leisure and 10% of shopping traffic qualify as having a free choice of destination. The experience values mentioned are not confirmed in any sources and also disregard scientific results from abroad, which show that the traffic performance above all in work-related traffic is pushed up by road building projects (OECD 2001 op. cit.). Plausibility considerations would also support the thesis that working people, schoolchildren and trainees also take more distant work places and places of training into consideration if these are more easily accessible.

Induced freight traffic is not taken into account at all in the evaluation procedure. The correlation between the reduced journey times brought about by road building measures and freight

transport performance is admittedly not very pronounced in the investigation carried out by Haag et al. (2000). Against the background of significance of transport costs for the development of freight traffic, however, it would be more plausible to assume the presence of induced traffic. The literature also shows that induced freight traffic is of importance. For example, almost 30% of the traffic induced by the above mentioned link road from Kristiansund to the mainland can be ascribed to goods vehicles. (OECD 2001).

Nor is secondary induced traffic taken into consideration in the evaluation procedure. The investigation carried out by Wagner et al. (1996), which concluded that the secondary induced traffic in the Stuttgart area was only of negligible importance, is used as a justification for this. Other studies, as already indicated, come to very different conclusions. For example, Rodier et al. (2001) show that secondary induced traffic accounts for half of the total of all induced traffic²¹. The investigation carried out by Wagner et al. (1996) also shows very different effects regionally, to the extent that no generally applicable statement can be made on this basis about the scale of secondary induced traffic. It is therefore not justified to leave secondary induced traffic out of the BVWP procedure.

As primary induced car traffic not fully included, and primary induced freight traffic, secondary induced private and secondary freight traffic are not taken into account at all, it can be assumed that the BVWP evaluation procedure hugely underestimates the levels of induced traffic. By the same token, environmental damage caused by the projects is also underestimated.

5.2 Promoting economic growth through infrastructure expansion

Traffic improvements and regional development

An efficient infrastructure is a precondition for a modern society. One significant purpose of infrastructure expansion is therefore generally the improvement of economic performance. Infrastructure upgrading is above all regarded as an instrument for regional development. Doubts, as to whether further infrastructure expansion could have regional development effects worthy of note in economically highly developed countries already blessed with high performance infrastructure, started to be voiced in the early 80s. As early as 1980, the Federal Research Institute for Geography and Regional Development (Bundesforschungsanstalt für Landeskunde und Raumordnung – BfLR)) published a study on the spatial effectiveness of arterial roads, which addressed the question of whether building extra arterial roads could be an effective tool to mobilise development forces in peripheral geographical areas (Lutter 1980). According to this study, each change in the transport network changes the regional

distribution of business locations in the economy as a whole. Amongst the consequences can be the settlement of new or expansion of existing businesses, or equally the closing down and relocation of businesses away from the region, although the actual direction in which the effects lead is basically open. Empirical results confirm these considerations (ibid.). Inasmuch as an effect can be determined at all in individual regions, the direction of that effect is not a uniform one. Thus, in some cases, growth effects were set in train, whereas in others tendencies towards relocation out of the region were simply reinforced.

The either non-existent or limited and patchy effects of arterial road building on regional development were established at this time by other investigations as well (cf. Aberle et al. 1987, Baum et al. 1987). A study carried out on behalf of the Federal Ministry of Transport established, in addition to localised job shifts, both positive and negative nationwide effects on employment as a consequence of investment in transport infrastructure, whereby the realisation of potential was dependent on certain important location factors, such as the degree of industrialisation (Zachcial et al. 1990).

Similar experience was also to be had in the development of the new Federal states (Gather 2004, Schröder 2004). An investigation carried out in Thuringia showed that, whereas the provision of motorway access had demonstrable positive effects on the growth of GDP, this development corresponded with relatively high unemployment and minimal job creation. The commuter balance becomes worse, the nearer one gets to the motorway, i.e. rather than ensuring the creation of job opportunities through the settlement of new businesses, the link is used instead by working people to get access to job opportunities further away. Apparently that higher levels of competitive and innovative pressure alongside motorways compel firms to introduce rationalisation measures, which on the one hand have a positive influence on their productivity and competitiveness, but on the other have negative effects on work and employment levels (Gather 2004). The expansion of road networks also means that places with central regional functions increasingly enter into competition with one another. For example, Nordhausen and Suhl, which are identified in the state development programme of Thuringia as middle-order centres with some of the functions of high-order centres, are placed at a relative disadvantage by the construction of the motorway BAB 38 and the expansion of the B 87. This is because their catchment areas then overlap more with neighbouring middle- and high-order centres (ibid.). A differentiated analysis of the Thuringian data shows that the proximity to urban agglomerations is more important for economic development than motorway access. If this proximity is missing then motorway access alone cannot create a positive economic impulse. Positive economic developments are also to be observed in regions not served by motorways, which are nonetheless in closer proximity to

²¹ quoted from Noland and Lem (2002)

such urban agglomerations. The author therefore concludes that motorways in themselves are neither necessary nor adequate for positive regional development to take place (ibid.).

After having evaluated results from several countries, the OECD working group quoted above states that the effects of infrastructure upgrades on regional development have been relatively rarely investigated ex post and that there are no common investigative standards. On the basis of available data, however, the working group concludes that infrastructure expansion can contribute both to positive regional development and to the emptying of entire regions (OECD 2001). An analysis of the correlation between accessibility and regional economic development in Austria shows that it was the central regions rather than the peripheral ones which benefited from the improvements in accessibility after 1950 (Rau et al. 2003). Last but not least, the EU commission established, in the course of an evaluation of infrastructure projects carried out with the aid of the Structural Funds, that a correlation between a better infrastructure configuration and greater economic power was statistically unverifiable (EU Commission 2000, quoted from Ifo 2002, p.109). The result arrived at by Bröcker et al. (2003) with reference to effects of the trans-European traffic infrastructure projects TEN and TINA was more finely differentiated. Whereas the effects in the "old" EU states were negligible, infrastructure upgrades in the accession states had a clearly defined positive effect. As a general rule, however, enormous investments in traffic infrastructure lead to only minimal increases in GNP (ibid.).

Effects on employment

Infrastructure upgrades create jobs, at first in the planning and construction phases, then in maintenance and operation. In these cases it is not only a question of the workforce required directly for construction, but also of indirect employment effects brought about by the increased demand that arises on the back of salary and wage rises. The region in question does not experience all the job creation effects, because EU competition law dictates the union-wide putting out to tender of all large-scale EU investments. The evaluation procedure for the Federal Transport Infrastructure Planning of 2003 assumes that 940 jobs will be created for every 100 million € invested in the affected regions (Planco et al. 2004). These jobs will however largely disappear again after completion of the projects, whose operation generally requires very many fewer workers. In the case of Federal motorways, the assumption is of 2 jobs per kilometre (BMV 1993); the largely automated new railway line sections require similarly low numbers. Airports and ports, however, do have a much greater need for workers (cf. Gather et al. 2003).

One of the main arguments made for the construction and expansion of motorways in particular is the job creation effect, which reaches beyond construction and operation alone. The evaluation procedure for the Federal Transport Infrastructure Plan (BVWP) of 1992 assumed

that, for every kilometre of new motorway, 8, or in the new Federal states up to 24, jobs would be created in the region in question. The reworked evaluation procedure for the BVWP of 2003 no longer estimates the job creation effect on the basis of additional length, but rather on that of improved accessibility, by which regional location factors also come into the equation (BMVBW 2002a). The procedure described in PLANCO (1999), however, leaves several questions unanswered. Above all, the empirical determination of the correlation between transport link quality and unemployment excludes the results from eastern German districts, because in these cases the rate of unemployment rises with link quality rather than falling. Justification for this approach is made in the assertion that adaptation problems associated with the change of systems came to the fore, thus masking the true state of affairs. The results of international investigations described above, which would seem to make a case for a much more cautious evaluation of the actual situation are not taken into account by PLANCO. The calculation coefficient for the job creation effects of BVWP measures is therefore exclusively restricted to surveys made in the western German districts. Here too, however, the regression coefficient is very low and statistically only barely confirmed. It can be assumed that a significant variance lies concealed behind this relatively low coefficient, which would reveal not only negative but also positive effects. In the face of the aforementioned studies, which show that infrastructure expansion leads not only to job creation but also to worker exodus, an average determination of regression cannot meet scientific standards. The data should rather be categorised according to positive or negative reactions. The BVWP evaluation procedure reinforces the misinterpretations arising out of the average determination by giving extra weighting to the usefulness of transport route investment in structurally underdeveloped regions is again given. This is despite the fact that the literature on the subject rather gives rise to the expectation of negative results for underdeveloped regions in the first place. It also needs to be stated as a matter of principle that the regression procedure carried out as cross-sectional analysis has nothing to say about the extent to which jobs are created or move from worse to better served areas. In addition, falling unemployment rates, by which success is measured, could just as well be the result of intensified commuting out of, or relocation away from, the region on the part of the working population, as that of an improved employment scenario. What is also not taken into consideration here is the potential job creation effect of using the money allocated to the infrastructure expansion project for other purposes (OECD 2001).

The procedure that has been developed is therefore for the above reasons not suitable to evaluate the effects of the BVWP on regional jobs markets.

5.3 Conclusion and action required

The expansion of infrastructure gives rise to one, thus far insufficiently considered, traffic generation effect. The original hope of easing traffic congestion through infrastructure expansion has proved to be illusory. According to Noland and Lem (2002), 15% to 20% of traffic growth in the USA and the UK can be ascribed to induced traffic. It can be assumed that induced traffic in Germany is of a similar order of magnitude. Federal Transport Infrastructure Planning has long neglected induced traffic and still fails to accord appropriate significance to it.

The shaping of future infrastructure development represents a powerful, but so far under-exploited, Federal instrument for influencing traffic growth, which could be used to achieve the sustainability targets of the Federal government: reductions in transport intensity in relation to GDP, the doubling of rail freight traffic volume, and an increase in the share of inland waterway transport by 40% (Federal Government 2002, 2004).

The basis of the traffic prognosis in the Federal Transport Infrastructure Plan 2003 is an infrastructure network for the basis scenario without measures, including projects, which can be put into effect by 2015 (BMVBW 2002a). Thus investments yet to be made of 24.7 billion € for road, 17.9 billion € for rail, and 4.4 billion € for federal inland waterway expansion already form the basis of the prognosis. This means that part of the traffic, which will be induced by infrastructure expansion projects identified in the BVWP 2003 is already contained in the prognosis. Exactly which part is unfortunately not made clear, nor is the amount of additional traffic that will be induced by the whole programme. It would be expedient to place the Federal infrastructure plan under scrutiny in order to guarantee an appropriate consideration of the induced traffic factor. The prognosticated traffic performance with the planned measures could then be compared to that without them (see the calculations of ITP/IVP for the transport projects German Unity, Mann et al. 1991).

Additional traffic especially needs to be taken into account in its entirety with reference to anticipated regional planning procedures and to the assessment of projects, for which a particular ecological planning application is made.

All modal shift effects, particularly those of road building on the total traffic quotas of rail, inland waterway, and local public transport, also need to be identified. This is a necessary precondition if the aims of the Federal government's sustainability strategy are not to be thwarted. The aim of doubling rail freight transport with the help of a targeted expansion of the railway network would only be realistic if a similarly targeted scaling back of road-building projects were undertaken.

In the case of all scheduled road-building measures, the question needs to be asked whether existing or predicted capacity bottlenecks might not better be alleviated through the expansion of rail services, settlement planning, or other non traffic generating measures.²²

The assessment of advantages to be derived from infrastructure expansion must be geared more strongly to its national economic and social effects. In the cost-benefit analysis of the evaluation procedure for Federal Transport Infrastructure Planning, the benefits are primarily assessed in terms of the sum of time saved by individuals. Although the strengthening of economic locations is the professed aim of the Federal Transport Infrastructure Planning, its effects on economic power are not investigated at all and those on employment inappropriately assessed. An appropriate evaluation procedure must make allowances for regionally specific differences in the effects of infrastructure expansion on regional development. To this end, reliable criteria need to be worked out to show in which contexts infrastructure expansion is a necessary precondition, under which conditions it can promote regional development, and under which conditions counter-productive effects can be expected. In order to maximise positive micro-economic effects and to guarantee the efficient use of budgetary means, each project should be tested as to whether more success might be had through alternative investments.

Environmental policy goals must be borne in mind in the further updating of Federal Transport Infrastructure Plans. The UBA has suggested redefining the BVWP in terms of Federal transport development planning and has made a concrete process proposal (Köppel et al. 2004, Gühnemann et al. 1999), which is oriented towards the demands of Strategic Environmental Assessment (Strategische Umweltprüfung – SUP). The procedure is intended both to develop scenarios in accordance with overall aims, and to demonstrate the traffic-related and environmental effects of the whole transport network, rather than, as has always been common practice, just of individual routes. The long-distance transport concept would be adapted to the aims in various steps, with reference to the effects at each stage. In this way, unwanted side-effects, such as induced traffic, could be seen in their full scope early on, which would enable political counter-measures to be developed on the conceptual level.

6. Summary of results

A continuation of the trend of uninterrupted traffic growth would make it more and more difficult to find solutions to significant environmental policy questions, such as climate protection or the reduction of land area use. Settlement patterns and the increase in integrated trade, as well as changing lifestyles and infrastructure expansion have heavily influenced traffic

²² cf. Article 11 of the Traffic Protocol of the Alpine convention

growth in recent decades. Measures, which work directly on these traffic determinants, can therefore influence traffic generation.

A structured settlement development policy is a necessary precondition for stemming the growth of traffic without restricting mobility. Multifunctional cities, which serve not only as places to work and shop, but also again increasingly as places to live, represent a rewarding model for the promotion of urban development. Densely populated, mixed-use settlement structures, which, in spite of their density, maintain recreational areas and offer local excursion destinations, and an urban model organised around individual district centres, offer the best conditions for traffic reduction. Tax incentives could help reduce the amount of virgin land exploited for settlement purposes, promote the reuse of fallow areas, and increase construction density. A conscious settlement policy and inter-regional planning are also required to consolidate commercial and residential building areas, to keep nature areas and landscapes free of construction, and, for example, to attract businesses, which help to reduce the supply routes for existing companies by acting as suppliers or customers. A targeted settlement planning policy oriented towards traffic reduction would be greatly expedited by round-table discussion between all the players, with the guidance of experts, in the concrete planning process.

In the arena of freight traffic, a relatively large traffic reduction potential could be realised in the diminishment of intra-industrial trade i.e. trading products of similar nature. In question are goods, which are practically interchangeable and whose physical characteristics or production methods are only minimally distinguishable. The skills are already on hand in the regions in question to produce the traded goods themselves, and no one region can produce them significantly more cheaply. For this reason, this trade segment may well react especially strongly to changes in transport costs.

The support of regional marketing could equally make a contribution to a reduction in transport distances. The possibilities of improving efficiency by means of modern logistics have also not yet been exhausted. Environment and economy could both profit from this.

Many decisions taken by the state have an unintended traffic generating effect. A systematic examination of laws and ordinances with respect to their traffic-related effects would make undesired side effects visible. This would apply to all areas, but most particularly to infrastructure expansion, because this contributes significantly to traffic growth. The evaluation procedures currently used give no information as to the scope of additional traffic generated by infrastructure expansion. Nor are the procedures used able to predict whether the expansion of traffic infrastructure promotes or inhibits the economic development of a given region.

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