

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT



# Managing the Fundamental Drivers of Transport Demand



## EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT)

The European Conference of Ministers of Transport (ECMT) is an inter-governmental organisation established by a Protocol signed in Brussels on 17 October 1953. It is a forum in which Ministers responsible for transport, and more specifically the inland transport sector, can co-operate on policy. Within this forum, Ministers can openly discuss current problems and agree upon joint approaches aimed at improving the utilisation and at ensuring the rational development of European transport systems of international importance.

At present, the ECMT's role primarily consists of:

- helping to create an integrated transport system throughout the enlarged Europe that is economically and technically efficient, meets the highest possible safety and environmental standards and takes full account of the social dimension;
- helping also to build a bridge between the European Union and the rest of the continent at a political level.

The Council of the Conference comprises the Ministers of Transport of 42 full member countries: Albania, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, FYR Macedonia, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom. There are six Associate member countries (Australia, Canada, Japan, Korea, New Zealand and the United States) and two Observer countries (Armenia and Morocco).

A Committee of Deputies, composed of senior civil servants representing Ministers, prepares proposals for consideration by the Council of Ministers. The Committee is assisted by working groups, each of which has a specific mandate.

The issues currently being studied – on which policy decisions by Ministers will be required – include the development and implementation of a pan-European transport policy; the integration of Central and Eastern European Countries into the European transport market; specific issues relating to transport by rail, road and waterway; combined transport; transport and the environment; sustainable urban travel; the social costs of transport; trends in international transport and infrastructure needs; transport for people with mobility handicaps; road safety; traffic management; road traffic information and new communications technologies.

Statistical analyses of trends in traffic and investment are published regularly by the ECMT and provide a clear indication of the situation, on a trimestrial or annual basis, in the transport sector in different European countries.

As part of its research activities, the ECMT holds regular Symposia, Seminars and Round Tables on transport economics issues. Their conclusions serve as a basis for formulating proposals for policy decisions to be submitted to Ministers.

The ECMT's Documentation Service has extensive information available concerning the transport sector. This information is accessible on the ECMT Internet site.

For administrative purposes the ECMT's Secretariat is attached to the Organisation for Economic Co-operation and Development (OECD).

*Publié en français sous le titre :*

**Gérer les déterminants de la demande de transport**

Further information about the ECMT is available on Internet at the following address:

**[www.oecd.org/cem](http://www.oecd.org/cem)**

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## FOREWORD

The Seminar *Managing the Fundamental Drivers of Transport Demand* was organised by the Belgian Presidency of the ECMT in order to prepare the ground for a debate between Ministers on sustainable transport policies at the 2003 Council of Ministers. This meeting marked the 50<sup>th</sup> anniversary of the Conference and was a time for taking stock of achievements and looking forward to the key challenges for transport policy in the coming years. The contribution of the sector to more sustainable development is clearly a major part of that challenge. The conclusions of the seminar completed the dossier for Ministers on integrated transport and environment policy, complementing conclusions on the reform of transport charges and taxes and recommendations on integrated assessment and effective decision making support, which lies at the heart of more integrated policy making.

The seminar worked to an agenda set by the Federal Minister for Mobility of Belgium, asking sharp questions about the need for practical policy advice. Ten technical presentations were given by transport specialists, covering freight and passenger transport, spatial planning, logistics, pricing, appraisal and implementation issues, including in transition economies. Following extensive discussions, tentative policy conclusions were presented, discussed and then amended. The version presented to Ministers concludes this report.

The following points were highlighted for Ministers.

- Demand management is necessary for making economies more effective, reducing environmental damage, and improving the quality of life. There are practical and proven methods of achieving it, using pricing, planning, market and political levers. It is important that these levers should all be used in combination, and should be consistent with each other for full effect.
- The expert community is convinced of the value of demand management measures. A small number of cases of good practice were identified in integrated transport and land use planning and charging for the use of infrastructure. The time has come for implementation of demand management policies on a much wider scale.
- Failure to grasp the opportunities for managing demand will undermine the value for money and effectiveness of infrastructure improvement and lead to increasing congestion and environmental damage.

The ECMT is grateful to all the speakers for their contributions to the seminar. Their papers are reproduced here and their presentations can be consulted at the web site <http://www.oecd.org/CEM/topics/env/Brussels02.htm>. In a few cases, maps and particularly complicated graphics are available only on the web site. The Secretariat is particularly grateful to the seminar *rapporteur*, Phil Goodwin, for developing conclusions that draw out the main themes from the discussions as well as from the papers presented.



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## ***Introduction***





## **THE POLITICAL AGENDA**

**Belgium's Federal Minister for Mobility, Deputy Prime Minister  
and President in office of the ECMT, Isabelle Durant  
Belgium**

### **Introduction**

We have to face the facts and accept that action needs to be taken upstream if we want to reduce the adverse impacts of transport. The forecasts remain worrying.

- The latest White Paper from the European Commission<sup>1</sup> informed us that by the year 2010 aggregate demand for transport will grow by 30%; between 1990 and 2010, road transport in a “business as usual” scenario will have increased by 50%, and the forecasts indicate that this growth will apply to both the overall volume of transport and its intensity in terms of number of kilometres travelled and tonnes transported.
- A victim of its own success, transport demand has outpaced growth in GDP in most EU Member States since the late 1980s, particularly in the freight sector. This trend will accelerate on the accession of new Member States to the European Union.
- At the same time, the “collateral damage” from this trend is increasing: CO<sub>2</sub> emissions from the transport sector, which already account for almost 30% of all emissions within the European Union, are set to grow by a further 40% by the end of 2010.
- In terms of congestion, according to the White Paper, “10% of the road network is affected daily by traffic jams” and “traffic forecasts show that if nothing is done, road congestion will increase significantly by 2010 [...] costs attributable to congestion will also increase by 142% to reach EUR 80 billion a year, which is approximately 1% of Community GDP”.

There are countless other examples one could cite, but is this spiralling growth in the number of trips and the cost of transport movements really unavoidable?

Could we not attempt to restrain transport demand upstream, rather than seeking, not always successfully, to limit the resultant damage. If so, how and under what conditions?

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1. European Transport Policy for 2010: Time to Decide, COM (2001) 370.

## **1. A politically controversial issue**

Being completely overwhelmed by the scale of the task with which we are faced, transport authorities attempt to treat the symptoms without paying enough attention to the underlying cause of our misfortune.

However, as long as the efficiency gains we have achieved through modal transfers, technological progress or other solutions continue to be neutralised by increases in the volume of transport flows, we will never be able to do more than marginally alleviate the adverse impacts of transport.

- Despite the introduction of fuel-efficient engines, air pollution continues to rise because energy savings are cancelled out by growth in the size of the vehicle fleet and number of kilometres travelled.
- In early December EU Ministers for Transport decided to reorganise the sky over Europe to avoid air congestion; traffic is nonetheless expected to grow exponentially. Despite the difficulties that the air transport sector is currently experiencing, the entry into the sector of budget airlines has boosted demand far beyond the forecast levels.
- While governments and public opinion alike have expressed indignation at the pollution of the Spanish coastline in Galicia and European Ministers have stepped up the introduction of double-hulled tankers, our dependence on petroleum products continues to grow.

This issue is one that has been thoroughly examined from a theoretical standpoint. The time has now come to take action, which is easier said than done.

To say that we want to improve the “management of transport demand” is, in political terms, a highly fraught proposition. Some commentators have taken it as a curb on the freedom of citizens and enterprise, and as an unacceptable step backwards or even as social discrimination against the working class.

Mobility, which is a term which has been included the name of this Ministry and which we want to promote in all its guises, is ultimately a positive value that is synonymous with freedom and the advancement of all. Anything which might be construed as a constraint on mobility would therefore be equivalent to a curb on freedom.

However, there can be no freedom without duties and no guarantee that the freedom that some enjoy will not encroach upon that of others. We are clearly reaching the stage where we need to plot a better course for transport demand in order to reduce its adverse impacts. We need to introduce rational mobility.

The aim is therefore not to impose limitations on the mobility of persons and goods, but to maintain the conditions necessary for the harmonious and sustainable functioning of our societies.

Yet there is a clear lack of political commitment to this issue, which in our view fully justifies the organisation of this seminar and the inclusion of this item in the agenda for the ECMT Ministerial Session next April:

- For example, the White Paper issued by the Commission, despite a forward-looking analysis and constructive proposals, merely paid lip service to the issue of demand management.
- The possible severing of the link between growth in the transport sector and growth in the economy is almost routinely rejected by certain delegations to the EU Council, as we witnessed at the last Council meeting on “transport”.

Another factor, which partly explains such reluctance to address this issue, is that transport authorities alone do not have all the powers required to modify the upstream determinants of transport demand.

Even though such a prospect may dampen the ardour of many, we need to co-ordinate the actions of the authorities responsible for transport, the economy, territorial development and the environment, and we need to do this at all levels of government.

It should be noted that the 2<sup>nd</sup> report on the economic and social cohesion of the EU emphasised the need for such interlinking of policies, notably through the concept of territorial cohesion.

## **2. Policy expectations with regard to the seminar and the Ministerial Session**

We are therefore faced with a central issue, whose resolution requires squaring the circle:

- The legitimate aspiration of citizens and economic forces to mobility subject to as few constraints as possible.
- Diverging priorities at the competent levels and sectors of government.
- The structural requirement for control over the impacts of mobility on the economy, the environment and health.

After taking due account of the political and conceptual reservations held by certain among you, I therefore hope that today you will be able to put forward realistic recommendations and, ideally, an action plan to bring to the attention of the authorities with the requisite power to act upon the determinants of transport demand.

We do not want simply to rehearse the theoretical wish-list we all know so well, nor is it relevant to propose attractive, but ultimately ineffective, “simple fixes”. It would indeed be better to define three practical actions that take account of the realities of the political and institutional context in which we operate, rather than draw up an academic “shopping list” which would secure a consensus but which would inevitably be ranked “vertically”.

The challenge is a mighty one in that, above and beyond the consensual debate on “sustainable” transport, the aim is to reconcile in practical terms the right to mobility, economic efficiency, the personal safety of all and protection of the environment. This is where our basic political expectations lie.

In order to steer policy action in this direction, we must therefore determine how to avoid creating unnecessary transport demands that are of benefit neither to the economy nor to ordinary citizens and the environment.

We have all heard stories about consignments of shrimps, potatoes or yoghurt wending their way around Europe, not always, as I'm sure you will agree, by the fastest or shortest route, before they finish up in our plates.

It is with this in mind that this seminar is resolutely directed towards finding "policy solutions" and to their "implementation".

To facilitate the task of identifying the operational recommendations which will provide the basis for discussions among the 48 Ministers of Transport that will meet in Brussels on 22-24 April, the Ministry ended by asking Seminar participants to focus attention on the following ten specific questions:

1. Are we locked into an irreversible process of continual growth or can we hope to "influence the determinants of transport demand"?
2. What are the main determinants of transport demand that can most effectively be influenced by our actions?
3. Accordingly, and this is the central issue in this seminar, what are the most appropriate policy instruments to use in order to influence these determinants positively?
4. Would separate instruments be required for passenger and freight transport?
5. As we await a series of proposals from the Commission on the pricing of transport infrastructure and automatic tolls, how can infrastructure pricing and taxation help to rationalise transport demand and under what conditions?
6. What lessons in this respect can we learn from initial experiences with mileage-based road charges.
7. How can we secure acceptance for and facilitate the introduction of measures proposed by different competent authorities, at what level are their actions most effective, and how can the work of the authorities concerned be co-ordinated?
8. Regarding the actors in the field, what specific actions could be taken to encourage less "mileage-intensive" forms of behaviour in terms of movements and lifestyles? What action should be taken in terms of communication, education and public information?
9. What possible distinctive characteristics of the economies in transition should be taken into account in the context of enlargement of the European Union and, more generally, in all European countries as a whole?
10. What instruments need to be developed to monitor our progress towards better management of transport demand?

*Part I.*

**DRIVERS OF TRANSPORT DEMAND**



## **FREIGHT TRAFFIC**

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### **1. Introduction**

Freight travel demand has not been the subject of the degree of research interest accorded to passenger travel demand. Essentially it had been regarded as the classic case of derived demand and hence good economic forecasting of output would lead to an adequate basis for traditional “predict and provide” transport policy. That has changed over the past 10-15 years, especially in Europe, where we have witnessed a much faster growth in freight traffic, and particularly in road freight traffic, than in output. This has occurred at the same time as sustainability concerns over the transport intensity of the economy were beginning to seek a “decoupling” of traffic growth from economic growth; how to reduce traffic growth without inhibiting economic growth. Once we start to investigate this issue we have to recognise that freight transport demand is much more complex than the simple derived demand model, and freight transport modelling has been struggling to catch up. The essence of any such model is that it has to recognise transport as one element, not just in the overall logistics of production, but in the overall production process. It is intimately related with decisions on where to locate production, but also with decisions on how to produce.

In this paper we identify the main elements of this approach. First, we need to address the problem of what to measure as changing economic and spatial structure make reference to traditional tonnes lifted and tonne-km transported more difficult to interpret. Secondly, we review the background to freight transport modelling in more detail before looking at the question of decoupling in aggregate models. Subsequently we examine the key questions of sectoral and spatial desegregation and the way in which the competitive structure of transport-using industries affects transport demand and the valuation of transport improvements.

### **2. The Metric of Freight Transport Demand**

What do we need to measure as freight transport demand? There are four basic dimensions, each of which has a use in different situations: tonnes, tonne-km, value of the goods carried and the value of the transport services provided. In terms of the conventional measure of benefit to the economy we are primarily interested in the value of the transport services provided, this is what the consumers are purchasing and it is changes in the cost of this service which will induce consumers to change their demand. The problem is that conventional national accounting measures of transport services provide poor estimates of this because of the under-recording of transport on own-account and the distortions due to competitive pressures in different markets.

The value of the services provided only make sense in the context of the value of the goods moved. We also face the problem here that the value of the goods moved is measured in terms of the prices at which those goods are sold. This again depends on the competitive structures of the markets for those goods and there is unlikely to be a stable relationship to traffic generation.

In terms of the prediction of the volume of freight traffic we are more interested in the tonne-km generated since this reflects both the weight of goods and the length of haul. From the point of view of the impact of freight on total traffic volumes, and the impact on congestion, road damage etc, it is of less concern how valuable a cargo than understanding the potential damage it may cause. Tonne-km is an awkward measure, however, since it can be pulled in different directions by similar changes in underlying demand. For example, the trend towards more footloose industries producing less bulky goods in an integrated global market simultaneously decreases the volume of freight to be carried whilst increasing the distance it is carried. Ideally we need to know the separate impact on both dimensions, thus it is useful to be able to predict both tonnes and tonne-km as measures of freight demand.

In intra-EU trade, road carries some 44.5% of total tonnes but 61.5% of trade by value. An average road cargo is valued at €1 674/tonne compared with €924/tonne for rail freight and €87/tonne for inland waterway traffic. In total intra-EU traffic road carries 80% of total tonnage but 44% of tonne-km since an average haul by road is 110 km against 245 km by rail and 280 km by inland waterway. Only a 4% of road traffic tonnage is international traffic, compared with 20% of rail traffic and 50% of inland waterway traffic, but in terms of tonne-km it is 20% of road traffic, 45% of rail traffic and 75% of inland waterway traffic. At the other extreme, 59% of road tonnage (12% of road t-km) is carried less than 50 km and only 3% of tonnage (but 20% of t-km) is carried 500 km or more.

### **3. The Background to Freight Transport Forecasting**

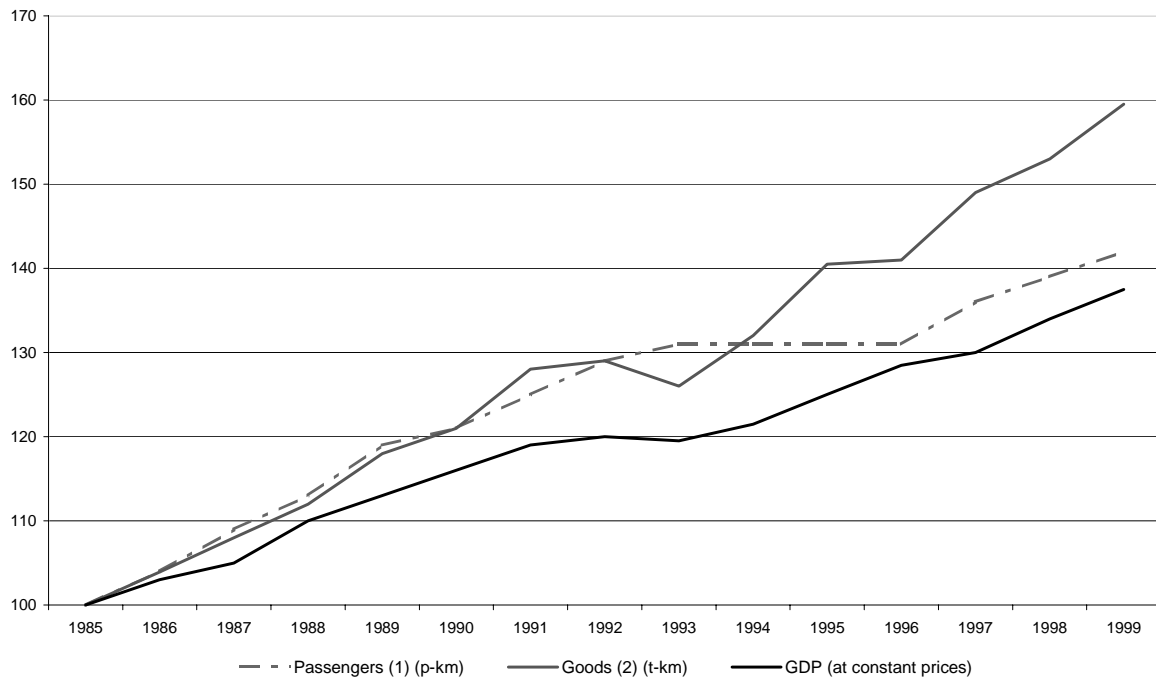
Traditionally freight transport forecasting has been the poor relation of the traffic forecasting business. Two reasons can be advanced for this:

- For a long time aggregate freight transport in terms of tonne-km bore an extremely stable relationship with GDP such that forecasting the growth of the latter would give a fairly robust estimate of the former with an elasticity typically just under unity.
- Secondly, the main requirement of traffic forecasting was to deal with problems of urban peak road traffic in which freight played a relatively minor part.

Both of these factors have changed over the past 10-15 years. From the late 1980s in Europe freight traffic in terms of tonne-km began to grow rather faster than GDP (Figure 1). This may be associated with a number of factors, relating both to the characteristics of the production process and the market for transport services, which we shall explore in more detail below. Although total traffic grew at this faster rate, the on-going modal shift from rail to road added to this and hence road tonne-km grew at an even more alarming rate (for a more detailed discussion see Vickerman, 2002a).



Figure 1. **Transport and GDP Growth, EU-15**



*Notes:* (1) Passenger cars, buses and coaches, tram and métro, railways, air.  
 (2) Road, rail inland waterways, pipelines, sea (intra-EU).

*Source:* European Union Energy and Transport in Figures, 2001, DG TREN.

This more rapid increase in freight traffic growth occurred at around the same time as the completion of the basic national motorway networks in a number of countries and the onset of a period of greater budgetary restraint, coupled with growing concerns over the sustainability of continued infrastructure growth, which led to a substantial reduction in the rate of road building. This has shifted the focus of congestion in a number of countries away from urban areas to the main inter-city routes which now routinely, if unpredictably, suffer from delays. This affects freight transport and, because freight is a larger proportion of traffic on such roads, this attracted greater attention as the growth of truck traffic was increasingly seen to be a cause of the problem.

Most models start from a potential volume of freight to be forwarded, which is then distributed between the various modes, according to the performances of the modes in terms of cost, time and reliability. Route choice is usually preceded by a phase in which the number of tonnes is translated into the number of vehicles, generally through a simple ratio. These kinds of models are used in particular in multi-regional models; trade between regions is modelled through distribution models linking the share of one region in the imports or exports of another one to the accessibility of the regions.

More sophisticated models integrate several of these steps, for instance through a nested model, which is a better way to take into account the fact that freight transport is just one part of the total logistics policy of a firm, including the management of inventories and the size and frequency of

shipments. This requires desegregated models. But even if they are more satisfactory in terms of explanatory power, they are more difficult to use for forecasting, because they need a lot of input data at the level of the firm, data which are often not available.

Regional models analyse generation and distribution together using regional input-output matrices. Here the demand of one region for a particular product is satisfied by “domestic” production and “imports” from other regions. The transport flows implied by the satisfaction of these demands can be modelled by logit models which use information on the prices of production in each region and the costs of transport between the two regions. Again we face the problem, however, of the basis on which to convert either value or physical flows into truck loads and hence traffic flows.

Modal split models use the value of time for freight as an input parameter. This parameter can be estimated by procedures, which are quite similar to those used for the determination of passenger value of time and based on desegregate survey data from shippers. Both opportunity cost methods and revealed or stated preference methods have been used. These reveal implicit values of time orders of magnitude higher for freight carried by road than for that carried by rail, reflecting the typically higher value of the goods carried. Average values of time may not be as important as the probability of delay and the risk of loss or damage.

Increasingly, it has been recognised that the transport element in the movement of goods is only one part of total logistics (see McCann, 1998, for a detailed discussion). Thus understanding the transport drivers needs also to take into account the way firms organise their operations, the location of both production and distribution facilities, the sourcing of inputs and the serving of markets. Firms may thus decide to substitute cheaper transport for more expensive inputs such as land and labour. Thus, for example, inventories are reduced in favour of regular (just-in-time) deliveries, labour intensive processes are relocated to lower wage peripheral regions.

Although the pure transport cost element may be a relatively small part of the total logistics costs it can still be a significant determinant for two main reasons:

- The unpredictability of the transport cost element for reasons outside the firm’s control, due to unreliability, can lead to sub-optimal locations and larger inventories as a precaution.
- Reorganising a firm’s total logistics operation in response to a change in transport costs may be costly and time-consuming. Considerable inertia may build up before a firm finds it worthwhile to change its pattern of transport demand whilst a relatively small change may have a disproportionate impact. Such discontinuities are difficult to model.

#### **4. Decoupling in Aggregate Forecasting**

Concerns over the rate of freight traffic growth, especially that of road freight traffic, have led to arguments in favour of policies to ensure “decoupling”, i.e. changing the underlying nature of the relationship between the economy and freight transport. It was argued above that, for a long period, aggregate freight traffic, in terms of tonne-km, was relatively easy to model in relation to GDP. A change in this relationship, a decoupling in the opposite direction, appeared to have occurred in most European countries in the late 1980s; a change which is more pronounced than any such trend in the US. It is tempting to associate this change with the greater integration of the EU economy following the Single European Act of 1987 which heralded the completion of a single market. Certainly the degree of regional specialisation in the EU prior to this was much less than that in the US

(Krugman, 1991) and this would imply more localised (national) markets and consequently the lower level of transport intensity observed in the EU.

We have to be careful in this interpretation, however, since the transport supply conditions were also very different in the US, longer average distances between major urban centres, a complete Inter-State highway network, lower fuel prices, a deregulated and more competitive freight transport industry for both road and rail.

However, it would still be possible to argue that the decoupling between GDP and freight transport growth observed was an adjustment and not the start of a new trend relationship. The problem is that other approaches to forecasting the relationship between infrastructure/transport growth and GDP growth also need to be considered to explore whether they offer any reliable basis for forecasting.

Three basic approaches have been used:

- The growth accounting approach assumes a simple aggregate neoclassical production function relationship between inputs (labour, capital etc) and output. Hence observed growth in output can be ascribed to the growth in capital and labour inputs and the residual (unexplained) growth in output, total factor productivity, to other factors. Since total factor productivity is a major component of growth, especially during periods of faster overall growth, it is quite easy to produce a strong association with other factors which are also growing strongly at the same time. Hence, for example, Baum and Kurte (2002) claim that, without the transport growth which occurred over the period 1965-90, labour productivity in Germany would have been about 20% lower and overall GDP about 25% lower. This assumes, however, that the resources used in transport could not have been used in an (at least) equally effective way. It would be equally possible from this approach to associate the growth in GDP with other factors which showed strong growth during this period, such as health care or education. Although this is an interesting way of decomposing growth into its broad component parts we have to be very careful in interpreting the results in the absence of a clear underlying theoretical model.
- The aggregate production function approach does achieve this requirement of using an underlying theoretical model in which the production function is estimated directly using either cross-section or time series data. Cross-section studies tend to be performed at the regional level and thus allow some comparison of the trajectories of different regions on the basis of their infrastructure. Aggregate production function approaches do have limitations, however: the need to specify the function form - most use Cobb-Douglas or constant elasticity of substitution (CES) functions; the measurement problem – most studies use a measure of the stock of infrastructure in value terms, when the real interest is in the flow of services from the infrastructure and there are problems in assuming that the prices at which infrastructure is provided give an accurate indication of its opportunity cost. A large number of studies has been carried out with a variety of results (see SACTRA, 1999; Lakshmanan and Anderson, 2002, and Button et al, 2002, for reviews). Most produce positive elasticities of output with respect to various measures of transport infrastructure or services, but these estimates range from high values of around 0.5 to less than 0.1. The conclusion we can draw from these studies is that transport has a generally positive impact on economic growth in the aggregate, but that this is neither overwhelmingly large, nor certain.

- The productivity gain approach assumes that any improvement in transport can be regarded like an increase in productivity since by saving time users of the transport system, for both business and pleasure, can use that time more productively. This would particularly be the case for freight where faster operations increase the productivity of both vehicles and labour. Assuming that this saving of time can be given an equivalent productivity value, this saving can be fed into a standard macroeconomic model of the economy to explore the impact on overall GDP and other parameters of the macro economy. Such an approach was used to estimate the impact of the transport TENs programme on the EU economy (European Commission, 1997). The difficulties with this approach are: first, the measurement of the equivalent productivity gain – it is tempting to assume that time is valued at the opportunity cost of working time, but the behavioural evidence from transport studies suggests that this would overvalue time savings even in the course of work; and secondly, that the macro model can produce sensible impacts unless it has a feedback to the underlying transport model allowing, for example, for induced traffic.

The basic conclusion from this discussion is that aggregate forecasting models tend to be limited by their assumption of a given set of relationships, both of transport to the factors from which its demand is derived and of the aggregate economy to improvements in transport. In practice transport is changing rapidly, both in the use being made of transport and of its impact on the overall economy through the ways users respond to changes in transport provision. This requires us to look at a more desegregated structure for understanding the transport demand problem, both by sector and by location.

## **5. Sectoral and Spatial Desegregation**

There has been a substantial change in both the sectoral and geographical distribution of industries generating freight transport demand. This applies both to international trade and to domestic freight movements (see Vickerman, 2002b for a more detailed discussion).

The main change has been the falling share of industry in national output with a corresponding rise in the share of services and particularly financial services. For example in the UK industry's contribution to GDP fell from 37% to 27% over the period 1980-1995 and services increased from 61% to 71% with financial services increasing from 16% to more than 23%. In Germany the fall in the share of industry was from 43% (West Germany only) to 31% (including the new Länder) and the increase in services from 55% to 68% (Sharp, 1999).

Within the industrial sector as a whole there were also substantial changes in composition. Fast growing industries include plastics, electrical machinery, chemicals and scientific instruments whilst the slowest growing industries include textiles, iron and steel, coal and petroleum, wood products. All of this reinforces the view that the transport intensity of industry in terms of tonnes lifted has fallen substantially with the move to lighter, less bulky and higher value products, although the need for larger markets and the smaller share of direct transport costs has often raised the average length of haul, and hence tonne-km by more.

By mode there are some notable differences in traffic composition. Agricultural products, which require specialised transport and reliability account for 32% of all tonne-km by road (but only 12% of rail traffic). On the other hand coal and other mineral fuels and petroleum and petroleum products each account for 10% of rail traffic, but 1% and 5% respectively of road traffic.

The changing spatial distribution of industry is more difficult to assess. However, evidence on the spatial concentration of industry in the EU (Amiti, 1998; Brühlhart, 1998a, b; Braunerhjelm et al, 2000) shows that there has, especially during the 1980s and 1990s, been a gradual increase in the geographical concentration of industries and sectoral specialisation of regions in the EU. The fastest concentration has been generally in the fastest growing industries and thus this has a tendency to reinforce the increasing transport needs of the economy.

## **6. Freight Transport, Logistics and the Competitive Structure of Transport-Using Sectors**

Transport is only part of total logistics costs. According to data reported in DETR (1999) it accounts for around 36% of logistics costs on average in the EU, although there are considerable variations with the figure in Germany being around 30%, in the UK around 38% and in France over 50%. Throughout the period of relative increases in transport intensity there is evidence that the ratio of stocks to turnover has fallen considerably from around 14% to 10%. Interestingly the rate of growth of light goods vehicle traffic has been stronger than that of all freight traffic. This is slightly difficult to interpret as vans are used for service provision and personal transport as well as goods transport, but it is consistent with several changes in the pattern of logistics including the move to home delivery through an increase in mail-order and internet shopping.

The key driver here is the substitutability of transport for other activities in the logistics chain, and this applies not just to the *transport* logistics chain (how goods are moved from place of production to place of distribution to customer) but to the *total* logistics chain (how and where goods are produced, inputs sourced, markets sought etc.). Relative falls in the cost of transport due to long-term falling real fuel costs and increasing efficiency of vehicles and increases in labour and management productivity lead to transport being substituted for other factors of production. Falling costs and increasing efficiency are particularly notable in road haulage where the larger increases in freight moved in the EU15 (+ 41%, 1990-99) have been achieved with a much smaller increase in the vehicle fleet (+ 28%). In the UK there was a reduction in the number of heavy goods vehicles registered in this period despite the continuing growth in traffic.

This move to a more transport intensive economy may not be a new trend, but simply an adjustment in the European economy which reflects improvements in the European network and the increasing integration of European industry through greater regional specialisation. What it also brings into question, however, is the competitive structure of the sectors using transport. Traditionally the analysis of the transport sector has assumed that the sectors using transport were in perfect competition. The implication of this is that these sectors would value transport services according to the impact these would have on their marginal costs of operation. If transport-using sectors are not perfectly competitive, either because of monopoly power or the existence of subsidies, changes in the marginal cost of transport may not affect decisions on price and output as directly.

Firms may use transport as a means of rent-seeking. In cases of poor transport, this may be reflected in the rise of local monopolies which are less efficient, but whose markets are protected by high transport costs to potential competitors. Where transport is improved, the conventional wisdom would suggest that this must be pro-competitive, but in fact it may have one of two effects. For small changes in transport cost it may simply increase the return to existing firms because of the costs of overcoming the remaining barriers. For larger changes smaller local firms may lose market share to larger firms in other regions which can benefit from the exploitation of scale economies. The local monopoly is thus replaced by a remote monopolist. The inertia effect due to the cost of responding to marginal changes in transport costs thus reinforces the rent-seeking behaviour of the imperfectly competitive firm using transport.

If we try and summarise the net welfare effects we can see there may often be a trade off between the welfare gains through more efficient pricing in transport and the impact on the sectors using transport (Table 1).

## **7. Future Needs**

One of the major problems in dealing with the core role of transport in the economy, its role in the production process, is that much of our evidence is anecdotal. The comprehensive, detailed data on which we could begin to base improved forecasting models does not exist in the same way that it does for passenger traffic. Detailed data on the movement of consignments in the context of the production decisions of the firms involved does not exist the way that detailed travel diaries have been collected for individuals in the context of their working and leisure patterns. It is not sufficient just to collect data on the movement of goods, we need to know how and where these goods were produced, using inputs from where and the competitive structure of the markets in which the firms were operating. This is a tall order; so how can we hope to proceed?

The most important issue is to allow for the interactions between sectors in the economy, understanding the potential flows between these is critical to effective traffic forecasting. Inter-regional models, such as the SASI model (Bröcker et al, 2001), which have been used to forecast overall traffic volumes are useful in this regard, but they suffer from their need to make rather restrictive assumptions about market structures and equilibrium. Rather more flexible are computable general equilibrium models such as the CGEurope model (Bröcker et al, 2001) which explicitly allow for imperfect competition and consumer preferences for differentiated goods. One of the problems which remains with this approach is that although it models the behavioural response within transport-using sectors more effectively, there is less explicit recognition taken of the internal characteristics of the transport sector itself (see Vickerman, 1999). As we have seen above, it is not just the changing (derived) demand for freight transport which has driven changes in traffic flows, but also the changes in the freight transport industry itself, not least the enormous increases in efficiency which have been secured in recent years. Securing a way of modelling these interactions between freight users and freight suppliers in a framework which also models the response of the users within their own operations is a major challenge for the future. Without this, any hope of understanding the decoupling process will remain remote.

The key policy issue which has dominated debate over freight transport is the issue of decoupling traffic growth from economic growth. The implications of the argument in this paper is that measures of transport intensity will not be useful as an objective in their own right. They imply a rather too simplistic view of the nature of transport demand in which attempts to reach arbitrary reductions in transport intensity may have unexpected, and undesirable, effects on a wide reaching range of other economic factors. Understanding the complexity of these transport-economy relationship is critical to an understanding of transport demand and its traffic implications.

**Table 1. Impacts of Competitive Structure in Transport Using Industries  
on the Welfare Benefits of Transport Improvements**

<b>Transport-Using Sector</b>			
Transport sector	Subsidised industry (price < marginal cost)	Perfectly competitive industry (price = marginal cost)	Imperfectly competitive industry (price > marginal cost)
Negative externalities (price < marginal cost)	<b>Cell One: <math>B &lt; 1</math></b> Wider transport benefits lost if externalities not priced efficiently	<b>Cell Two: <math>B &lt; 1</math></b> Transport benefits lost if externalities not priced efficiently	<b>Cell Three: <math>B = ?</math></b> Indeterminate: wider benefits through increased competition may outweigh lost transport benefits
Price = marginal cost	<b>Cell Four: <math>B &lt; 1</math></b> Transport benefits lost through inefficient users	<b>Cell Five: <math>B = 1</math></b> Transport benefits exact measure of total benefits	<b>Cell Six: <math>B &gt; 1</math></b> Wider benefits through increased competition will add to directly measured user benefits
Positive externalities (price > marginal cost)	<b>Cell Seven: <math>B = ?</math></b> Indeterminate: transport benefits may be outweighed by inefficient users	<b>Cell Eight: <math>B &gt; 1</math></b> Transport benefits may underestimate total transport benefits	<b>Cell Nine: <math>B &gt; 1</math></b> Wider benefits through increased competition will add to directly measured user benefits which may underestimate total transport benefits
<i>Note:</i> This table illustrates some of the main cases that might arise in the context of appraisal of transport improvement or traffic reduction schemes. The caption $B > 1$ indicates cases where total economic benefit exceed transport benefit in relation to traditional cost benefit analysis. There are 2 cells where it is uncertain whether traditional CBA will over or underestimate total economic benefits. <i>Source:</i> Adapted from SACTRA (1999).			

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## **PASSENGER TRAFFIC**

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### **1. Introduction**

With environmental pressures providing new impetus for efforts to control traffic growth (particularly growth in road and air traffic), the aim of this Seminar is to describe the scope of the tools currently available to manage demand, whether these fall inside or outside the traditional responsibilities of Transport Ministers. In order to do so, we will begin with some comments on the influence of classic economic drivers and transport supply, and also structural demographic and geographic factors. We will then outline the field of responsibility of Ministers of Transport from the standpoint of the various administrative levels (from European to local level) and then in relation to other ministerial departments. Unless otherwise stated, the following paper relates to the situation in France. Among other subjects, we will discuss the feasibility of using public transport subsidies and fuel taxes (i.e. changes in price) to send economic agents sufficiently long-range signals to influence their long-term expectations.

### **2. Gauging the impact of the factors driving demand**

The European Union SCENARIOS project [Berri *et al.*, 1999] gives a general overview of these factors, impossible to detail in a few pages. If we confine ourselves to price and income effects based on aggregated time series, we find that the elasticities are often quite high. We will provide a few examples to illustrate that they are generally less high once structural aspects are taken into account (population ageing, urbanisation and urban sprawl).

#### **2.1 Car traffic**

Two trends can be observed in the spatial distribution of population.

- Urbanisation, i.e. steady gravitation towards the largest population centres.
- Population dispersion from the centre towards the outer suburbs, a trend which has been gradually slowing down in France since the 1980s [Bessy-Piétri, 2000], with the overspill encroaching into surrounding rural areas and gravitation to small, formerly separate population centres.

Population trends by both size of population centre and concentric zone (city centre, suburbs outer suburbs) reflect these movements. From 1977 to 1994 we recorded the distance in kilometres

travelled per year by car for residents in each of these population centres (defined by size and zone). In order to highlight the demographic phenomena (effect of life-style and shifts in the behaviour of successive generations) we constructed an Age-Cohort-Period model for each zone. The period effects show that the key economic factors are income and per-kilometre cost of fuel. The same approach was developed for household car ownership in a comparative study of the United Kingdom and France (Dargay et al., 2000).

Figure 2 for the Île-de-France region shows the age effects computed from the model as life-cycle trajectories, rising to a peak as the head of household reaches “middle age” and declining slowly thereafter. Of course, residents of the outer suburbs make more intensive use of the car than Parisians, for whom no dynamic income effect is discernible. Within the framework of these geographic and demographic factors, the income elasticity of kilometres driven is of the order of 0.5 (Table 2). It is proportionately lower where households live in densely populated zones (city centre and/or large population centres). This demonstrates that urban sprawl is not conducive to the decoupling of traffic growth from economic growth [Madre *et al.*, 2002]. Fuel price elasticities are low (of the order of - 0.1) and do not differ significantly from one zone to another.

Figure 2. **Kilometres per year per household over the life-cycle, by zone**  
(Paris Area)

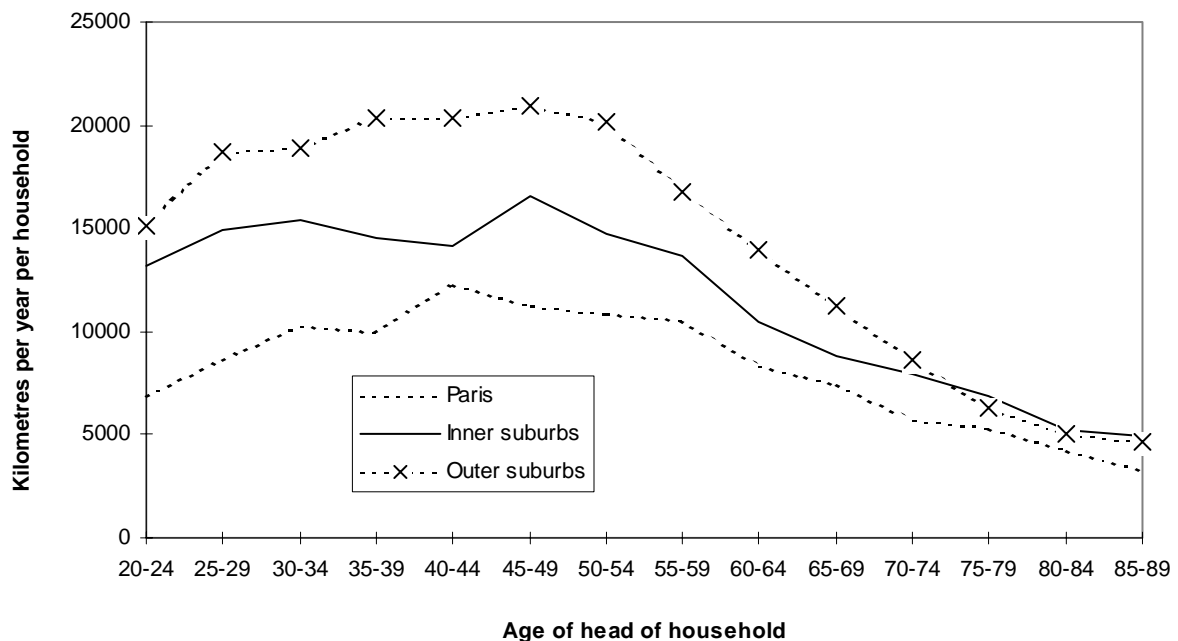


Table 2. **Household expenditure elasticity for distance driven by area of residence**

	<b>Centre</b>	<b>Suburbs</b>	<b>Outer suburbs</b>
Paris	n.s.	0.30 [ $< 0.61$ ]	0.40 [0.17 ; 0.63]
Population centre of 300 000 inhabitants or more in the provinces	0.36 [.07 ; 0.65]	0.50 [0.26 ; 0.75]	0.65 [0.23 ; 1.08]
Population centre of 50 000 to 300 000 habitants	0.33 [ $< 0.67$ ]	0.57 [0.26 ; 0.89]	0.74 [0.45 ; 1.02]
Predominantly rural zones			0.67 [0.51 ; 0.82]

*Note:* n.s.: not significant.  
*Source:* Estimates based on INSEE household economic surveys (1977-94).

*Nota bene:*

- These are period effects on average annual kilometres driven per by household as estimated from an Age-Cohort-Period Model for each zone of residence. The model incorporates generation and age indicators as well as final consumption expenditure by households and weighted fuel prices (logarithmic weighting).
- Elasticity values are obtained by dividing the co-efficient for the period variable by average kilometres per household. It therefore decreases over time and was calculated above for the period 1993-1995.
- The confidence intervals are indicated in square brackets, only one bound is given where the second does not have the expected sign.

Based on these estimates [Berri, 2001], car traffic projections were obtained for 2020 by comparing:

- A range of urban sprawl scenarios (from no change in the population distribution recorded by the 1999 census to resumption of the pace of sprawl noted in the 1980s).
- A smaller range of economic growth scenarios (from 1.9% to 2.6% per year).

In 2020, the difference in kilometres travelled for the whole of France for the highest and lowest economic growth scenarios is 8%, while it is only 4% for the sprawl scenarios. However, in the large population centres, the differences are of the same order of magnitude for both the sprawl scenarios and economic growth scenarios: 5% for Paris and 7.5% for centres in the provinces with more than 300 000 inhabitants.

## 2.2 Public transport in the Île-de-France

The above were analysed following two different approaches based on data that elucidated complimentary aspects: data comparing public transport networks in different towns [Boulahbal and Madre, 2000] and data on competition with transport by car in the Île-de France [Bresson et al., 2002]. The same model was again used to incorporate the economic factors (direct impact of public transport fares and fuel price cross effects), supply and structural factors: the spread of the car and the built environment and the declining percentage of young people in the population have a negative impact on the use of public transport (note 2 of Table 3 gives details on the construction of the indicator used to measure these phenomena). Bayesian procedures were applied to a panel of public transport network users in 62 urban transport belts in order to determine the elasticities for each town and hence specific results for Paris. Although Paris was by far the largest city analysed, it was in the provinces, not the capital, that extreme behaviours were found. Using this approach, the impact of supply could be broken down into a capacity effect (available seat-kilometres) which was the principal effect, a frequency effect (six times lower), and a network density effect (ten times lower than the volume effect).

In the second approach, times series for public transport and road traffic in the Île-de-France were treated as a set of simultaneous equations. The supply of public transport was measured by capacity in available seat-kilometres and road transport supply was also factored in (extension of the motorway network in the outskirts and construction of parking spaces in Paris).

A comparison of the two models over the same period (1981-1993) with the same set of independent variables shows (Table 3):

- Fairly moderate elasticities with respect to supply volume (approximately 0.35) and fares (of the order of  $-0.3$ ).
- Low sensitivity to fuel prices (less than 0.1), bearing in mind that another factor in competition from the car is car ownership, which is included under structural factors.
- Low sensitivity to structural factors seen in the panel approach, which looks to be much higher, although the estimates are not very accurate, with the time series.
- As for income, which could not be incorporated in the comparative study, the direct impact appears to be negative (public transport being what economists call an “intangible good”), its impact becomes only just positive in major agglomerations (slightly negative in small towns when car ownership is incorporated into the structural factors. It is the relationship of income to car ownership -- which weakens over time -- that makes public transport an “intangible good”.

Short-term model validation showed that the two approaches performed more or less equally well for 1994 (with the time series proving slightly better). However, for 1995 when there was a long strike in France in November-December, the panel data approach performed better, as is often the case when there are unforeseen shocks. Medium-term validation (to 2000) is in progress.

This said, the direct elasticities obtained using the LASER interactive land-use/transport model for Southeast England [Jin et al., 2002], which are based on actual trends during the 1990s appear to be appreciably lower than the generally accepted values [Goodwin 1992]. Several explanations have been proposed for this: rigidity of behaviour during morning peaks, high income in the London region,

the high proportion of captive public transport or car users, etc. However, the incorporation of structural factors, as in the exercises described above, could also explain this outcome.

**Table 3. Two approaches to calculating public transport elasticities in the Île-de-France  
(confidence interval bounds, 95%)  
Period 1981-93**

	<b>Time series</b>	<b>Panel</b>
Traffic, t-1 (1)	0.78 to 0.94	0.42 to 0.43
Structural factors(2)	0.11 to 1.97	0.18 to 0.20
Public transport fares	> -0.30	-0.31 to -0.32
Fuel prices	-	0.05 to 0.07
Available seat-km	0.24 to 0.51	0.34 to 0.35
MAPRE adjustment	0.335	1.207
Forecasting error:		
1994	0.186	0.380
1995	1.874	1.504

MAPRE: Mean Absolute Percent Relative Error (arithmetical mean of relative difference between actual results and model), the same indicator that is used for measuring “Forecasting errors”.

- (1) With monthly time series data and yearly panel data, the substantial difference in the coefficient for each approach is hardly surprising.
- (2) The relevant composite indicator combines:
  - Population distribution from the standpoint of four factors relevant to the analysis of demand for public transport (sex, age, resident in centre/suburbs, number of cars per household).
  - Mobility (number of trips by public transport per person per week, from the National Transport Survey 1993-1994).

*Source:* ERMES calculations [Bresson *et al.*, 2002].

This “structural mobility” indicator is the sum of the populations of each category, weighted for public transport mobility. While the weighting is constant over time, the population changes.

For this variable alone, related factors are taken into account (e.g., urban sprawl because it stimulates car ownership) are taken into account. Introducing them into the model separately would raise co-linearity problems and reduce the number of degrees of freedom.

It is not easy to incorporate the wide range of important factors into a dynamic econometric approach which uses estimates based on data covering a long period (panel data or time series data). This said, once structural factors are incorporated, demand elasticities with respect to economic and supply factors do in fact appear to be lower, often half as low as those obtained by more classical approaches. Actually, it is not surprising that the more factors are identified:

- The more difficult it is to distinguish the part played by each, owing to co-linearity problems.
- The smaller the part each one appears to play.

True, the elasticities obtained from our econometric models with respect to economic factors and supply could be interpreted as partial elasticities, quite apart from structural effects [Papon 2002]. Nevertheless, the LASER model, which specifically covers transport and land-use, leads to similar conclusions.

Space prevents an account of the more theoretical approaches like the MATISSE model [Morellet and Marchal, 2001] and other key factors such as the increase in leisure time (French legislation on shorter working hours, following a period of 10 years or so in which there was a break in this long-term trend). [Viard *et al.* 2002, Chenu, 2002].

### **3. Traditional area of responsibilities of transport ministries**

#### ***3.1 Central government, between the European Union and Regional and Local Authorities***

The traditional field of transport ministries is changing rapidly with the revival of decentralisation policy in France. We will touch on just a few examples, in the hope that they are not overtaken by events too quickly.

With the exception of the Île-de-France, which we will go back to later, central government was responsible for rail transport subsidies (for passenger transport, mainly for the old “stopping services”, now called Regional Express Transport (TER) services . The *Loi sur la Solidarité et le Renouvellement Urbain* (Solidarity and Urban Regeneration Act, SRU) transferred more responsibility to the Regions. In regions where pilot schemes were run traffic increased faster (+ 12.1%) than in others (+ 6.3%) over the period 1996-1999. This was also the case for revenues, up 11.7 and 6.7% respectively over the same period. This is a good sign, if we can balance the finances over the long term and satisfy the increase in demand induced by improved supply.

For urban transport in the provinces, central government reserves its subsidies for infrastructure and these are heavily geared to networks that are developing segregated services, although the amounts remain quite small, (accounting for 8% of investment in 1999). Central government also finances Urban Mobility Plans (PDU), which are compulsory for towns with a population of over 100 000 under the French Air Quality and Energy Use Act of 1996 (*Loi sur l’Air et l’Utilisation Rationnelle de l’Energie*, LAURE).

Only urban public transport services in the Île-de-France were subsidised by central government (fare reductions, compensatory payments). The restructuring of the public transport authority for the Paris region (*Syndicat des Transports d’Île-de-France, STIF*) has given the Region a role that looks set to grow.

Subsidised services, it should be remembered, include transport to school, which is virtually free. Even supposedly commercial services, such as taxi services (albeit heavily regulated) are not necessarily always paid for by the consumer (private individual or firm): for instance, patient transport services paid for by Social Security.

While it is true that subsidies influence demand because they routinely reduce prices, the public authorities also tend to ensure better value for the money they invest through contractual quality incentives.

With respect to infrastructure, we have already mentioned central government’s contribution to the construction of segregated urban networks. Space prohibits a more detailed account of its role in

sectors where it plays a more substantial part: the national road network; the French rail infrastructure authority, RFF; air transport, etc. Often, several decision-making levels can be involved in one and the same project: even a roundabout or local superstore may involve local, departmental and regional authorities. Funding for infrastructure is a priority area for the European Union, which is also active in the regulatory field through Directives which outline the role of Member States.

As regards taxation, fuel is increasingly a target; indeed the higher rate of VAT on the purchase price of new cars is steadily falling back to the normal rate of the beginning of the 1990s, and the road tax disc was abolished in France in 2000. If the aim is to encourage “more responsible” use of the car and encourage multi-modal behaviour (so that people stop to think which is the best mode for each trip from home), it makes sense to increase the costs of actually using the car rather than fixed costs. This could well be taken further by specifically discouraging car use in circumstances where it generates the greatest nuisance. However, France’s national parliament would have to pass a vote to enable local authorities to introduce urban road pricing. At present, motorway tolls (almost exclusively on the intercity network) are the only way of varying automobile costs according to the network used. A last point is that in some countries variable fuel taxes are levied and/or passed on to local authorities.

### ***3.2 Policies of other Ministries with an impact on transport demand***

This is the case for almost all Ministries, although the policy objectives often differ. In France, as in other countries (Japan, for instance), transport is the responsibility of a large ministry the Ministry for Infrastructure, which is also generally responsible for tourism and maritime affairs as well as housing. The effects of land-use planning on transport demand, for which there are outlined estimates in Section 2, shows the benefits of close proximity at ministerial level. Synergies have developed around the SRU Act, for example, with a view to “rebuilding the city” and structuring urban sprawl. In fact it is the wide dispersal of the population that encourages greater car use. Re-directing this dispersal to districts more easily served by public transport [Wiel, 1999] would probably mitigate the impact. We should point out that this aspect was not covered in Section 2.1, which dealt with the urban fringe generally.

The Ministry for Economic Affairs, Finance and Industry, historically another “large ministry” which wields substantial power through taxation: taxes on transfers disruptive to urban planning policy, but mainly taxes on fuel. In France, the domestic duty on petroleum products (*Taxe Intérieure sur les Produits Pétroliers*, *TIPP*) is the fourth highest source of revenue for central government after VAT (which is also levied on fuel), income tax and company tax. Transport policy objective policies are therefore not the priority in administering this resource as we will see in Section 3.3. The Ministry is also responsible for economic policy, i.e. supporting growth with the attendant income effects mentioned in Section 2. Nevertheless, given the impact on employment in particular in order to decouple economic growth from traffic growth it is demand management measures that we will have to rely on rather than on weak growth.

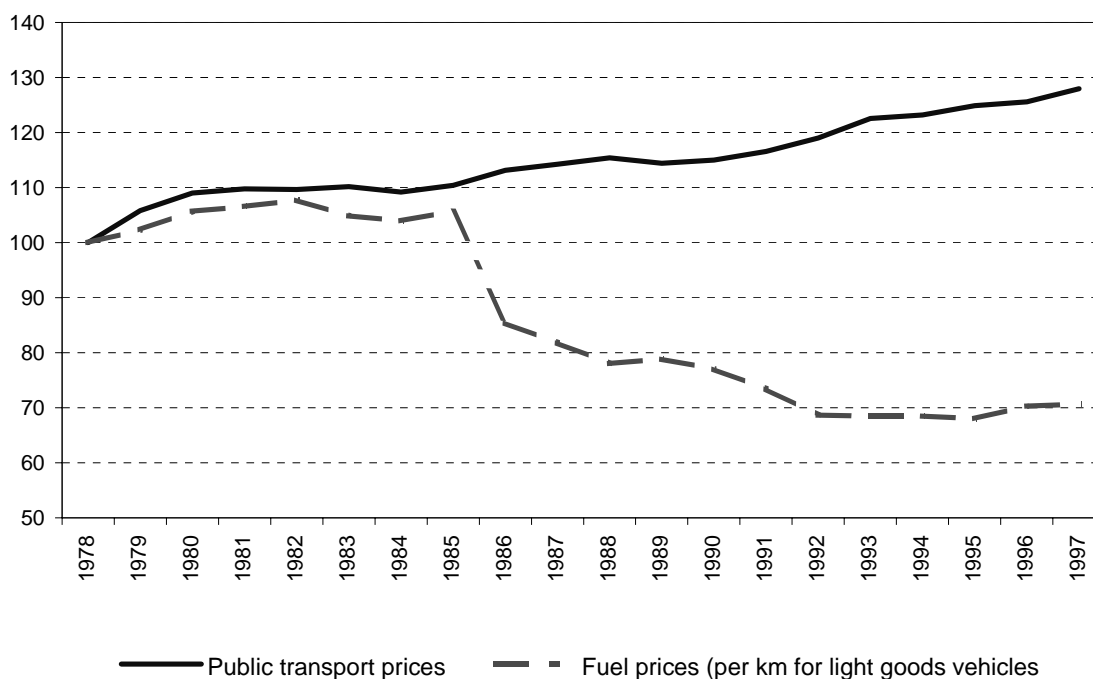
The Ministry for the Interior oversees the Regional and Local Authorities which, as we have seen, are now playing a greater role. It also shares responsibility with the Ministry of Justice for regulatory enforcement on the roads. Other Ministries concerned include the Education Ministry, responsible for school transport, the Defence Ministry, responsible for military transport, the Ministry for French Overseas Territories, responsible for ensuring “territorial continuity”. Lastly, the Ministry for Ecology and Sustainable Development which is responsible for regional development as well as international agreements, including the Kyoto agreement on global warming. It is concerned primarily with the issue of controlling energy consumption and nuisance, a more difficult problem in the transport sector than in other sectors.



### 3.3 Towards a long-term pricing policy

What happened with urban transport shows that when government (central government in the Île-de-France, local government in the provinces) is confronted with funding problems, public transport fares can be raised at a rate faster than the rate of inflation per year for over two decades (Figure 3). The share of taxes in fuel prices gives central government the means (under European Directives to harmonise taxation) to do the same. A first step in this direction by the UK Government – the “fuel price escalator” -- is to be welcomed. In the course of the 1990s, taxes on fuels had been increased by 6 points over the rate of inflation every year. Unfortunately, soaring prices made the rise unacceptable in 2000: demonstrations all over Europe made it clear that fuel taxes were no longer “painless” for many “captive car-users”.

Figure 3. Trends in transport prices in the Île-de-France  
(Relative price indices, base 100 in 1978)



*Note:* The fuel price series is for the whole of France. However, since the liberalisation of fuel prices in 1985, trends in the Île-de-France do not seem to be very different from prices for the rest of France.

*Source:* INSEE, INRETS figures.

Learning from this experience, the French government put in place the “floating TIPP”. This adjustment mechanism for domestic tax on petroleum products was introduced on 1 October 2000 in order to cushion consumers from the sharp increase in prices on the main refined petroleum products (premium grade petrol, DERV and fuel oil) through tax relief. [Vacher 2002]. The principle was to balance out increased receipts from the TIPP, which is a specific duty (set at fixed amount per unit of measure regardless of the value) and receipts from VAT, which is a percentage of the price paid.

Therefore when prices rise, VAT receipts automatically go up and it is that increase, which is was used to offset an equivalent reduction in the rate of the TIPP. Conversely, the rate goes up if the price of oil suddenly falls. The reference price selected for the mechanism was the price of Brent crude and its introduction was accompanied by a one-off “bonus” tax cut. These instruments, which had worked the opposite way at the beginning of 2002, were intended to be temporary and were to be suspended once oil prices had reliably fallen. The mechanisms were suspended in 21 July 2002, as the sums collected now exceed the amounts voted by Parliament which constitute a tax ceiling.

Similarly, the plan introduced in 1999 to close the gap between petrol and diesel taxes has now been scrapped. The justification for the price advantage traditionally accorded to diesel in France (but not in the UK) is open to question in view of the toxicity of diesel emissions and specific consumption. Here again we have to point out the difficulty of maintaining a fiscal policy on fuel for a period of several years that translates into price trends that will have a clear influence on the expectations of the economic actors. It has already been demonstrated [Schipper et al., 1997] that the effect of higher fuel prices is not generally a reduction in kilometres driven or in fleet size, so much as an incentive for consumers to buy vehicles with lower petrol consumption. This is an area in which the European Union could perhaps help governments to stay on course.

#### **4. Conclusion**

It is clear from the foregoing that the instruments available to Transport Ministers alone are limited. They are much more effective when synergies can be developed:

- Between ministerial sectors (especially synergies among the most closely related sectors where transport is part of a large Infrastructure Ministry, but also with Finance Ministries so that consistent price signals can be sent to economic agents by means of long-term fiscal policy).
- With the European Union and the different levels of local government.

This will be borne out by the following reports, which address the long term and more systemic aspects as well as the short-term drivers of demand and direct (prices, communication, operation, infrastructure, not forgetting standards and research) as well as indirect measures (from scrapping incentive payments to land management and international treaties).

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# **THE DRIVING FORCES BEHIND TRANSPORT GROWTH AND THEIR IMPLICATIONS FOR POLICY**

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## **1. The success story of transport: faster and cheaper**

If we want to manage the fundamental drivers of transport demand, we first need to identify what the fundamental drivers are. Next, we can discuss how these driving forces can be managed and whether the benefits of these policy options are larger than the disadvantages.

To gain insight into the fundamental drivers of transport demand, long term developments need to be analysed. This paper takes a look into the history of transport over the last two centuries and investigates the future for the coming half a century. This focus on the long term reveals the fundamental drivers, while neglecting all sorts of temporary and minor influences.

This paper illustrates what we all know: The history of transport can be described as a continuous reduction in the friction of distance. Travelling or transporting goods, has become faster, cheaper, more comfortable and reliable. This allowed for the impressive mobility growth we have experienced. In addition, it is likely that new improvements in the price-quality ratio of transport will shape the future.

## **2. Passenger transport**

### **2.1 Trends**

The average distance travelled per person per day increased from a few kilometres to 40 kilometres in the period from 1800 to 2000. The dominant mode of transport shifted from walking and horse power to the train and then to the car. Technological developments, such as the internal combustion engine, in combination with growing income, allowed people to buy faster modes of transport over time. Figure 4 shows this history of transport: two centuries of exponential growth in distance travelled.

Next, we know that the daily amount of time spent on travelling only slightly changed over time. We use as much time for travelling as medieval people and there is also no substantial difference between the average travel time between individuals in industrialised countries and developing countries. Figure 5 shows that the average time budget lies around 1.1 hour a day and more importantly this does not depend on income level or historic period. The investigated values differ roughly between 0.8 and 1.2 hours a day. Because total mobility (p-km) equals travel time (h)

multiplied by travel speed (km/h), the impressive growth in mobility can only be explained by an equally impressive growth in speed.

Following this approach a projection for the future can be made (see Figure 6). Mobility will continue to grow and aviation will become the dominant transport mode between 2030 and 2040. Again we will see a shift to a faster mode of transport.

## 2.2 Driving forces

Travelling speed has increased from between 5 and 10 kilometres an hour – horse power – to an average of close to 70 km/h now. Figures 7 and 8 illustrate this development. The train with steam engines reached a speed of around 30 km/h and replaced horse power in the second half of the 19<sup>th</sup> century. Next, the passenger car improved its speed from 15 km/h in 1900 to an average of 45 km/h now at which level it seems to stabilise. This improvement is achieved by building an extensive network of motorways and by the manufacturing of more powerful and convenient cars. The car became the dominant mode of passenger travel around 1960.

After 1980 the continuing increase in travel speed is mainly caused by aviation. The modal share of aviation has increased to around 10% and at the same time the average door-to-door speed of air travel is improving.

Figure 4. **Daily distance travelled per person 1800-2000 (excluding walking; France)**

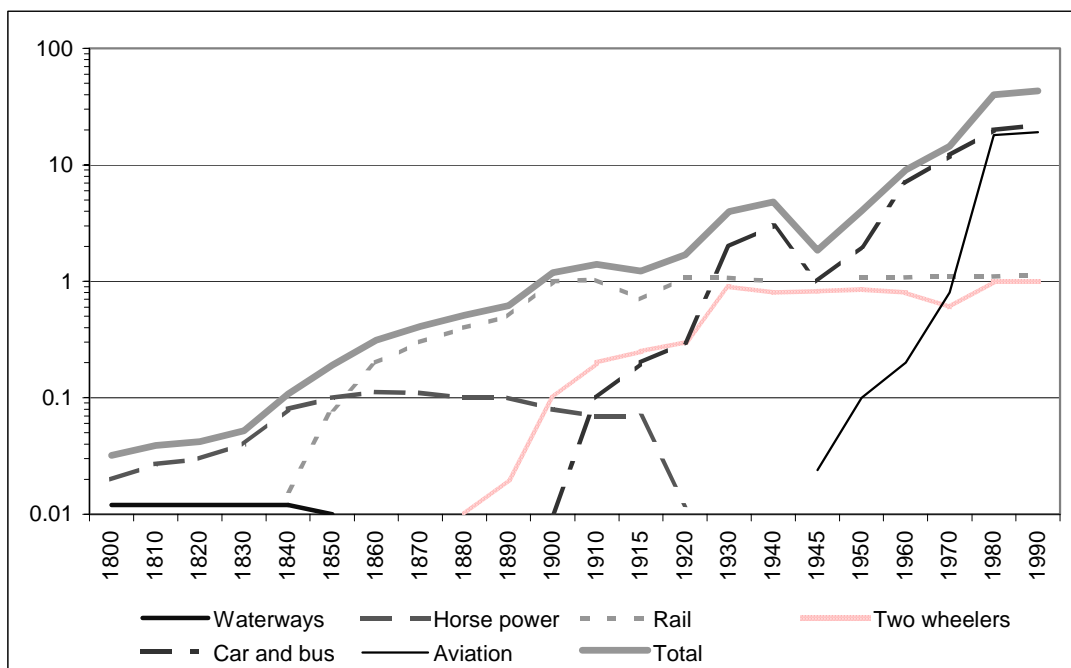
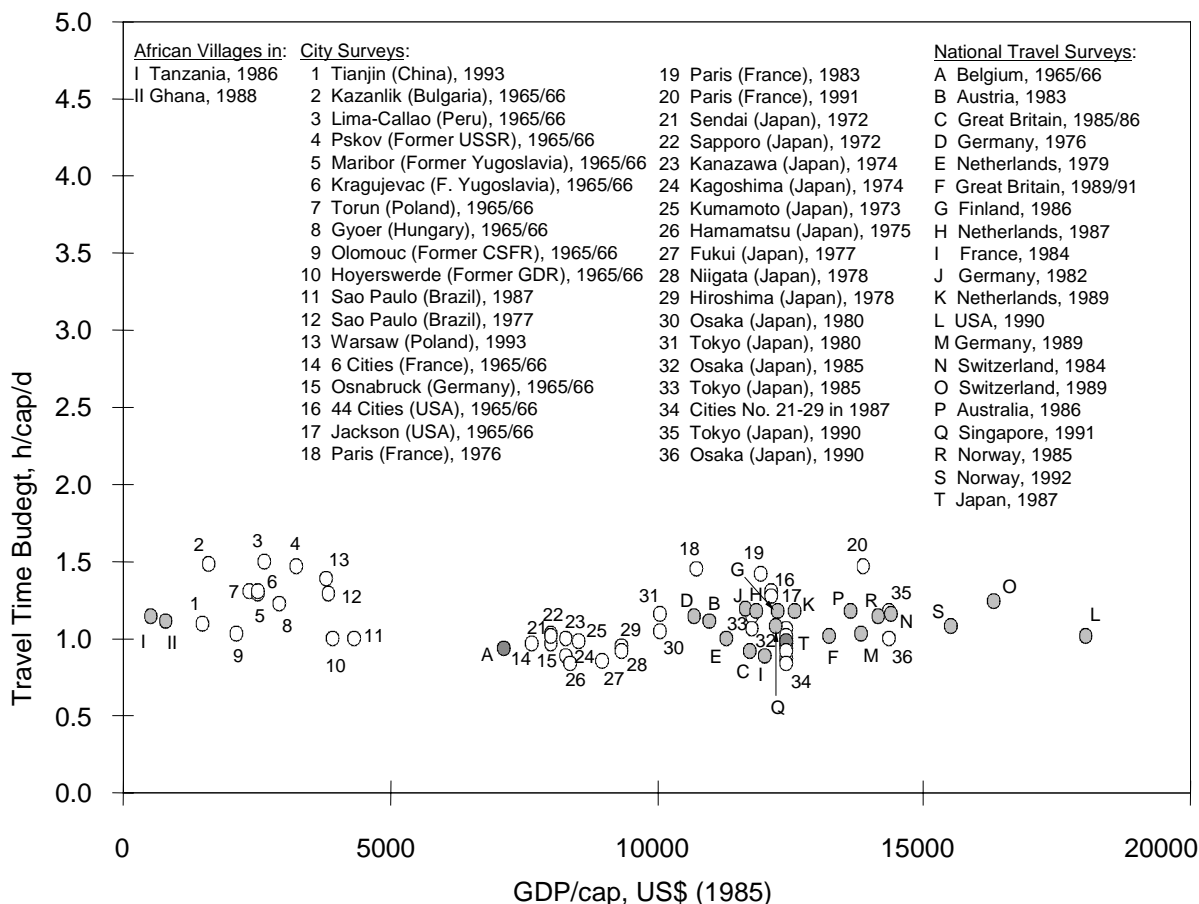


Figure 5. Constant Travel Time Budget



So, the main driver of the growth in passenger travel is the increase in average speed. However, this shift to faster transport modes in its turn is caused by different forces. The first is technological improvements. Each travel mode has become faster, cheaper and more comfortable by innovations such as the internal combustion engine, airplanes and building motorway networks. Note, however, that since the first flight with an aircraft in the beginning of the 20<sup>th</sup> century, no major technical breakthroughs have occurred in the transport field. Trains, cars, planes and related infrastructures are not new technologies. It is true, however, that these “old” technologies have been improved tremendously by e.g. mass-production, new materials and lately by the break-through of new information and communications technology and applications.

Figure 6. **Projected mobility growth 2000-2050 (Western Europe)**

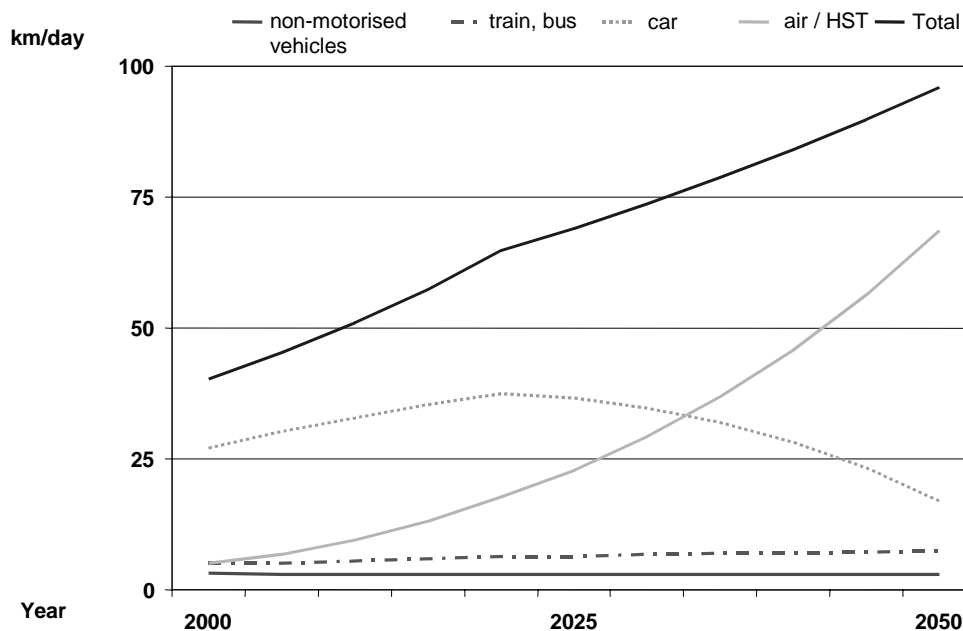


Figure 7. **Average door-to-door travel speed for different modes (The Netherlands)**  
(km / hour)

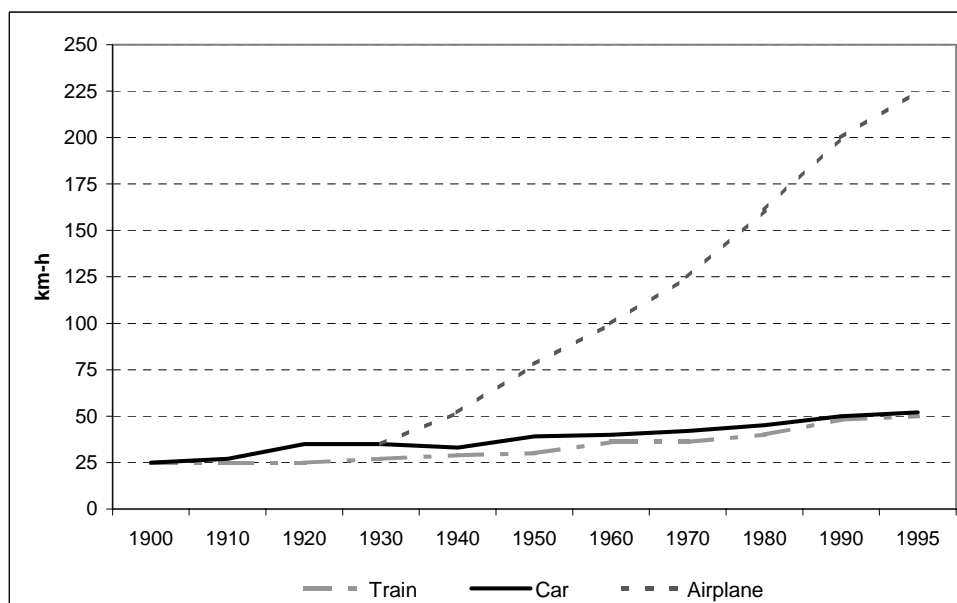
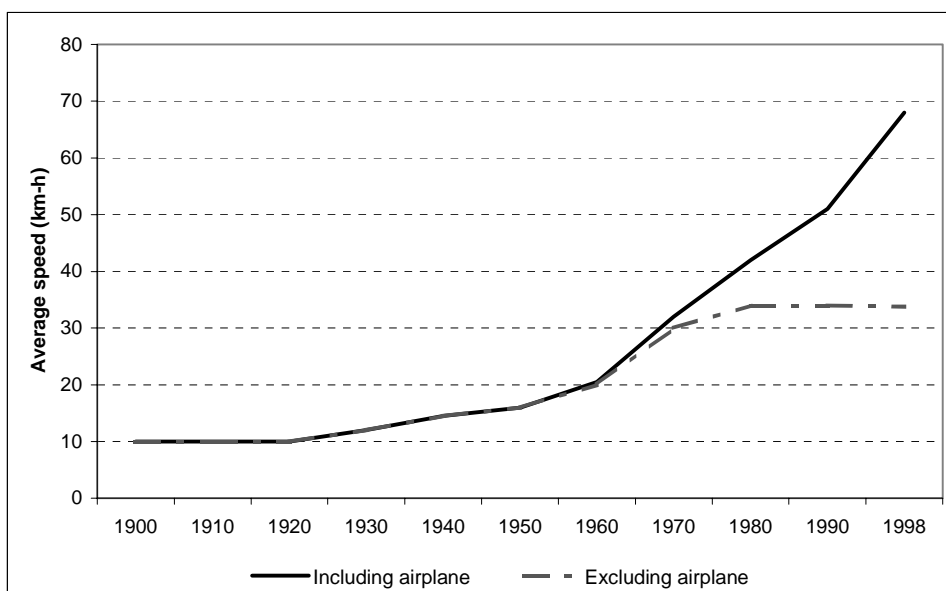




Figure 8. **Weighted average door-to-door travel speed for all modes, both including and excluding aviation (The Netherlands)**

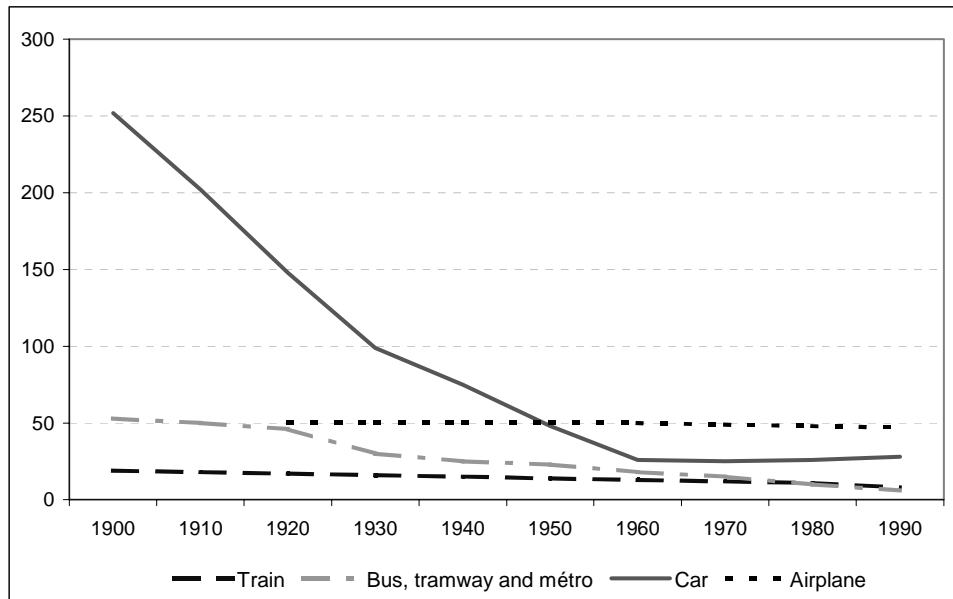


In addition to this technological driver, there is a strong economic driver. Increasing purchasing power, as a result of economic growth, allowed people to buy faster transport modes. In 1960 only 1 out of 20 people could afford to own a car. Car ownership in the Netherlands is currently 8 times higher than in 1960. Rising incomes generate also the current increase in the modal share of air travel. Nowadays, many people can afford to fly long distance.

Not only economic growth, but in addition a reduction in costs of travelling, promoted the shift to faster modes. Figure 9 shows this reduction in costs for the past century. Car driving, in particular, experienced a sharp cut in costs in the period 1900-1960. This explains partly the success of the car.

Finally, social forces influence the shift to faster travel. It generally takes time before new (transport) technologies are accepted and fully adopted. For example, we are still witnessing an increase in the numbers of people with a driving license. In addition, the social acceptance and emotional attitude might influence somewhat the modal choice of people, mainly when speed and costs differ little between modes.

Figure 9. Average costs of passenger travel (in 1990 Euro per km)



### 2.3 Policy implications

The analysis presented above leads to the conclusion that influencing the door-to-door travel speed will influence both total mobility and modal choice. Slowing down car travel will reduce car driving, as can be witnessed in congested urban areas where people look for ways to shorten their commuting distance. Policies towards infrastructure (density and capacity of networks) and travel speed could be designed to reduce door-to-door speed. However, such policies will inevitably also reduce the benefits of travelling, e.g. the benefits derived from visiting distant places, and the economies of scale and economies of scope industry that benefits from through transport. Therefore, policies which reduce travel speed often lack public and political support.

An often promoted policy is to invest in public transport. According to the analysis presented here this will only have a substantial effect if the door-to-door speed of public transport at least equals that of the car. And this seems only feasible in large cities where car driving slows down to an average of 10 or 20 km/h and on longer distances between city centres, where public transport can reach a speed of 100 km/h. On other medium distances the car is unbeatable. Policy makers should avoid illusions about the effectiveness of promoting public transport as an instrument to reduce car mobility.

Part of the negative effects of the car are concentrated in urban areas. Occupation of scarce space, noise nuisance and negative health impacts are mainly urban problems. Allocating more of the scarce space to people living and working in the city can increase the spatial quality but reduces the available road and parking space for cars. As a counterpart, mass transport systems are needed to safeguard the accessibility of our metropolitan areas. Congestion charging, on the other hand, will promote better use of existing roads, which also increases accessibility.

Another often promoted policy is to reduce car travel through spatial planning, with planners locating houses closer to jobs, or more generally locating travel destinations closer to origins. However, this line of thinking conflicts with the analysis in this paper. It is not the fault of planners that average travel distances have grown tremendously. Instead, it is the increase in average travel

speed that caused the growth in travel distances. This can be further illustrated by looking at the impact of a new motorway. In the short run people will gain time, because they can travel faster. However, in the long run people might choose a more pleasant place to live, outside the city, or look for a more suitable job located further away. In general, people will gain “distance” in the long run, as a result of a new motorway. So, policy makers should avoid illusions about the effectiveness of spatial planning as an instrument to change mobility patterns.

Pricing policy can be effective, if it diminishes the use of fast transport modes. Congestion charges will spread the traffic more equally over the day, and will thus increase the benefits of existing infrastructure. Introducing variable user charges instead of fixed charges (such as taxes on the possession of vehicles), will stimulate a more selective mobility. Finally, well targeted charges to internalise external costs should reduce externalities such as accidents, noise nuisance and air pollution.

Following the assessment of the policy instruments above, there is not much hope for substantial changes in people’s travel behaviour. The fundamental driving forces appear to be strong. Effective policy measures are not easily accepted. How can sustainable mobility then be achieved? The answer lies in the further development and mass application of safe and clean technologies. The introduction of the three-way catalyst has thus far contributed most to reducing air pollution from cars. All sorts of safety techniques – both on vehicles and roads – have effectively reduced fatalities and injuries. New technologies will be developed and some are waiting for mass introduction. However, making transport much safer and cleaner can not be left to market forces. Strong policies are required, of which setting and enforcing strict standards and a variety of financial incentives are the most important.

These new technologies will impose additional costs to travelling. These costs need to be accepted as the price for making mobility sustainable.

Finally, the future of air travel must be addressed. As Figure 6 showed, air travel will become the dominant transport mode somewhere between 2030 and 2040. Although this forecast is rather uncertain, policies should anticipate the strong growth in air travel, as well as the associated decline in car use. The geographical density of airports will most likely shape the future of mobility to a large extent, because this density will largely determine the future door-to-door speed of air travel. Developing safe and clean air travel will require strong policies, as is the case for other transport modes.

### **3. Freight transport**

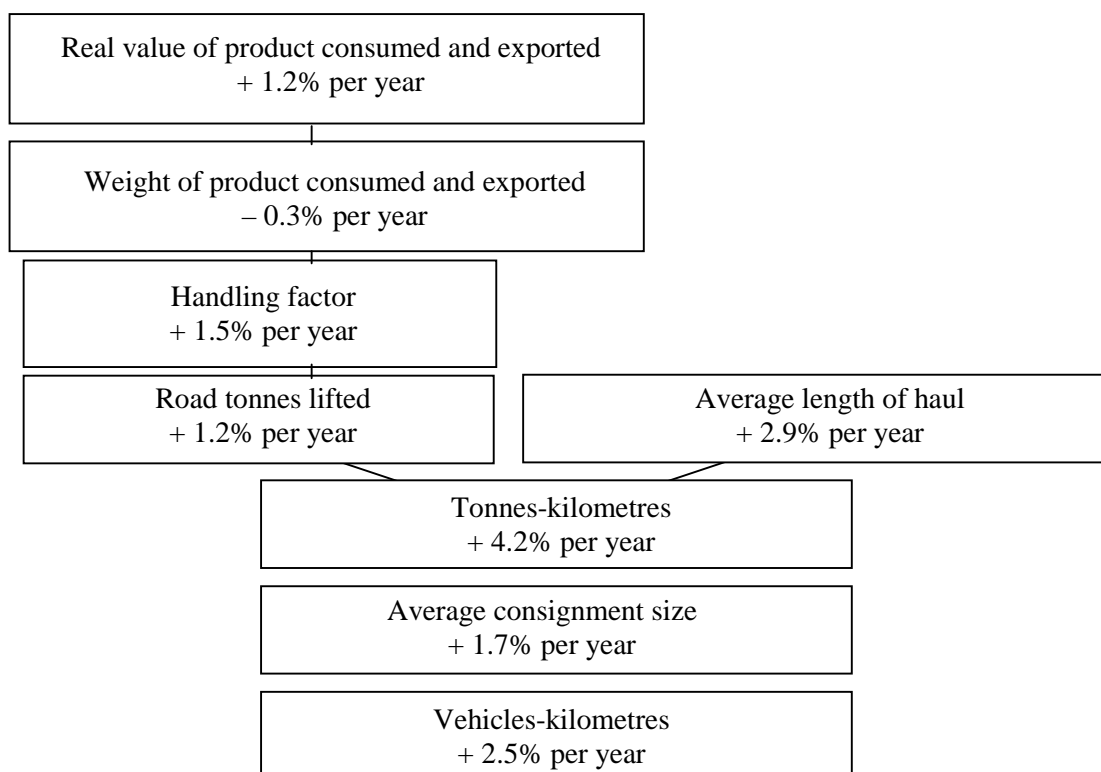
#### **3.1 Trends**

It is often assumed that the growth in freight transport is directly linked to economic growth. Because governments strive for high economic growth, equally strong growth in freight transport is then inevitable. However, this is at most half of the story.

Our economies grow on the long run with an average 2.5% a year in money terms. This, however, does not equal the growth in physical terms (tonnes). The physical growth of our economies is roughly estimated at 1% a year. The divergence between economic growth and physical growth reflects the structural changes in our economies: from industrialisation towards services and a knowledge based economy.

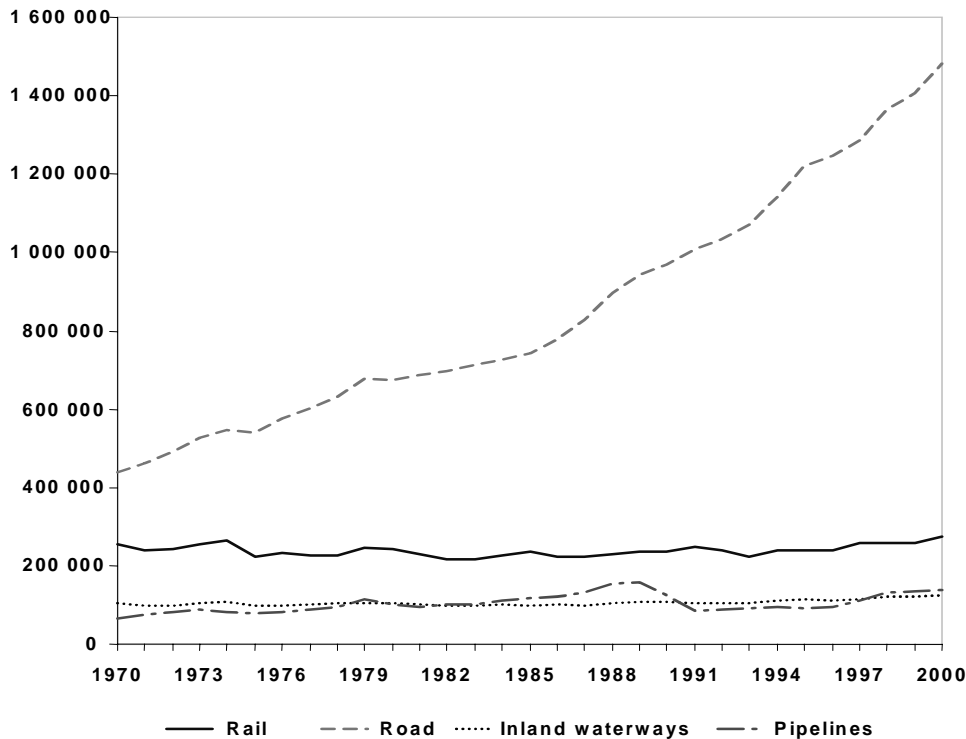
If it is not the physical growth of our economies that cause the high growth rates in freight transport, what is then the cause? Two separate factors explain the growth: each tonne of final product is moved more often in the production chain leading to more hauls and at the same time the average length of haul has increased. These are the logistics of what is called the network economy. Figure 10 presents the results of a quantitative study into these mechanisms for the UK food and drink sector. The handling factor - number of links in the production chain - increased by 1.5% per year and the average haul length by 2.9% a year.

Figure 10. **Logistical changes in the food and drink sector 1983-1991 (United Kingdom)**



Next, Figure 11 shows the total growth in tonne kilometres in Western Europe and the split over different modes. The figure clearly shows that road freight transport has become the dominant mode.

Figure 11. **Growth in freight transport (tonne kilometres)  
and modal split ( Western Europe)**



### 3.2 *Driving forces*

What are the driving forces behind these changes in logistics resulting in the strong growth in freight transport?

One driver is the increased purchasing power (income growth) to choose from a large variety of consumption goods. We see 20 brands of beer in the shelves and 10 brands of mineral water. Furthermore, we can buy exotic products originating from all over the world. Both reflect economies of scope for the consumer and lead to more freight transport.

The second driver lies within the logistics of the production process. Firms will minimise their total production costs, which might lead to more - or less - transport. The economic benefits of freight transport consist of:

- Economies of scale in production and distribution.
- Locational advantages (or comparative advantages according to the neo-classical theory on international trade).
- Reduced costs for warehousing (stimulates just-in-time deliveries).

Companies weigh the economic benefits of more freight transport against the additional transport costs, in search of minimal production costs. If transport becomes cheaper, they will use more transport in the optimum and thus save money on warehousing and production costs. And this is exactly what happened: freight transport has become cheaper, faster and more reliable over the past centuries. The Figures 12, 13 and 14 show this cost reduction for domestic transport, continental transport and for intercontinental transport. In addition to these cost reductions, road and air transport have managed to increase their speed substantially at the same time, thus lowering the generalised costs even more strongly.

According to a rough estimate, the reduction in the costs of freight transport caused half of the growth in freight transport (tonne kilometres) over the last decades. So, the realised reduction in transport costs is an important driving force behind the growth in freight transport. The reduction in costs of freight transport stimulated logistical changes resulting in lower total production costs while transport volume increased.

Figure 12. **Price of domestic freight transport 1800-2000 (The Netherlands)**

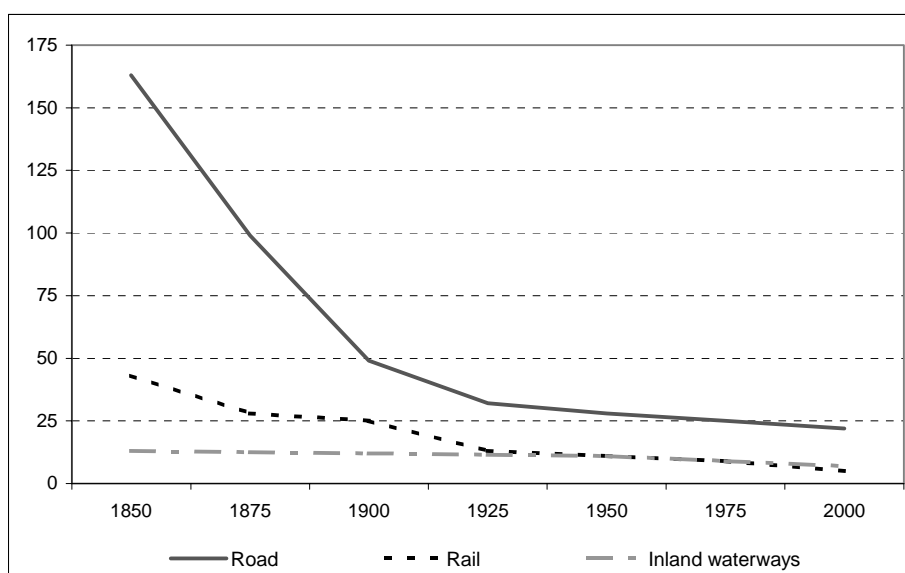


Figure 13. **Price of continental freight transport 1850-2000**

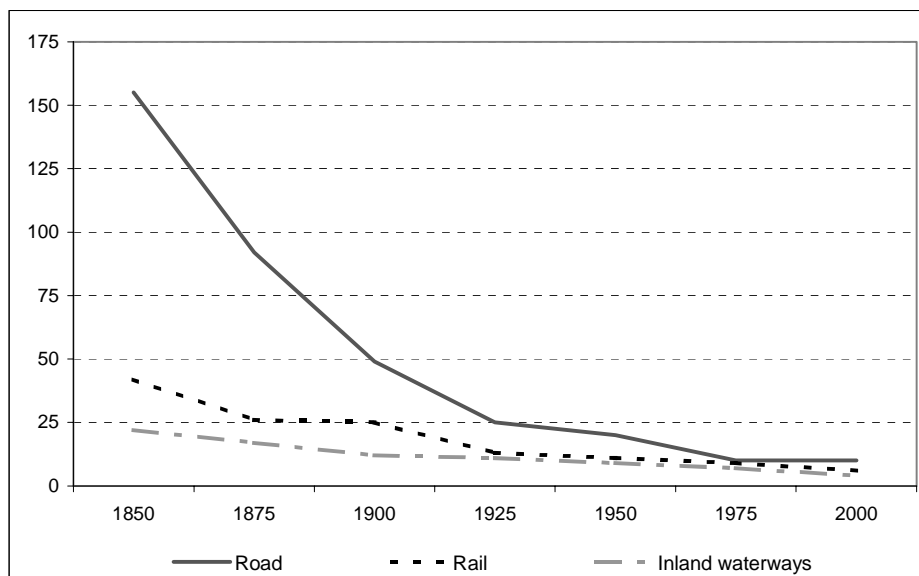
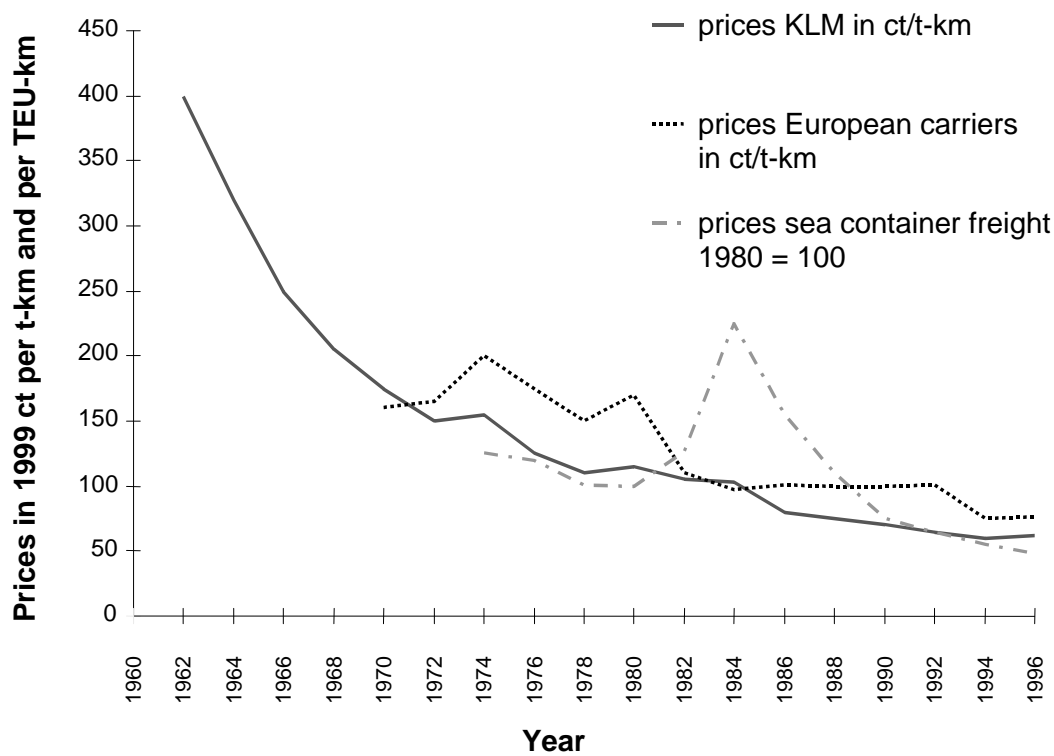


Figure 14. **Price of intercontinental freight transport 1960-1996 (KLM, TEU Rotterdam)**



### 3.3 Policy implications

The analysis above reveals four driving forces behind the growth in freight transport:

- Population growth.
- Income growth, resulting in a demand for a wide variety in available consumer goods and for exotic products from all over the world.
- Reduction in the costs for production and distribution, caused by economies of scale, locational advantages and warehousing.
- Reduction in the (generalised) costs of freight transport, including risks and reliability.

Of these four drivers, only the last seems relevant for policy making. Indeed, the price of freight transport is a rather effective policy instrument. A recent review study of international findings concluded that the price elasticity for road freight transport lies around  $-0.8$ . So, a 1% higher price per tonne kilometre, results in a 0.8% reduction in vehicle-kilometre transported volume. And this is mainly the result of more transport efficient logistics.

In addition, many studies indicate that freight transport currently does not pay its full marginal social costs. Combining these observations suggests that if targeted correctly, policies that increase the price of freight transport can thus improve the overall efficiency of our economy.

It is quite common that government policies aim at a shift from road freight to rail and water transport. This should reduce pollution, accidents and congestion in urban areas. Such policies try to reverse the current trend towards an increasing market share for road freight transport (see Figure 11). However, it will be difficult to reverse this trend. The analysis above showed that the performance – or price-quality ratio – of each transport mode determines its competitive position. Costs, speed and reliability are the most important factors. So, the question is whether rail freight and inland waterways can improve their performance strongly, to catch up with the quality road freight can offer. During the last decades the opposite has happened. Road transport has improved its price-quality ratio (or generalised costs) substantially by technical and logistical innovations. In the same period rail freight and inland waterways did not improve their performance so much and they managed to follow the price cut of road freight by concentrating on long distance and large volume hauls, thus losing market share (see Figures 11 and 13).

In addition to the price and quality each mode can offer to the shippers, two other factors reduce the likelihood of a strong shift away from road freight. First, the growth in bulk transport – with a high market share for rail and water – is lower than the growth in containers and packed goods. Second, it seems that the costs of goods transfer are not declining at the same rate as the transport of goods. This makes it harder for inter-modal transport to compete with road freight. So, policy makers should avoid illusions about the feasibility of a substantial modal shift in freight transport. It is mainly the price-quality ratio of the different modes for freight transport, that will determine the future modal split.

If modal shift is not a likely route, how can sustainable freight transport then be achieved? As stated before, pricing policy is effective and will reduce negative externalities through more efficient logistics. In addition safe and clean technologies – for each mode – are a promise for the future. However, as stated before, strong government policies are required to force the further development and application of these technologies and the additional costs need to be accepted.



Finally, if it is true that half the growth in the past decades was caused by reduced generalised costs, an important question for the future is whether the costs of freight transport will continue to decline. If this is not the case, future growth rates will be lower than the historic growth in freight transport.

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*Part II.*

**POLICY RESPONSES  
INTEGRATION, LOGISTICS AND PRICING**



## INTEGRATING SPATIAL PLANNING AND TRANSPORT POLICY

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The claim for integrating spatial planning and transport policy is at least as old as the ECMT. The rationale behind this claim has evolved from a somewhat static to a more dynamic vision. The aim today is not simply to provide harmonised transport and land-use plans in order to reduce zones of conflict between infrastructure alignments and their environment. This may have been the driving idea during earlier planning phases. Nowadays we perceive spatial development as a means for influencing transport demand. Hereby we can distinguish two paths:

- On the one side, a philosophy of planning which is looking for spatially more mixed patterns of housing, work and recreation. The policy behind it is to reduce the need for travelling long distances. Many planners engage in the vision of “the city of short ways”.
- On the other side, spatial development in the sense of active engagement of the public and the private sector to open-up land and to realise investment in areas that can easily be served by public transport. Hereby the policy line for influencing transport demand is mainly understood as one that aims at promoting this mode of travelling.

The question we deal with is thus more specifically “In which form, in which institutional setting and by means of which procedures can spatial planning and transport policy be effectively interlocked in view of sustainable mobility and land-use patterns?”

OECD and ECMT have the merit to be since long involved in getting answers to that question. One major platform for pertinent discussion was the Linz Workshop on Land-Use Planning and Sustainable Travel, in September 1998. Roger Gorham has given an excellent overview on the state of the art for “Overcoming Barriers to Effective Co-ordination”.

In order to avoid repetition we shall first discuss such barriers and potentials on a concrete case – the town of Zurich. We shall then discuss ways how to support such local and regional approaches by national policies and also the international community. With that we intend to complement the views expressed in Linz.

### **1. Lessons form the S-Bahn and light rail Projects in Zurich**

#### ***1.1 An analytical framework that stems from research for the EC***

The Zurich S-Bahn is actually one of a dozen case studies of the so-called TRANSECON project of the 5<sup>th</sup> EC research programme on “Competitive and Sustainable Growth”. TRANSECON is

concerned with Urban Transport and Socio-Economic Development. It involves the ex-post analysis of the impacts of underground systems (metro lines) and regional rail transport of the RER type on land-use and vice-versa.

The case studies are based on a common analytical framework that intends to break with the assumption that there could be something like an automatism between efficient public transport, accessibility and land-use.

- The analysis covers the specific influence of (i) the local context, (ii) actor involvement and (iii) the general economic situation. All the three determine the impacts of public transport systems on land-use and regional development. Actor involvement is the factor where there is most space for manoeuvre and with this the highest challenge.
- TRANSECON intends to work out in what way land-use policy and pertinent tools can become drivers of transport demand.

With this in mind the TRANSECON project does not only make use of statistical and econometric analysis but also of interviews with key persons such as transport operators, business circles, developers, public authorities and specific interest groups. The project shall come to an end in 2003.

### ***1.2 The Zurich S-Bahn – focus on comprehensive transport policy***

In 1962 and again in 1973, the voters of Zurich rejected the project for an underground system. The consequences were twofold. Firstly the Municipality of Zurich submitted to the public a proposal for a 200 million Sfr. (130 million EUR) investment in promoting public transport on roads. The policy was to manage traffic in view of strict priority for trams and buses on roads and crossings. On the other side the Cantonal Government submitted a project for a 700 Mio Sfr. investment in the improvement of the regional railway network, in order to allow for a vast and efficient S-Bahn system. Both projects were accepted by the Municipality of Zurich and have since been carried out.

Looking back we can today say that that double-handed approach was a success in terms of interlinking the S-Bahn with its feeder system. The latter was not only provided in the core-city but also in all the suburban communities. The economically, ecologically and socially backed idea was to provide an alternative to car use. Today over 90% of the population of the Canton of Zurich lives less than 400 m distance from feeder bus stops and 750 m from S-Bahn stations. With the exception of the hills all parts of the Canton have their S-Bahn branches. The modal split (measured as the share of public transport in city-oriented movements) reaches 70 and 80% in the peak hours. It falls down to 20 – 50% outside peak hours. Cost coverage of the best S-Bahn line is more than 80%, while the main bulk of lines reaches 40 – 60%.

Interviews in the framework of the TRANSECON project show that co-ordination of S-Bahn planning with land-use planning did originally not go far beyond the goal of avoiding problems with the alignment. Not until five years after the opening of the S-Bahn system did the Cantonal Master Plan (*Richtplan*) designate so-called Central Development Zones that referred in large part to the spatial distribution of the S-Bahn stations.

The designation of Central Development Zones did not, however, necessarily evoke investment in the areas served by the S-Bahn. Land-use planning in most parts remained without efforts from the

authorities and the transport operators to involve private actors. Investors in back offices of the tertiary sector and in shopping centres preferred locations in the vicinity of highways around the core-city.

Substantial change in land-use developments have only occurred for about a decade. The economic decline of the industrial sector has led to a large amount of degraded land, both in the core-city and in the suburbs. At earlier times, the industry was obviously located near the railways. Today that land is partially emptied and gets converted into new urban developments, be it for businesses or for housing. In this way the economic transition has supported the system of public transport in influencing land-use and driving additional demand to that mode.

Yet demand for using public transport does not by itself rely on excellent operational performance. Land-use planning in the new development areas in S-Bahn corridors today involves relatively restrictive rules for traffic and parking management. The main effect of such restrictions is both to avoid congestion on the surrounding road network and to stimulate maximum use of the high public transport frequencies and capacities. A good example of such rules may be the contingency policy for parking and/or car access applied in the large Zurich North development zone.

The example shows that in principle the S-Bahn was primarily considered as a matter of transport policy. The integration into a wider scheme of regional and local development policy has only gradually come about. And it was supported by general economic changes and related reaction of the real estate market.

### ***1.3 The Glattal Suburban Light Railway***

In terms of integrating spatial planning and transport policy the S-Bahn of Zurich represents thus only a kind of a first generation approach. The Glattal Suburban Light Railway Project which will be submitted soon the voters of the Canton of Zurich carries, in contrast, the label of a second generation and shows signs of learning.

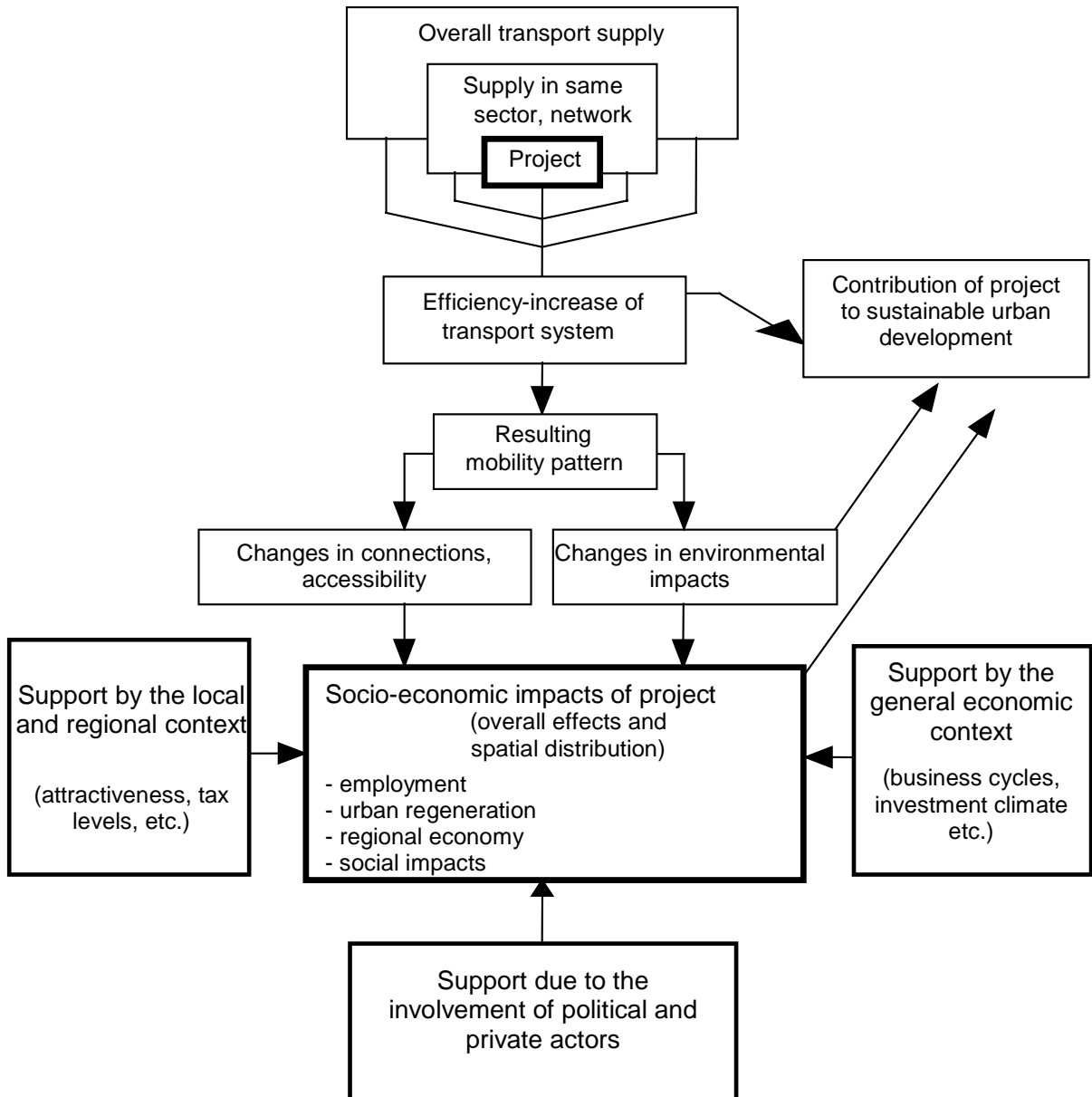
The Light Railway is to be implanted in the vast development area between Zurich airport and the core-city, and it also extends in tangential direction over a broad segment of the first suburban ring. It is a further element of public transport policy after the voters have given green light for still another large extension of the radial railway system in the metropolitan region.

The Light Rail Project has from the beginning been conceived – and communicated - as a new backbone of suburban development. Its alignment covers those large shopping and business centres that decades ago were placed in vicinity to the highway interchanges and close to the international airport. In addition it serves new development areas and supports the principle of densification of the settlements. This policy is accompanied by strong promotional efforts of the Transport Operator to the address of investors.

The Glattal Light Rail interlinks three of the 14 designated Central Development Zones in Zurich Metropolitan Region and hereby covers some 40% of the future development potential of the whole Canton. The active development of such designated and well-served areas occurred in several “co-operative procedures”:

- Co-operation between the Transport Operator, the municipalities and transport-oriented interest groups in view of reorganising land-use patterns and feeder bus systems in a way that would allow for optimal and profitable operation of the Light Rail.

Figure 15. TranSEcon - Common analytical framework





- Co-operation between the Transport Operator and private land-owners and/or investors in view of stimulating factual development of the designated areas and in view of reducing parking facilities to a level that corresponds with the excellent public transport services. One of the most remarkable cases is a large business that provides not more than one parking lot for ten employees.
- Co-operation among all actors to achieve an attractive common appearance of all stations and their surrounding. The Transport Operator provides consultancy to private businesses and investors for reaching such corporate identity.

This project and its link to development policy may be seen as a late answer to the challenges of urban sprawl. And it is geared to overcome the often-stated difficulties to provide high capacity public transport in tangential direction, around the cities.

It is to be expected that its clearly defined and comprehensive territorial and operational vision will be successful in giving new shape to this amoeba-like and faceless suburban segment of Zurich metropolitan region – and in driving demand for a sustainable mode of transport.

## 2. Support “from above”

The latter example, in particular, shows that successful integration of spatial development and transport policy depends on gear-wheel-like interrelated performance of both of them. There are definitely pertinent potentials on local and regional level.

We shall now consider in what way such integrative policy can be supported “from above”, mainly from the national level.

The Federal concept “Rail and Bus 2000” has brought enormous support to any endeavours for promoting public transport in urban - and also rural – regions. This concept is based on a country-wide offer of optimal connections, on at least an hourly frequency. Investment in speed has not been done in view of moving as fast as possible but of reaching the next knot in the network in due time and thus guaranteeing its hub function. Not only factually, but also by its suggestive idea to perceive public transport as a matter of regular pulsation, this system of railway and regional bus services has gained wide credibility and acceptance. It has provided excellent network effects to all regional centres and the periphery. One must, however state that in Switzerland none of the important railway interchanges has carried out such large re-urbanisation projects as we can see for instance in Lyon Part-Dieu, Den Haag Centraal or London Liverpool Street.

In terms of institutions, spatial planning on Swiss Federal level has taken essential steps towards integration with transport policy:

- The Office for Spatial Development has recently become part of the Federal Transport Ministry, and it has hereby incorporated the previous Service for Comprehensive Transport Planning.
- The Federal Law for Spatial Planning obliges each office of the Federal Government that deals with infrastructures to submit to the Planning Office sectoral plans (so-called “*Sachplaene*”) that give proof to the observance of the principles of spatial development. Among these principles the will to reverse settlement growth towards densification (“*Siedlungsentwicklung nach Innen*”), combined with the increased insertion of public parks

and other recreation areas, takes a prominent position. Actually the Sectoral Plan for Roads and the Sectoral Plan for Railways are in the pipeline for approval.

- Since the mid-nineties the Federal Government engages more strongly in a policy geared for solving problems of the cities and urban regions (“*Agglomerationspolitik*”). The Federal level will share pertinent costs. This is relatively late in international comparisons. Yet it may be of interest that the Federal contributions are conditionally linked with integrative efforts between spatial development and transport policy. In an initial phase the Federal Government supports prototypes of such approaches (“*Modellvorhaben*”). Among the candidates is also the Glattal Light Railway Development that was discussed before.

The Swiss case inserts itself in a long row of similar efforts and experience in other countries, such as the Netherlands with its ABC-policy, France with its “*Contrats de Plan Etat-Region*”, the UK with its White Paper on Urban Renaissance, Germany with its “*Modellvorhaben*” for Urban Networks and the United States with the active involvement of railway companies in the real estate market, to name just a few. The recommendations of the ECMT Project Group on Urban Travel and the OECD “Metropolitan Governance Principles” of 2001 give room for support in the here discussed direction.

Political acceptance for integrating spatial planning and transport policy is thus broadly ensured.

### **3. Towards more acceptance of land-use policies by the real estate market**

Some key questions remain, however: Does the real estate market and do enterprises accept locations whose primary quality is that they are very well served by public transport? Can co-operative efforts of public authorities and private developers for making use of these locational qualities become the norm, at least for establishments with large numbers of employees or customers? Has the trend to choose sites that are first of all in the vicinity of highways been broken?

Exact figures that could confirm a clear turn of the earlier trend do not exist. But it seems that locational preferences have somewhat changed in recent years in the direction that is aimed at in most official spatial policies. There are three reasons for this:

- Public transport has in many countries improved very substantially, in far-distance as well as regional dimensions. The networks are functioning. Reliability and comfort have increased. This quality can become increasingly important when congestion on road becomes the norm. And if this service quality is really high a developer may be ready for a reduced provision of parking lots, considering also savings in investment costs.
- The widespread discussion and praising of sustainability, as a guideline for political and entrepreneurial action, has at least the merit that there is a kind of common compass, even if it can often not be clearly defined what sustainability means in terms of balancing economic, environmental and social attributes.
- The risk of depending on car use while fuel prices might increase, be it due to market movements on the international scene or due to pricing policies, is today assessed as being bigger than years before.

In any case re-urbanisation – in the sense of bringing back high value urban functions to the centre - takes place in many countries in the proximity of railway stations, and that trend goes hand in hand with an increase in demand for public transport.

#### 4. Conclusions

To conclude one may say that land-use and zoning plans *per se* are not able to drive transport demand to an environmentally sound path. Zoning plans outside cities in general provide so much land for settlements that the steering capacity of such planning is limited. And the general level of mobility is so high that people choose their travel destinations almost independently of physical distance. To a certain degree this also corresponds to economic development policy, in the sense that competition is stimulated by mobility.

Transport policy and spatial development can, however, become interlocked gear wheels if distinct efforts are taken to:

- Provide a very attractive public transport service, from national rail networks down to regional and local feeder buses, and by providing priority treatment to public transport on urban roads.
- Give railway stations a key role for structuring settlement patterns, by master plans that allow for high density developments.
- Engage transport operators, public authorities and private developers in co-operative procedures and negotiation in view of locating urban functions and dense private investment at station areas and their immediate surroundings.
- Link land-use regulations and building permits in such well-accessible areas with restrictive rules for car traffic and parking and to engage businesses with authorities and transport operators in mobility management in view of making best use of public transport services.
- Apply stricter rules in terms of environmental audits for large commercial establishments and business complexes.
- Link business parks and shopping centres that have been placed around highway interchanges by means of feeder buses or light railway systems with suburban railway stations and to oblige such centres to charge for parking.
- Back all these efforts by guidelines and financial incentives from national governments, in the frame of re-urbanisation policies.
- Improve urban governance by way of institutionalising close interaction between transport and land-use policies. This interaction must by all means rely on further developed networking capabilities of the authorities and on more dynamism in the sense that planning should not only look for spatial order but also for the activation of processes that can lead to sustainable urban performance. Pertinent urban transformation does not simply occur by chance - it must be led by political will.

Most of our urban regions have to undergo a kind of Gestalt-Therapy. Hereby the railway system and its interchanges can take a leading role. A recently finished COST-Action - with the name of CIVITAS and a publication on “Governing Cities on the Move” – has worked out functional and management perspectives on such transformations of European urban infrastructures. If that happens we can drive travel modes and patterns in the direction of sustainability.

# INFLUENCING COMPANY LOGISTICS MANAGEMENT

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## 1. Introduction

Freight transport is affected by a broad range of corporate decisions. These decisions influence the transport operation in different ways. Table 4 attempts to map the inter-relationships between a set of six freight transport parameters and areas of strategic decision-making grouped in relation to three core business processes, namely product development, marketing/sales and order fulfilment. The presence of a dot in a cell signifies the existence of a direct relationship.

This table shows that the nature of the freight transport operation is the result of a complex web of decision-making, spanning different functional areas within the business. The reorganisation of business activity at functional, corporate and supply chain levels over the past 40 years has transformed the strategic context within which transport decisions are made. Few studies have examined the effects of these managerial changes on the physical movement of freight.

Of the freight transport parameters listed in Table 4, only the volume of freight movement has been analysed in detail within the context of logistics management. Logistical decisions affecting freight transport operations are made at four levels (McKinnon and Woodburn, 1996):

1. *Strategic decisions* relating to numbers, locations and capacity of factories, warehouses, shops and terminals.
2. *Commercial decisions* on product sourcing, the sub-contracting of production process and distribution of finished products. These establish the pattern of trading links between a company and its suppliers, distributors and customers.
3. *Operational decisions* on the scheduling of production and distribution that translate the trading links into discrete freight flows.
4. *Tactical decisions* relating to the management of transport resources. Within the framework defined by decisions at the previous three levels, transport managers still have discretion over the choice, routing and loading of vehicles.

The growth of freight traffic is the result of a complex interaction between decisions made at these different levels. Decisions at levels 1 and 2 determine the quantity of freight movement measured in tonne-km while decisions at levels 3 and 4 translate this movement into vehicle traffic, measured in vehicle-km. In assessing the effectiveness of policy initiatives in this field, it is therefore

important to take account of the trade-offs that companies make between transport and other logistical activities at each decision-making level.

Table 4. **Inter-relationship between Strategic Decisions and Freight Transport Parameters**

	Quantity of freight	Mode choice	Vehicle type	Vehicle utilisation	Vehicle routing	Delivery scheduling
<b>Product Development</b>						
Product design	•	•	•	•		
Packaging	•	•	•	•		
Product range	•	•	•	•		
<b>Marketing and Sales</b>						
Market area	•	•	•		•	
Marketing channels	•	•	•	•	•	
Sales strategy / promotion	•	•	•	•		•
<b>Order Fulfilment</b>						
Location of production and distribution facilities	•	•			•	
Sourcing of supplies	•	•			•	
Production system	•		•	•		•
Inventory management	•	•	•	•		•
Materials handling	•	•	•	•		
After sales service	•		•	•		•
Recycling / reverse logistics	•	•	•	•	•	

*Source: McKinnon, 2001.*

The UK Royal Commission on Environmental Pollution (1994) argued that ‘a sustainable transport policy would be based on growth of no more than 10% per decade in overall demand for freight transport over the next 30 years’. Between 1985 and 1998, total tonne-km (by all modes) in the EU rose by 53% (40% per decade), while GDP rose by 34% in real terms (European Commission 2000). The European Commission’s white paper on transport indicates that, to ease environmental and congestion problems, it may be necessary to decouple tonne-km and GDP trends, with the former growing at a slower rate (European Commission, 2001). Given the recent history of economic and freight traffic growth in Europe, merely aligning the tonne-km growth trend with that of GDP would be a worthy policy objective.

In this paper we will consider the opportunities for reducing the rate of freight traffic growth by altering two critical ratios:

- Total tonne-kilometres: output - **Transport-Intensity**.
- Vehicle kilometres: tonne kilometres - **Vehicle Utilisation**.

## 2. Reducing Transport Intensity

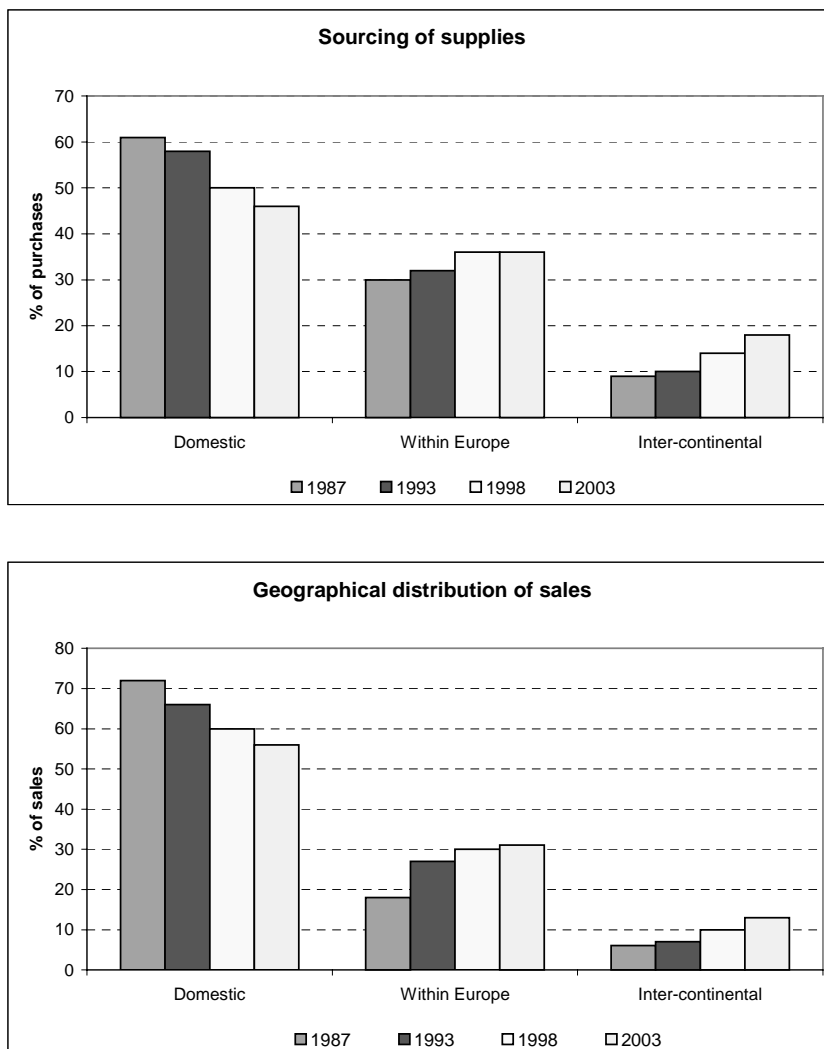
The transport intensity of a supply chain is determined both by the number of links and their average length. The number of links can be crudely measured by dividing the tonnes-lifted statistic by the actual weight of goods produced or consumed (i.e. at either end of the supply chain). This index, known as the *handling factor*, effectively measures the number of separate freight journeys that a consignment makes in moving from raw material source to final point of sale. As limited data are available on the weight of products produced and consumed, handling factor calculations are inevitably highly approximate. An attempt was made in the EU REDEFINE project to analyse the trend in handling factors in five European countries (France, Germany, the Netherlands, Sweden and the UK) (Netherlands Economic Institute *et al.* 1997). This suggested that over the period 1980-1995 handling factors had fluctuated and shown no consistent trend.

Some industrial trends are likely to have been increasing the number of links in the supply chain. In some manufacturing sectors, for instance, a process of vertical disintegration has been occurring, with non-core activities being increasingly subcontracted to outside agencies. Extra tiers have also been added to some supply chains to consolidate inbound flows to factories and distribution centres or to localise the final customisation of products. In many retail markets, on the other hand, distribution channels have become more streamlined with products passing through fewer stockholding points *en route* to shop. The counteracting effects of these processes on the structure of the supply chain may partly explain the absence of any clear trend in handling factor values.

In contrast, the average length of links in the supply chain, known as the *average length of haul*, has been rising steadily, in most countries, for several decades. Within Europe it has been increasing at an average rate of 1.5-2.0% per annum (ECMT, 2000). Increasing haul lengths have been the main cause of road freight growth. Over the past thirty years, they have been responsible for approximately two-thirds of the increase in road tonne-km within Europe. This increase in average length of haul has been attributed primarily to three developments:

1. *Wider sourcing of supplies and expansion of market areas*: in their search for suppliers capable of offering a superior mix of product quality, service and price, manufacturers and retailers have been sourcing products over greater distances. Surveys undertaken by A.T. Kearney (1999) for the European Logistics Association between 1987 and 1998 revealed a significant decline in the proportion of industrial purchases and sales made within countries and sharp increase in the proportion traded internationally at both European and global levels.
2. *Centralisation of production, warehousing and terminal capacity*: this enables companies to exploit economies of scale in the construction and operation of these facilities. By reducing the number of stockholding points in their logistical systems firms can also take advantage of the so-called 'square root law', cutting the amount of safety stock required to provide a given level of customer service (Maister, 1976). For example, according to this law, moving from a decentralised system with a national warehouse in each of the fifteen EU countries to a completely centralised system focused on a single pan-European warehouse should, *ceteris paribus*, cut the amount of safety stock by roughly three-quarters. By increasing the average distance from the supply point to the customer, centralisation usually generates more freight movement per tonne of product distributed.

Figure 16. **Wider geographical sourcing and distribution**



Source: A. T. Kearney Ltd (1999), *Insight to Impact: Results of the Fourth Quinquennial European Logistics Study*. European Logistics Association, Brussels.

3. *Development of hub-satellite systems*: a large and increasing proportion of freight, mainly in the form of parcels or pallet-loads, is now assembled at local 'satellite' depots, trunked to a centralised 'hub' for sortation and distributed via other satellite depots to their final destinations. Indirect routing of freight flows through hubs generates more tonne-km of freight movement than direct inter-depot trunking, though this system offers the advantage of improving vehicle utilisation and cutting total traffic levels.

At a macro-economic level, transport intensity can be defined as the ratio of road freight tonne-km to the level of economic activity measured by GDP. In many countries this ratio has been relatively stable, suggesting that it may be difficult to 'decouple' these two variables (Pastowski, 1997). The recent EU White Paper on transport, nevertheless, acknowledges that, "*we have to consider the option of gradually breaking the link between economic growth and transport growth*" (European Commission, 2001). Although not explicitly stated in this policy document, this would

entail reducing the number and/or length of links in the supply chain by means of what Bleijenberg (1996) calls '*spatio-economic changes*'.

The number of links in the chain could be cut by increasing the degree of vertical integration in manufacturing, expanding the range of activities carried out on a single site. In some sectors, this would involve fundamental re-engineering of the production process and require very strong inducements. Distribution channels might be further streamlined to reduce the number of intermediate storage and handling points. In many developed countries, however, this streamlining process is well advanced leaving little opportunity for further rationalisation. Moreover, eliminating from the supply chain nodes at which loads are consolidated could be counterproductive as it might reduce vehicle load factors.

In theory it would be possible to reduce the average length of haul, or at least moderate its rate of increase, by reconfiguring production and distribution systems, sourcing products from local suppliers and finding shorter routes between collection and delivery points.

1. Reconfiguring production and distribution systems: These systems, which are shaped by decisions at level 1 in the logistics management hierarchy, are relatively fixed in the short- to medium-term. It would be very difficult to reverse the geographical concentration of production, given the magnitude of the scale economies that firms have achieved. Restraining or arresting this lengthening of hauls would require fairly radical policy measures. Simulation modelling of logistical systems in a range of industrial sectors indicates that the cost trade-offs which companies make between transport, manufacturing, inventory, warehousing and handling are very robust (McKinnon, 1998a). Tilting these cost trade-offs sufficiently to induce a return to more localised and decentralised patterns of production and distribution would require very large increases in transport costs (generally in excess of 100%)<sup>2</sup>. Increases of this magnitude would not only be politically unpalatable; they would also be difficult to defend on environmental grounds. The main justification for imposing a much higher level of taxation on freight movement is that it would internalise the related environmental and social costs. Several attempts have been made in recent years to place a monetary value on these external costs (e.g. European Commission, 1995; ECMT 1998). If these costs were fully internalised in higher taxes on freight operators, the increment in transport operating costs would be unlikely to cause much logistical restructuring. It might, nevertheless, slow the rate of freight traffic growth, particularly in sectors making and distributing products with a low value-density.

Alternatively, the governments could introduce physical controls on the movement of freight. Quantity licensing has been abolished at the international level and phased out of most national haulage markets. It has been suggested that at some stage it may be necessary to reintroduce it for environmental reasons (Cooper, 1991). For reasons discussed elsewhere (McKinnon, 1998b), this would run counter to the prevailing trend of liberalisation in the world's freight markets and probably prove counter-productive.

In the absence of high 'eco-taxes' or quantitative controls on road freight capacity, increasing traffic congestion might force a return to less transport-intensive logistics. Theoretical modelling by Eberhard (2000), however, suggests that this too will be unlikely to cause much logistical restructuring. He simulated the effects on a hypothetical European

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2. It is likely too that this modelling exercise will have under-estimated the transport cost threshold as it failed to incorporate all the benefits that firms claim to derive from centralisation and took no account of restructuring costs.



distribution system of a 50% increase in road traffic levels between 1995 and 2015. It was assumed that road capacity would remain fixed and there would thus be a substantial increase in traffic congestion. By comparing the optimal structures of the distribution systems in 1995 and 2015, he found that the number of warehouses would remain the same (at four) and only marginal changes would have to be made to the locations of two warehouses. The main impact of the growth of congestion would be on the size and shape of the 'hinterlands' served by the warehouses. The net effect on total vehicle-km would be fairly marginal.

2. Pattern of sourcing: This pattern, which is created by decisions at level 2 in the management hierarchy, is becoming more transport-intensive through time, as products are sourced and marketed over wider areas. The geographical expansion of trade areas appears so fundamental to the process of economic development that it is difficult to see how it can be contained. On the contrary, the development of business to business e-commerce is likely to reinforce the lengthening of supply lines as it enables companies to extend their search for suitable suppliers (EC Joint Expert Group on Transport and the Environment, 2001). Advances in information and communication technology are also making it easier for companies to manage the global supply chains through which remotely sourced products are channelled.

In many industries, factor cost differentials are very wide relative to transport costs, making it economic to move products long distances for intermediate processing that may only add marginally to their value. For most product groups, only a very steep increase in transport costs and/or transit times would be likely to offset these production cost differentials and promote a return to more localised sourcing.

Holzappel (1995) favours the development of 'regional supply structures' within which firms would source as much as possible from local suppliers. Using data collected by Böge (1994) on the 'transport logistics' of strawberry yoghurt, he calculated that if, in the production and distribution of this product, the nearest suppliers had been used, total lorry-km could have been reduced by 67%. If widely applied, this practice would dramatically reverse the recent growth in 'food-miles' (Sustain, 1999), but at the expense of customer choice and, possibly, higher prices. In the realms of industrial logistics, Strutyniski (1994) has shown how rationalisation of the supply networks of large car assembly plants, with greater 'vertical integration' at the regional level, could reduce freight transport requirements by 70%. He concedes, however, that huge increases in transport costs (at least 5-fold) would be needed to induce this process of rationalisation.

3. Vehicle Routing: The efficiency with which vehicles are routed around collection and delivery points influences the tonne-kilometre figure. It has been estimated that the use of computerised vehicle routing and scheduling (CVRS) packages can, on average, reduce the distance travelled by around 5-10%, though instances of 20% distance savings are quoted in the literature (Freight Transport Association, 2000). Minimising the distance travelled need not minimise environmental impact, as the shortest route may involve traversing sensitive urban areas or congested sections of the road network.

The development of vehicle tracking and mobile data communication systems has created the opportunity to replan vehicle schedules and routes in real-time while the vehicle is on the road in response to short-term changes in customer requirements and traffic conditions. It is too early to predict the net effect of the widespread adoption of this dynamic form of CVRS on road freight traffic levels.

Governments can also exploit information and communication technology (ICT) to manage more effectively the flow of freight traffic on the road network. There is a need to supplement general measures which influence overall freight transport demand with geographically-specific measures targeted on freight traffic levels on particular routes at particular times. The application of satellite tracking to the collection of distance-based taxes will allow public agencies to vary the level of charges by location and time of day in relation to congestion levels. This is likely to promote rerouting and retiming of deliveries, particularly the latter where there is sufficient flexibility in production and distribution systems to permit rescheduling. As road networks get more congested, companies will be forced to reorganise other logistical activities to accommodate longer and more variable transit times.

### **3. Improving Vehicle Utilisation**

By raising vehicle load factors it is possible to reduce the amount of commercial vehicle traffic (measured in vehicle km) required to move a given quantity of freight (measured in tonne-km). The effects of the growth in freight tonne kilometres on traffic congestion and pollution levels can therefore be mitigated. In addition to reducing these externalities, improved loading also increases the efficiency of delivery operations. This measure therefore has the advantage of yielding economic as well as environmental benefits and, in most cases, being self-financing (Holman, 1996).

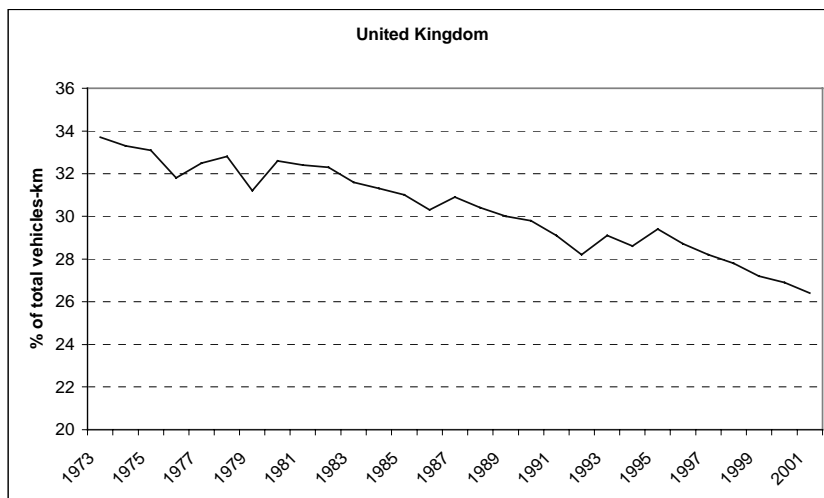
Most of the discussion of vehicle utilisation is confined to road transport. It is, after all, by far the dominant freight mode, the most polluting of the surface modes and the one subject to the greatest congestion. It is also the mode to which most of the available utilisation data relate. This is not to deny that there is also considerable scope for improving vehicle load factors on other modes.

In assessing the utilisation of vehicle capacity it is important to distinguish empty running from vehicle loading on laden trips.

#### ***Empty running***

In some European countries the proportion of truck-km run has been declining. In the UK, for example, it is fallen from 32.6% in 1980 to 26.4% in 2001 (Department for Transport, 2002). A discussion of the factors responsible for the decline in empty running can be found in McKinnon (1996). One factor contributing to this trend has been the liberalisation of road haulage operations which has granted operators freedom to collect return loads.

Figure 17. **Downward trend in empty running**



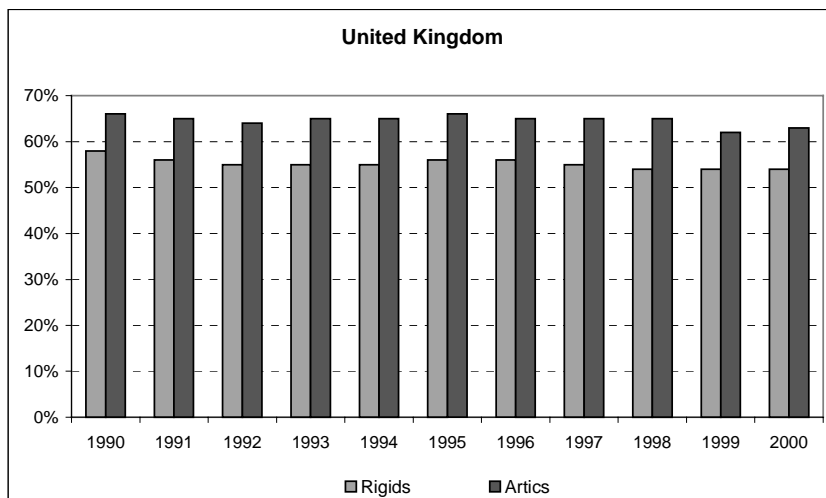
Source: Department for Transport (2001), *Transport of Goods by Road in Great Britain*, London.

It is uncertain how long this downward trend in empty running will continue. Regional imbalances in freight flows, vehicle incompatibility and scheduling constraints, for instance, impose a lower limit on the proportion of empty running. There is little that government can do to reduce this residual level of 'structural' empty running. Governments can use advisory and best-practice programmes to encourage companies put greater effort into finding backloads. For example, the UK government's 'Sustainable Distribution' document cites examples of company backloading initiatives which it would like to see more widely adopted (DETR, 1999a). The market pressures to do this are already very strong, however, as the availability of backloads is a critical determinant of profitability in the trucking industry. The growth of on-line freight exchanges is both intensifying these pressures and giving carriers a means of improving the loading of their vehicles in both directions (Rowland, 2000, Mansell, 2001). On the other hand, the application of the Working Time Directive to the haulage industry and the growth of traffic congestion may inhibit backloading by imposing tighter time constraints on delivery operations.

### ***Vehicle loading factors***

There is no readily available source of data on vehicle utilisation across EU countries. UK data indicates that approximately 60% of the capacity available to carry tonne-km is actually utilised, a figure that has remained reasonably stable for the past decade (see Figure 18) (Department for Transport, 2001). Although this utilisation level may seem relatively poor, it should be noted that many low density loads fill the available space on the vehicle long before the maximum weight is reached. Where there are tight limits on the stacking height of the product, loading is usually constrained much more by the available deck-area than by the cubic capacity. The increasing use of double-deck vehicles is helping to address this problem, particularly in countries such as the UK where height clearances on the road network are relative high (McKinnon and Campbell, 1998).

Figure 18. **Percentage of t-km capacity utilised**



Source: Department for Transport (2001), *Transport of Goods by Road in Great Britain*, London.

Vehicle utilisation has been affected by a range of logistical developments, most depressing load factors, though some having a counteracting effect. Major developments include:

### ***Just in Time (JIT) replenishment***

It is often argued that by sourcing supplies on a JIT basis, demanding more frequent deliveries of smaller quantities within narrower time windows, companies trade-off more transport for less inventory (e.g. Whitelegg, 1995, Bleijenbergh, 1996). The conventional view is that savings in inventory, and related productivity benefits, can more than offset the additional transport costs. The negative effects of JIT on vehicle utilisation may have been exaggerated, however. A crude indicator of the effect of JIT on the road transport sector is average payload weight. If JIT has been causing a pronounced ‘de-consolidation’ of loads, one would expect to see this reflected in a decline in the average payload weight. Analysis of official freight data for the UK, the Netherlands and Sweden revealed significant net increases in this index across these countries’ truck fleets (McKinnon, 2000). Many of the firms supplying or receiving products on a JIT basis have taken measures which, directly or indirectly, minimise the downward pressure on vehicle load factors. These include the insertion of an additional consolidation point into the supply chain, the ‘milk-round’ collection of orders and the single-sourcing of supplies.

### ***Postponement***

The postponement principle states that companies should delay committing inventory to particular market segments as long as possible. It suggests that the final customisation of products should be delayed to a late stage in the production and distribution process. Although motivated primarily by a desire to cut inventory levels, postponement can also yield transport benefits. As Van Hoek et al. (1998) point out, ‘A high product cube or weight increase through final manufacturing, as in the case of the soft drink industry, favours postponement for reasons of reduced transportation and inventory carrying costs.’ Most of the research on postponement has concentrated on its effects on

inventory levels. Very little work appears to have been done to assess its effects on transport efficiency.

### ***Upstream order-picking***

Traditionally, the primary distribution of manufactured products from factory to distribution centre was supply-driven, with pallets loaded to maximum height with a single product line and standard packaging. The growth of 'quick response' and 'cross-docking' is now forcing manufacturers to assemble mixed orders for individual retail and wholesale customers either at the plant or central warehouse. The flow of product at the upper levels of the supply chain is thus becoming demand-driven and pallet loads tailored to customer requirements. These pallet loads tend to be lower, have an irregular profile and offer less opportunity for stacking.

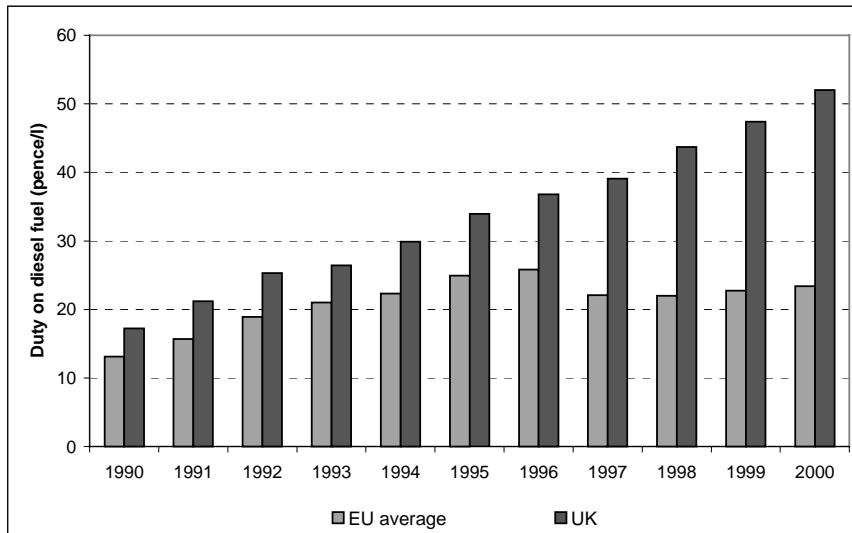
### ***Direct delivery to home***

The growth of business to consumer e-commerce is increasing the proportion of retail sales delivered as individually-packaged consignments directly to the home through parcel networks. This form of distribution generally achieves lower levels of vehicle utilisation than deliveries through conventional retail channels, though in assessing the net effect on traffic levels allowance must be made for the substitution of van journeys for car trips on the 'last mile'.

Governments can do little to directly influence these trends. They can, nevertheless, encourage companies to make better use of vehicle capacity in three ways:

- *Raise vehicle operating costs through the imposition of higher taxation:* The available statistical evidence suggests, however, that high fuel taxes exert little leverage on vehicle load factors. Load factors across the UK lorry fleet remained fairly static during the period of the fuel tax escalator. This supported the finding of Schipper et al. (1996) in a multi-national study of road freight efficiency that over the period 1973 to 1992 that there was '*no correlation between changes in trucking fuel price and changes in trucking modal intensity*'. It has been argued, however, (e.g. by Plowden and Buchan, 1995 and European Federation for Transport and the Environment, 2000) that the introduction of a system of distance-based taxation government will put additional pressure on firms to improve vehicle loading.
- *Increase legal limits on vehicle weight and size:* The main measure that governments have so far taken to raise the degree of load consolidation is to increase legal limits on vehicle weights and dimensions. Ironically, this actually reduces vehicle load factors in the short term, by permitting a step-change in vehicle carrying capacity. As fleet management adjusts in the longer term to the new regulations load factors generally return to their previous level, significantly increasing the degree of load consolidation. An analysis for the UK Commission for Integrated Transport (CfIT) of the effect of increasing maximum truck weight from 40/41 tonnes to 44 tonnes, concluded that, after allowance had been made for some erosion of freight traffic from rail and a small traffic generating effect, the net consolidation of loads in the heavier vehicles would remove 100 million vehicle-km of articulated vehicle traffic from the UK road network. Increasing the physical dimensions of vehicles is more difficult, given public opposition to vehicles getting bigger and physical constraints on the size of vehicle than can be accommodated on the road network and at industrial and commercial premises.

Figure 19. **Policy instruments: taxation**



Source: Road Haulage Association (2000), *Fair Play on Fuel*, Weybridge.

- *Helping companies to benchmark their transport efficiency:* The UK government has funded the development and implementation of a standardised system of benchmarking vehicle utilisation and energy efficiency in several sectors, including food, automotive and non-food retailing (DETR, 1999b, McKinnon, 1999). This encourages companies to upgrade their transport efficiency to that of the best practice operators with their particular sector.

#### 4. Conclusion

Governments can directly influence logistics management decisions through the use of:

- *Fiscal measures:* mainly fuel duty, vehicle taxes and road user charges.
- *Financial incentives:* these have been used more encourage a transfer of freight traffic between modes than to influence the rate of freight traffic growth.
- *Regulations:* most of the quantitative controls on freight capacity and tariff levels have been removed, leaving qualitative controls to govern the design, licensing, operation and maintenance of vehicles. Changes in Construction and Use Regulations, such as raising maximum lorry weight, can promote load consolidation in some sectors.
- *Infrastructure and land use planning:* the provision of network and terminal capacity and land use planning policies clearly affects both the total volume and geographical distribution of freight traffic.
- *Advice and exhortation:* this has so far been largely confined to identifying and promoting best practice in vehicle loading and fuel efficiency. It could be extended to the design of

logistical systems to show they can be made less transport-intensive with little loss of competitiveness.

Many transport-specific policy measures impact on logistics management at the bottom level in the decision-making hierarchy, primarily affecting the ‘tactical’ management of delivery operations. At this level they can have a noticeable effect on load factors, vehicle routing and fuel efficiency. Their impact on higher-level strategic decisions relating to the structure of the logistics system, the sourcing of materials and scheduling of production is usually much more limited. This partly reflects the fact that freight transport represents a small proportion of total costs and sales revenue. Vehicle and fuel taxes therefore give government planners little leverage on the major logistics trends that have been propelling the growth in freight traffic volumes. Concern about traffic congestion and the working time directive, however, is forcing many companies to review their current logistical operations and may result in significant reconfiguration of logistical systems over the next decade.

Finally, it is worth noting that the structure and operation of logistics systems have been subject to many policy influences outside the transport arena. Finance ministries and central banks, for example, through their application of tight monetary policy, have encouraged the adoption of inventory-reducing measures, such as the centralisation of warehousing and move to JIT replenishment, which have had the effect of increasing the overall transport-intensity of the economy.

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## HOW CAN INFRASTRUCTURE PRICING HELP RATIONALISE TRANSPORT DEMAND?

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### 1. Introduction

In this report we survey the economic approach to rational transport demand. We focus on a few principles and illustrate these with recent policy research. We aim to cover several issues rather than one issue in depth.

### 2. When is transport demand rational?

From an economic view any demand for which the willingness to pay is lower than the social (= including all externalities) marginal (= additional) cost is not rational. The reason is simple: when the value to the consumer of the good consumed is lower than its total production cost for society it is better to forego this consumption. This holds for bathtubs, mobile phones and also for transport trips.

Table 5. **Social Marginal Cost and costs for users**

COSTS FOR USERS	SOCIAL MARGINAL COST
<i>Resource costs car and fuel</i>	<i>Resource costs car and fuel</i>
<i>Own time costs</i>	<i>Own time costs</i>
Fuel taxes +vehicle taxes	Environmental costs (air pollution, noise)
Insurance premia for third party liability	Accident costs caused to others
	Time losses for other road users (external congestion costs)
	Wear and Tear of infrastructure

This principle is common sense; the problems are in the definition of the social marginal cost and its implementation. In the case of a road transport trip, as shown in Table 5, the social marginal cost

includes the resource cost<sup>3</sup> of the vehicle and the fuel, the time cost of the driver and passengers, the wear and tear of infrastructure, the environmental costs, the accident costs for the others and the congestion time losses caused to other drivers.

Whether the drivers' willingness to pay is at least as large as the social marginal cost depends on the pricing and taxation structure. The drivers pay for the resource and fuel costs of their car, for the time losses of themselves and their inhabitants, they pay taxes on fuel, vehicle ownership, finally they also pay insurance premia.

In the end, we need to determine whether the sum of taxes on fuel, vehicle ownership and the insurance premium equals the sum of the wear and tear of infrastructure, the environmental costs, the accident costs for the others and the congestion time losses caused to others<sup>4</sup>.

The difficulty is that we need to achieve this not only for car use on average but for every type of car use: polluting and non polluting, in the peak and the off-peak period, dangerous and careful drivers, in the countryside and in metropolitan areas.

It is clear that by the present flat structure of pricing of car and truck use, transport demand cannot be rational in all circumstances. In this case economists talk about pricing inefficiencies: prices that are not equal to social marginal costs make that transport demands are either too large or too small. The next question is: how important is this unbalance, what are the pricing inefficiencies and what can we do about it?

### **3. Pricing inefficiencies or what is wrong with current prices and taxes in Europe?**

The TRENEN-II –STRAN project<sup>5</sup> is one of the projects that examined present transport pricing in Europe. Figure 20 gives an idea about the pricing inefficiencies for peak car use by a driver that does not pay its parking resource cost in London. The left column shows the generalised price (= the money cost plus the time cost) while the right column measures the marginal social costs. There are serious imbalances: peak demand in urban areas is often not rational. Now things are not as dramatic for off-peak travel and in non-urban areas. Important to note is that also public transport (passengers or freight) can also be irrational because prices for public transport can also be below the social marginal cost.

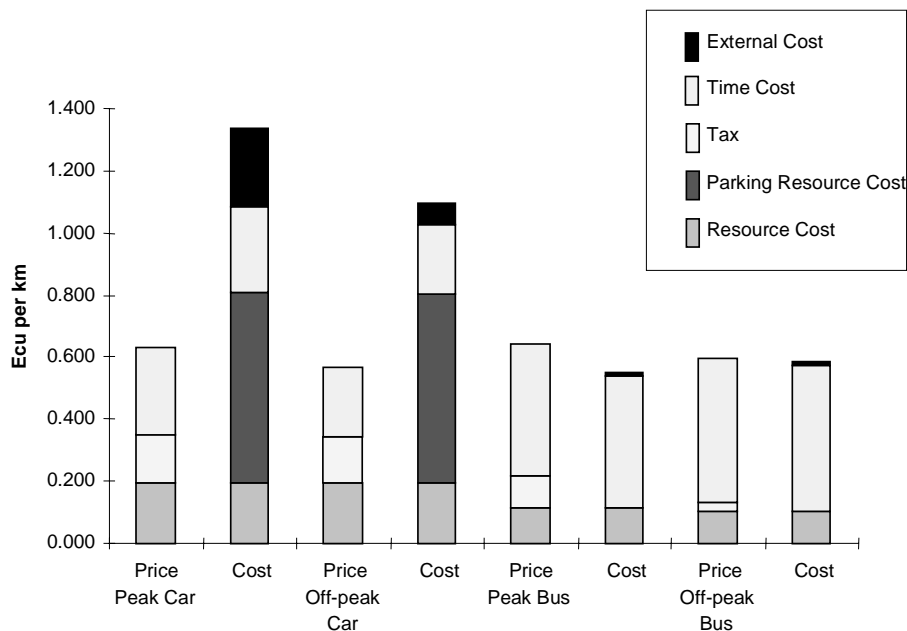
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3. Resource cost is the production cost before taxes. In a competitive economy, the production cost will be equal to the opportunity cost for society.

4. Some people expected to find infrastructure investment costs in this list. We reason here for fixed capacity and then only wear and tear are relevant.

5. Project funded by the 4th research program on Transport of the European Communities. Results are summarised in S. Proost, K. Van Dender, Courcelle, De Borger et al. (2002), "How large is the gap between present and efficient transport prices in Europe?", Transport Policy; A more extensive discussion of methodology and case studies can be found in De Borger B., Proost S., (eds.) (2002), "Reforming transport pricing in the European Union – a modelling approach", Edward Elgar.

Figure 20. Users prices and Marginal social costs of different modes in London  
(2005 with present policies)



#### 4. What can we do about pricing inefficiencies and does it really matter?

Correcting pricing inefficiencies is not easy for two reasons. First, we need to measure marginal external costs and this requires a methodological effort and some resources. The measurement will sometimes have an important error margin but is feasible<sup>6</sup>. Even an imprecise estimate of marginal external costs can be an important guide for improving pricing policies. We learned for instance not only that peak car traffic in urban areas is grossly under priced but also that diesel cars are in the end much more environmentally damaging than gasoline cars<sup>7</sup>, or that off peak bus urban busses have a high external cost in terms of noise and air pollution, etc.

Second we need to find the right pricing instrument to correct the pricing inefficiencies. Differences in environmental costs can be taken into account much better in vehicle and registration taxes. The more difficult part is to differentiate prices over time and over space. Now most drivers pay a flat gasoline tax wherever they drive. Sure, our engineers promise us fancy GPS based electronic road tolling that can charge a different tariff by time and by road but do we really need this investment?

6. In the UNITE project (5th Framework – Transport TRD project of the European Commission) one has reviewed current estimates and one has developed a methodology to estimate marginal external costs.

7. I. Mayeres, S. Proost, (2001), “Should diesel cars in Europe be discouraged?” *Regional Science and Urban Economics*, 31, 453-470.

The answer will be “not always”. Table 6<sup>8</sup> gives us an idea about the relative efficiency of different instruments to correct pricing.

**Table 6. Relative efficiency (before implementation costs) of different pricing instruments in the case of Brussels 2005**

<b>POLICY</b>	<b>RELATIVE ECONOMIC EFFICIENCY</b>
Benchmark (unchanged policies)	0%
Higher Fuel taxes	5%
Better Public transport pricing	5-10%
Parking Charges	30%
Cordon pricing	52%
Full social marginal cost pricing	100%

This table shows that, at present, the added value of some instruments is small (lower public transport prices, better environmental regulations), that some instruments (cordon tolls and parking) are capable of realising an important share of the maximal welfare gains one could potentially achieve. This will depend on local circumstances.

One of the few general conclusions one can draw is that the traditional instruments as there are public transport pricing and environmental regulation have been almost fully exploited and it is time to look for more drastic changes that address time and place specific problems that are becoming more acute every year.

## **5. Does better pricing make sense when the level of investment is not correct?**

Whenever we have infrastructure available (roads, railway lines, canals, port capacity), this infrastructure is used best when it is priced at the short run marginal cost. When there is ample capacity, this means pricing infrastructure at the marginal running costs and when there is a capacity shortage (congestion, etc.), we need to charge prices such that demand is equal to existing capacity. This way we make sure that those who use capacity need it most. This optimal pricing principle holds whenever one has followed a good or a correct investment policy in the past. In private business, one will charge, “whatever the traffic can bear” and the sunk investment costs are as irrelevant as in welfare optimal pricing.

Obviously it always pays off to have good investment policies but this does not imply that wrong investment policies imply another pricing principle, only that optimal prices will probably be different for different available capacities.

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8. S. Proost, K. Van Dender, (2001), “Welfare impacts of alternative policies to address atmospheric pollution in urban road transport”, *Regional Science and Urban Economics*, 31, 383-411.

**6. Should we not first increase public transport capacity before we start changing road taxes and prices?**

This is not necessarily true. Correct pricing means in general much higher road prices in peak periods in metropolitan areas and may involve lower prices in rural areas. Similarly, the efficient public transport prices may be also significantly higher in some periods and areas. The net result on demand for public transport is uncertain and does not necessarily require more capacity for public transport. This is an area that needs further study.

**7. Is the first priority not to have higher gasoline prices and more fuel efficient cars, so as to meet climate change concerns**

No, this is not the first priority. Greenhouse gas emissions may need to be reduced but this should be done where it is least costly for society as a whole. As there is already a high fuel tax and therefore a high greenhouse gas tax for car use (current motor fuel prices include a 200 to 300% tax), there will be cheaper options for greenhouse gas emission reductions in other sectors.<sup>9</sup>

There may be some cheap options for emission reduction around. Some transport volumes are excessive because of external congestion or external accident costs that are not covered. A better transport policy will reduce these flows and this will generate a side benefit under the form of lower greenhouse gas emissions.

**8. Does social marginal social cost pricing generate large deficits for the different modes or infrastructure operators?**

Previous research for the IUR<sup>10</sup> and ongoing research for ECMT and the European Commission shows that social marginal cost pricing may generate important surpluses for road use certainly in urban areas. As regards the other modes, results may be mixed. For public transport one needs to increase some prices and decrease other prices. The decreasing returns to scale nature of the industry implies that efficient pricing will require that important subsidies to pay for the fixed cost part will continue to be needed.

**9. What is the best use of surpluses generated by increased road taxes and charges and is road pricing equitable?**

The best use of budget surpluses is a decrease of the labour taxes or social security contributions in all sectors (not only the transport sector). In Table 7<sup>11</sup> we examine the efficiency and equity effects of three alternative pricing scenarios. A first scenario where we replace current pricing by average cost

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9. For a comparison across sectors See S. Proost, D. Van Regemorter (2000), "Are there cost-efficient CO<sub>2</sub>-reduction possibilities in the transport sector? – Combining two modelling approaches" International Journal of Vehicle Design, Vol. 24, N° 2/3, p 1-15.

10. Rana, R.(ed.), (2001) "Revenues from Efficient Pricing: Evidence from the Member States" Final Report of the UIC/CER/European Commission DG-TREN study.

11. Mayeres, I., Proost, S., Van Dender, K., Wickart, M., Suter, S., Van Nieuwkoop, R., (2002) "Testing alternative integration frameworks- what are the effects of alternative Pricing Policies ?" D13 of UNITE project, 5<sup>th</sup> framework Programme – Transport RTD, European Commission.

pricing per mode: every mode has to break even and charges its average variable and infrastructure cost. This will actually require decreasing taxes in the transport sector and increasing the taxes on other goods, here labour. We see that the net effect of this is actually a labour tax increase and a welfare loss for all 5 income quintiles. The second scenario implements social marginal cost pricing, has no budget constraints per mode and uses the generated budget surpluses to reduce existing labour taxes. This is the most efficient pricing and revenue use scenario. The final scenario tries to improve the welfare of the lowest income quintile and uses increased social transfers to redistribute the increased revenues from SMC pricing.

Table 7. **The welfare effects of the policy reforms – general equilibrium analysis for Belgium**

	<b>Benchmark</b>	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>
		Average cost + higher labour income tax	Marginal social cost + lower labour income tax	Marginal social cost + higher social security transfers
<b>Equivalent income (EURO/person/year)</b>				
Quintile 1	18 586	- 0.78%	0.47%	3.88%
Quintile 2	22 260	- 0.04%	0.03%	2.21%
Quintile 3	25 027	- 0.24%	- 0.16%	0.75%
Quintile 4	28 330	- 0.20%	0.22%	0.00%
Quintile 5	35 579	- 0.49%	1.45%	- 0.51%
$\varepsilon = 0$		- 92.71	160.66	148.89
$\varepsilon = 0.5$		- 89.56	142.50	179.17

## 10. How do current pricing doctrines relate to the economic theory?

In the UNITE project<sup>12</sup> one has found that for a selection of European countries, the practice differs strongly from the theoretical principles. Most often one refers to principles more akin to long run marginal cost, such as “development cost”, “average cost” or “full cost” allocation than to short run social marginal cost pricing (SRMSC). This is mainly motivated by concerns about the difficulty and manipulability of SRMSC calculations and by equity concerns. These concerns are understandable. However, they can be addressed by standard economic theory. No recourse is needed to other pricing principles that are more arbitrary and less efficient.

12. Mayeres, I., Proost, S., Quinet, E., Schwartz, D., Sessa, C., (2001) “Alternative Frameworks for marginal costs and Transport Accounts” D4 of UNITE project, 5th framework Programme – Transport RTD, European Commission.



# **ONE YEAR ON: HAS THE NEW HEAVY VEHICLE FEE AFFECTED TRANSPORT DEMAND IN SWITZERLAND?**

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## **1. Introduction**

Managing transport demand has become a major issue in most industrialised areas. In Switzerland, this discussion was determined to a large extent by transit traffic through the Alps. The leading role of transit traffic is not especially due to the number of vehicles transiting Switzerland, there are other regions in Switzerland with a much higher traffic volume than that in the Alps. But the special and difficult topographical situation in the Alps, the important role of the Gotthard pass in Swiss history and the strong interest of our neighbouring countries, especially Germany and Italy, in reliable transport routes across the Alps led to a specific policy for heavy goods transport across the Alps. This policy aims at respecting the interests of the people living along the transit routes as well as the interests of neighbouring countries and the European Union.

## **2. The Swiss Policy on Heavy Goods Transport**

The Swiss Policy on heavy goods transport relies on three pillars, two concerning the railways and one concerning road transport:

1. Reform of the Swiss Railway System (open access, separation of infrastructure from train operations, commissioning principle).
2. New Alpine Rail infrastructure (new tunnels across Gotthard and Lötschberg).
3. Introduction of a performance related fee for heavy vehicles (HVF).

The aim of this policy is to reduce growth in the road transport sector in general and, in the special case of transalpine traffic, to limit the number of heavy vehicles on our transit routes. To achieve this ambitious goal in transit traffic, complementary measures were introduced, such as subsidies for the use of rail track. These measures demonstrate that shifting goods from road to rail is one of the central objectives of Swiss transport policy.

## **3. The Heavy Vehicle Fee**

On the first of January 2001, Switzerland set in force the Heavy Vehicle Fee. It replaced a former flat fee, which corresponded in many ways with the Eurovignette. The fee applies to heavy vehicles

with a total admissible weight of more than 3.5 tonnes, using the Swiss Road network. The level of charge depends on three factors:

1. The distance driven on the Swiss road network (all roads).
2. The admissible (and not the actual) weight of the truck.
3. The emissions of the vehicle (three emission classes).

The main part of the revenue from the fee is used to finance Rail infrastructure projects such as the new rail links through the Alps.

In parallel to the introduction of the HVF, Switzerland raised the weight limit for heavy vehicles from 28 to 34 tonnes. This was the result of negotiations with the European Union, that would not have accepted the HVF otherwise. In 2005, the rates of the fee will be raised (from 1.1 Euro cents per tonne-kilometre to 1.8 cents per t-km) and the weight limit raised (from 34 to 40 tonnes).

#### **4. Consequences of the new System**

The new Pricing system has consequences at different levels:

- Level of performance: The change from a flat fee to a performance related fee is a strong incentive to optimise logistics (especially to avoid empty runs).
- 5 times higher than it used to be (increasing to 8 times higher in 2005). Costs in the road transport sector will therefore increase 19% by 2005, strengthening thus not only the incentive mentioned above, but also incentives for a shift from road to rail.
- Level of infrastructure financing: Most of the revenue from the HVF will be used for investment in railway infrastructure in order to help make rail more competitive in the long term.

The consequences of raising the weight limit are ambiguous: On the one hand it raises the productivity of road transport which in the short term leads to less heavy vehicle traffic on the roads, on the other hand, it more or less balances out the advantage of higher competitiveness conferred on railways by the HVF (average gain in productivity for road transport of 18% due to the higher weight limit). The effects explained immediately below have to be seen as a result of the interaction between the HVF and the higher weight limit.

#### **5. Effects**

##### ***Effects on the road***

First of all: The introduction of the fee caused no severe problems; today the system is functioning well and is well accepted, even by the hauliers. The following effects can clearly be attributed to the new system:

1. Renovation of the lorry fleet: In the year before the introduction of the HVF, sales of heavy goods vehicles increased by 45%. By renovating their fleets, truck owners saved money in

two ways: new vehicles belong to the lowest and therefore cheapest emission class and the size (or admissible weight) of the trucks in the fleet could be better matched to the actual needs of the market (with the flat fee truck owners used mainly over-sized vehicles for the loads generally hauled).

2. Structural change in the road transport industry: The new system led to a concentration of the road transport industry, either through mergers or through the closure of smaller companies. Larger companies are able to manage their lorries more efficiently and particularly avoid empty runs.
3. Less truck traffic: The new traffic regime led to a significant break of the former growth trend: annual increases of about 7% in the years before the introduction of the fee were followed by a drop of around 5% in 2001. This decrease cannot be attributed to the slow down of economy, because it was also recorded in the first half of 2001, when economic growth was still about the same as in previous years.

### ***Effects on the rail***

No significant influence could be measured so far on the performance of rail transport. According to what was said above, this is not astonishing: The better competitiveness of rail due to the HVF was outbalanced by increased productivity in road transport due to the higher weight limit. To reach a higher market share, railways have to improve their productivity as well. With the construction of new railway infrastructure and the railway reform programme, the necessary framework is established. There remains the interesting question, what might have happened in the rail sector if the effects of the HVF had not been balanced by the effects of the higher weight limit. In this context it is most interesting to know that since the introduction of the HVF, rail has a much bigger share in the transport of mineral oil from some Rhine ports to the oil storage sites in central Switzerland. Though mineral oil is a heavy good it is, at least in the short term, for various reasons (e.g. safety regulations and the capacity of road tankers) not possible to profit from the higher weight limit in this transport sector. This example shows clearly the importance of pricing where there is real competition between different modes of transport.

## **6. Conclusions**

Today, almost two years after its introduction, the new HVF can be considered a success:

- The system works perfectly.
- Truck traffic has been reduced.
- The incentive to use newer, less pollutant vehicles has proved to be effective.
- The financing of new railway infrastructure by charges on the roads works and is well accepted by the Swiss people.

However, the initial question of whether the HVF has affected transport demand can not be fully answered: Demand is satisfied more efficiently and in a more sustainable way. Whether it was reduced or not has not yet been established.



*Part III.*

**IMPLEMENTATION**



## RE-THINKING THE OBJECTIVES OF EU INFRASTRUCTURE CHARGING POLICY

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DG TREN  
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The Commission's White Paper on the Common Transport Policy - September 2001- set the scene for the development of a new approach to infrastructure pricing. The White Paper identified the following main characteristics of transport that are likely to dominate policy development for the coming decade:

1. **Demand for freight and passenger transport has increased strongly as costs and prices** in the transport sector have been reduced. Efficiency has improved notably and transport has made a major contribution to the economic success of the EU.
2. **The bulk of the increase in demand has concerned road transport.** The railways have steadily lost market share both for passengers and freight.
3. **Congestion on the road system but also in the airways has increased substantially.** Indeed, some of the major cities in the EU now face almost continuous congestion in working hours.
4. The impact of transport on the environment is considerable and in relation to so-called 'green-house' gases is showing little sign of improvement although many other pollutants are being reduced.
5. There are still over forty thousand deaths on the road each year and accidents in the maritime and other transport sectors are causing increasing concern.

Overall, then, the picture is mixed: there has been success but there are also clouds on the horizon. The question is how should the Common Transport policy be adapted to take account of this situation and provide a long-term sustainable solution? We would like to attempt to show what role infrastructure pricing plays in the new policy to be developed.

One of the key elements for future policy measures concerns the growth rates of passenger and freight transport. There is a very clear linkage between economic growth and the expansion of the transport sector has developed. As concerns the EU economy as a whole, the summit of Lisbon two years ago established the target of a fast economic growth rate to enable the EU to remain competitive. This target remains essential to try to achieve it if the EU is to build a vigorous, dynamic economy, which encourages the best of modern technology. The aim is to make a substantial reduction in unemployment and enable the EU to compete in an expanding world economy. We hardly need to repeat that in the period under review there are likely to be new entrants to join the fifteen existing members of the EU. This will have important impacts on markets and growth - and of course on transport.

Although the Commission is committed to 'decouple' the linkage between transport and economic growth, the next ten years are likely to see transport demand continue to expand. The views of experts are that this is likely to be the case for freight transport but for passenger transport there may be something of a change. The difference between passenger and freight is mainly due to the fact that the EU population is ageing, car ownership is already at very high levels and, particularly in and around the cities, congestion will get even worse physically and restrain new mobility.

Specifically, the forecast for the White Paper was that passenger transport would increase by over 20%, while freight transport would show an increase of around twice this - 40%. Not surprisingly, the highest growth within freight transport is expected to be for road transport - an increase of 50%. Within passenger transport, aviation will experience the steepest growth of 5-7% p.a.- up to 90% in the period concerned. On this latter point we should say that the latest figures show that the airline industry is on the way to recovery following the events of 2001 in terms of passenger growth if not in profitability with the low-fare companies doing particularly well.

These forecasts demonstrate a further deterioration of the modal shares of those modes that are more environmentally friendly such as the railways and public transport. Thus they will put at risk the attainment of the EU's environment commitments with respect to the United Nation's Kyoto Protocol to cut down CO<sub>2</sub> emissions. The concentration on the road mode of transport will inevitably lead to further congestion, which will unfavourably impact on EU competitiveness. We do not need to say that there will be a negative impact on the quality of life by increasing congestion, pollution and safety problems.

In this situation, and even accepting the uncertainty attached to these forecasts, it is therefore quite clear that the revision of transport policy is called for. The new aims for policy should be structured around the following issues:

1. Europe, particularly its urban areas, must not succumb to a gridlock of chronic congestion. This is a costly and highly inefficient way to balance supply and demand for transport services.
2. There is an evident need to address the environmental consequences of transport much more directly. Even if it is economically unjustified to expect transport as a sector to meet the general Kyoto target of 8% reduction, as there are other sectors where the economics of carbon reduction look more attractive, the current situation with rising CO<sub>2</sub> outputs from transport is untenable. Also, as the recent Green Paper on Security of Energy Supply pointed up, transport is becoming increasingly and dangerously reliant on oil as its single source of supply - 98% of transport depends on oil.
3. There is the issue of the safety and security of the EU in the widest sense. This embraces subjects from the high death toll on the roads, dangerous cargoes at sea and crime plus terrorist threats.

Faced with these goals, the EU response has to be radical but realistic. There is no miracle solution that will resolve all the problems and make everyone happy. We are in a difficult situation and transport policy has to take account of, in a way arbitrate between, conflicting objectives. To maintain economic growth, industrialists want transport costs to be reduced further. Those concerned with the impact on transport on climate change and the environment in general, claim that transport is already too cheap as external costs are not paid for. The reality is that to make substantial progress, investment in many of the transport sectors will be needed. This in turn will require a strong economy that is growing rapidly which with current trends would lead to more transport. This is the paradox



that we face and it is clear that there is no short-term solution. We have to seek to develop a growth path that takes the EU gradually towards a sustainable situation where transport services still provide the motor for the economy but in a virtuous manner consuming less non-replacable assets and polluting much less. How can this be achieved?

The aim of the White Paper is to propose a change of direction in the Common Transport Policy to reverse the negative tendencies that we have identified. The medium-term objective, up to 2010, is to improve the balance between the modes of transport. In particular, this policy of modal rebalance will foster intermodality through exploiting the complementarities between the modes. One of the major problems in land transport is that growth has been concentrated in one mode: road. Although the other modes have also had problems, they are nothing as severe as on the road system and indeed in some modes like maritime transport there is free capacity. This problem has partly been due to the fact that the pace of market opening has been unequal - the road mode has always gone first and very great difficulties have slowed down progress in others, notably the railways.

The White Paper sets out a series of ideas to enhance the quality, efficiency and competitiveness of the transport system. These modal proposals are set in a context that respects general sustainability objectives, by means of economic and regulatory measures. Indeed, the EU has a series of policy measures that are available varying from the traditional tool of regulation, through economic instruments like pricing, to persuasion through the application of best practices.

At the same time, through its framework programmes on research, the EU can help to develop and launch new technologies that will make the renewal of the transport system possible in the medium term: we are thinking of such developments as fuel cells and telematic applications in transport.

The overall aim of the White Paper is to ensure that the supply of transport services is available to meet demand at the right price - that is a price that covers full costs. It will not be the same transport mix as before. There will be a greater emphasis on environmentally friendly modes particularly where capacity is available or can be expanded economically. Differentiated prices for infrastructure taking social costs into account and variations in taxation need to be introduced. We should make the point here - this is sometimes unpopular with Ministers of Finance - that, if pricing measures are introduced, at least a part of the additional revenue should be devoted to expand the investment in the sector. To avoid problems of incompatible national approaches to pricing, it is far better to develop a common EU framework from the outset. This seems to be one of the key measures that have to be introduced if the general public is to accept new charges. In sensitive areas like the Alps, it is proposed that there be 'cross-financing' to enable, say, projects like multimodal rail tunnels to be partly funded by existing users on all modes.

In establishing a new approach to infrastructure pricing, it is generally accepted that many of the transport system users do not bear the infrastructure and external costs they create. This produces an inefficient operation of the internal market, distorts competition between transport modes and damages the environment. Public service obligations may justify running services at a deficit but, in general, charges should be gradually reformed to reflect costs, including environmental ones. The situation varies greatly between modes of transport and between Member States. The Commission intends, within the respect of subsidiarity, to implement with Member States a harmonisation of pricing principles within the Union. The first step will be the publication of a methodology setting out the approach proposed for all transport modes. This methodology paper should appear early in 2003 and should provoke a debate that will lead to a 'framework' directive being tabled later in the year.

Pricing and investment in infrastructure are closely linked. Among the measures needed to enhance the competitiveness of the transport system, the development of a trans-European infrastructure network that offers real value to long distance and international journeys is of great importance. The proposal for the revision of the existing trans-European network, which has accompanied the White Paper, focuses on the priorities that are likely to improve the existing capacity shortages in the network. A notable element will be the creation of a railway network dedicated to freight traffic with the technical capacity to suit longer, heavier trains in particular. In the short term, this requires the elimination of existing bottlenecks and the implementation of the interoperability directives that will allow trains to cross frontiers with no technical problems. It also calls for the identification and completion of links able to absorb the increased traffic flows coming from the future accession countries.

Investment in infrastructure will be needed and public funds are scarce. Private financing is essential to ensure that many infrastructure projects are carried out. The EU has to continue its efforts to adapt its regulatory framework and its financial support to the specific needs of Public-Private-Partnerships so as to facilitate the involvement of the private sector in them. An efficient pricing system is key to this.

But transport policy should not only aim to raise competitiveness but it must also be at the service of citizens, solving their mobility needs safely, upholding their rights as transport users and keeping the environmental nuisances they suffer to a minimum.

We hope that we have been able to demonstrate clearly the challenges that transport in the EU is facing. We can consider that to a large extent the problems we face today are due to the success that has been achieved. We firmly believe that this success can be continued and that transport will maintain its key role in ensuring economic growth. However, a series of carefully tailored policies will be called for to ensure that there is a better balancing of economic and social objectives than in the past. This means that the use of transport infrastructure at certain times and in certain places will be priced differently from now. However, investment in quality improvements has to be continued in both infrastructure and other equipment. There is no quick solution. But the initiative should be seized now to start on a policy to initially stop the worsening of the situation. If major efforts are made to introduce new policies and technologies, we are confident that by 2010 we will see the first signs of a sustainable transport system that meets the needs of users and society as a whole. The long-term objective, put very clearly, has to be to maintain accessibility to services and markets but to do this in a way that reduces physical mobility. This is the sort of challenge that the Common Transport Policy has to reply to and better infrastructure pricing will be one of the key elements.

## **INTEGRATED ASSESSMENT AND EFFECTIVE DECISION-MAKING SUPPORT**

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### **1. Summary**

This paper reviews the role for evidence-based analysis and modelling in providing decision-makers with effective support. It draws on the experience of the UK Department for Transport's multi-criteria, multi-modal appraisal framework. This provides UK decision-makers with the opportunity to demonstrate the extent to which the policies and schemes that they seek to implement are likely to deliver the sustainable development objectives which underpin UK transport policy.

### **2. Helping to get good decisions made - the role of evidence based analysis**

Economic assessment and transport modelling are essential for providing decision-makers with the evidence they need to reach soundly based decisions on transport policies and infrastructure schemes. Decision-makers, usually national, regional or local politicians, aided by their advisers, need to know:

- Whether the scheme or policy will deliver transport policy and wider government objectives?
- Whether it provides a better way of achieving these objectives than any other comparable option?
- Whether, after taking account of the costs, likely opposition and political acceptability, it is worth implementing?

Most countries have remarkably good evidence on trends in travel, on the drivers of demand, and on the factors that affect these drivers. We are rapidly accumulating information on the environmental and other impacts of transport. We understand very well how in theory improvements can be made through more effective pricing or charging methods so as to meet economic efficiency and many environmental objectives through implementing road user charging. Technological advances mean that we are now close to delivering these improvements. For most countries there is a good evidence base that can be called upon to support decisions about transport policy. A comparison of the role of analysis supporting decisions about transport with the role of evidence based analysis in some other fields of government – housing, land-use planning, health or social security – shows how transport is well up among the leaders in our ability to deliver evidence-based policies.

There are, of course, still aspects of transport where the evidence is less good and the success of policies less certain – in particular, we understand much less about factors that influence the supply of transport services than we know about demand. When transport is supplied by the state this might not matter; supply of new infrastructure is determined by the availability of funds. But when supply is the responsibility of the private sector, we have a few good evidence-based models on which to rely. Airline deregulation and the growth of low-cost airlines throughout the EU, or the provision of a rail infrastructure in the UK, are two examples of cases in which the behaviour of suppliers as a consequence of these policies was not foreseen in full by decision-makers.

Decision-makers need to understand the likely consequences of policies or infrastructure schemes that are put forward as meriting their consideration. In addition, they, and those officials to whom the minor decisions are delegated, are required to make a large number of decisions. So information about the likely impacts of any scheme or policy has to be documented in a reasonably accessible way. Good integrated assessment methods must focus on the issues that matter and avoid overloading decision-makers with unnecessary information.

There is a strong case for providing high-quality evidence-based analysis for transport policy makers. Decisions about transport schemes and policies are usually debated hotly in Parliament, by local administrations, in the press and on television because they tend to be controversial. It is unusual for governments to obtain universal support for any major transport measure. Active well-informed interest groups take care to ensure that their side of the story is heard. For any transport scheme there will be winners, there will be losers. The scope of the gains and losses is contested in the media. Any lack of clarity about the overall case for the scheme or policy and about whether it will deliver the benefits claimed for it makes it very difficult for policy makers to reach a decision. The role of analysis is to make the case for the scheme as clear as possible so as to ensure there is no dispute about its likely effects. The decision-maker can then focus on the balance between those who benefit and those who lose.

### **3. Integrated transport assessment in the United Kingdom - The new approach to appraisal**

#### **3.1 Introduction**

The system of appraisal now in place for UK transport schemes and policies was developed for the government's 1998 Transport White Paper – A New Deal For Transport: Better For Everyone. This White Paper gave explicit recognition to the role of appraisal in decision-making. It outlined a “New Approach to Appraisal” which addresses the five fundamental objectives of the government's transport policy:

- Economy.
- Environment.
- Safety.
- Accessibility.
- Integration.

Although the UK had a long history of transport appraisal, the New Approach differed from previous methods in a number of ways. In particular, it ensured that full weight was given in the decision process to those factors that cannot easily be quantified or given money values. And it focussed more directly on the extent to which a project or policy was consistent with the government's overall policy of sustainable development.

### 3.2 Valuation and assessment methods

The New Approach To Appraisal was used initially only for roads schemes. The challenge faced by those responsible for drawing up guidance for highway authorities was to find ways in which the contribution of new transport infrastructure to the five objectives could be assessed. They were also, to a large extent, constrained by the information that can be derived from the transport models used to establish the design parameters for the scheme, its capacity and the travel time savings it would deliver. The extensive information available in the Environmental Impact Assessments, which are required in the UK for all major transport schemes, was also used extensively in identifying and measuring many of the impacts.

Measures of the impact of a scheme in the New Approach to Appraisal fall into three different categories:

- *Money values*, used where costs or savings are in market prices or well-established willingness to pay-based values exist.
- *Changes in quantities*, usually derived from the Environmental Impact Assessment, for example in the number of people or properties affected by high levels of noise or local emissions.
- *Qualitative or descriptive measures*, based on a scale agreed with the relevant external experts, in respect, for example of whether the damage to landscape from a new road is slight, moderate or serious.

The information is provided in a way which permits a description of the impact to support measures based on money values, qualitative assessment, or changes in quantities.

Information on the impacts of a scheme or policy is provided for the decision-maker in the form of a single page which tabulates the main 5 objectives, divided into 21 sub-objectives. A copy of the page is attached at annex A. The aim is to describe and measure each impact so as to ensure that:

- No significant impact is omitted.
- Decision-makers can form a good idea of the value for money of a scheme, including those effects which cannot easily be valued or quantified.
- Significant adverse impacts, especially those on the environment and hence which are likely to make a scheme controversial, are identified.

The appraisal summary table which contains this tabulation is an aid to decision-making, not a substitute for it. Political judgement is needed to take into account current priorities, distribution effects between those who gain benefits or suffer losses, and the specific needs of the location served by the scheme. The results of the appraisal are made public at the inquiry into the scheme along with all supporting documents.

The appraisal summary table is supported by a number of other documents including details of the transport models, estimated traffic flows on each link and extensive detail in the Environmental Impact Assessment of the effects of the scheme on the local environment. The other analyses include a table which shows the sources of funding for the scheme and a further table identifying the main distribution impacts in terms of gainers and losers.

## 4. Components of the appraisal summary table

### 4.1 Economy

The impact of a transport scheme on the economy is sub-divided into three sub-objectives:

- Transport economic efficiency.
- Reliability.
- Regeneration.

The transport economic efficiency measure comprises all the conventional transport user costs and benefits, mainly in terms of time savings and changes in vehicle operating costs. To these are added the project costs: the separate additional table showing sources of funds identifies whether the costs are incurred by the public or private sector. Values are expressed in money terms as conventional present values of benefits or present values of costs, both sums discounted at the appropriate rate.

Reliability is presently measured on a qualitative scale. Decision-makers are provided with information as to whether a scheme is likely to contribute significantly, slightly or not at all to improved reliability. In general, the more congested a road, the greater is the benefit of new capacity to reliability. Work is in hand in developing money values for changes in reliability, using studies of transport users value of reducing the standard deviation around the expected journey time, combined with an assessment of how additional capacity on roads or rail networks reduces travel time variability.

The contribution of transport schemes to local or regional economic regeneration is another area which is currently being examined with the aim of linking transport improvements with estimates of net jobs created. The present assessment simply notes whether a scheme serves a location targeted for general regeneration policies and whether consent for building factories and offices is conditional on the construction of the transport scheme.

### 4.2 Safety

Safety benefits are measured in terms of 2 sub-objectives:

- *Accident savings*, expressed in terms of a present value in money terms using conventional estimates of the value of a statistical life together with money estimates of reductions in injuries and damage to property.
- *Improved security*, mainly of relevance to public transport users' perception of personal security from improved facilities at stations and bus stops, measured on a qualitative scale. A range of indicators of good, moderate and poor provision of security (e.g. quality of lighting, levels of formal and informal surveillance) provide the analyst with guidance on how to rank a project.

### 4.3 Environment

The Department for Transport uses ten environmental sub-objectives to assess the impact of transport schemes and policies. Of these, noise and local air quality are measured in terms of the

number of individuals and properties experiencing changes in air quality or noise and the broad magnitude of the change. CO<sub>2</sub> is measured in terms of changes of tonnes of carbon. These are all measured as estimated in the year in which the scheme opens. Seven impacts have been selected:

- Landscape.
- Townscape.
- Heritage.
- Bio-diversity.
- Water sources.
- Lifestyles.
- Journey ambience.

These impacts are measured on a qualitative scale. The last two sub-objectives are concerned with the potential of transport schemes to promote physical fitness and healthy lifestyles by encouraging walking and cycling through improvements in facilities dedicated to these modes. Journey ambience is concerned with such aspects of the trip as the quality of public transport vehicles and provision of facilities such as lay-bys and rest areas for motorists. Those responsible for carrying out the appraisal are required to show whether the impact is slight, moderate or severe and whether the direction of change is beneficial or detrimental. Here, in particular, a brief description in words of the nature of the change can help decision-makers understand the reasons for the rating given. The published guidance on measuring and assessing the environmental sub-objectives covers more than 100 pages. It is extensive and detailed so as to ensure comprehensive coverage and consistency between appraisals. The guidance was drawn up in consultation with the various environmental and other organisations responsible for advising government on these aspects of the environment.

#### **4.4 Accessibility**

Accessibility covers certain aspects of the scheme which do not figure in the transport economic efficiency sub objective as they are not conventionally part of a standard transport cost benefit analysis. There are three sub objectives:

- *Option values*, which usually relate to the provision of rail or other public transport services which people value even if they do not use them. Values based on stated preference studies have been derived for specific rail links and these can be adjusted for other schemes. Alternatively, a qualitative scale may be used.
- *Community severance*. Describes the impact of transport infrastructure and high traffic flows on pedestrian movements in a community. Impacts measured on a qualitative scale taking into account both the numbers of people affected and the extent to which people are deterred from making their preferred pedestrian trips.
- *Access to public transport systems*, which measures the extent to which a scheme or policy influences the proportion of non-car owners who live within close proximity to a public transport service.

#### **4.5 Integration**

Many of the themes used to describe transport integration are covered in the definitions of economy, environment, safety and accessibility as described above. However, a specific integration

objective is added to cover integration between transport modes and integration between transport and other government policies. The transport integration objective is made up of three sub objectives:

- *Transport interchange*, which provides a qualitative score according to the extent to which project changes the quality of passenger and freight interchange facilities.
- *A land-use policy sub objective*. This sub-objective takes account of the extent to which the transport proposal is integrated with land use policies more generally at a local, regional and national level. The effect is assessed on a 3-point descriptive scale – neutral, adverse or beneficial.
- *A sub-objective related to integration with other government policies*. A qualitative impact score is provided. A qualitative impact score is provided to inform decision-makers of the extent to which the transport scheme or policy helps to contribute (or otherwise) to those government policies which are likely to interact with transport.

#### **4.6 Future developments**

Full details of the Department for Transport's guidance on the assessment of transport schemes are published on the Department's website ([www.dft.gov.uk/itwp/mms](http://www.dft.gov.uk/itwp/mms)), following the links for 'Integrated Transport Policy') in 2 volumes of advice 'Guidance on the Methodology for Multi-Modal Studies'. This guidance was drawn up specifically to provide advice for these studies which have been commissioned by the appropriate regional authorities to assess and provide solutions to the transport problems and needs of certain specific corridors in England.

The advice is now being revised with the aim of providing a more user-friendly publication. The aim is to provide a description of appraisal methods at different levels of detail which at one level can be understood by the non-expert and at another level provides the expert with all the information needed to carry out the appraisal. These revisions will be completed by summer 2003 and will be published on the Department for Transport's website.

As noted above, the Department for Transport's programme of research into travel behaviour and modelling is aimed at improving the evidence base for its appraisal methods. Work is in hand on improving the way in which travel time variability (reliability) and the contribution of transport to economic development are assessed. The value of transport user timesavings will shortly be updated using the results of recent surveys and analysis. Certain environmental impacts such as noise and local air quality, will be measured in money terms when the results of two current research projects aimed at establishing money values for these impacts are completed.

### **5. The use of appraisal in policy making**

Three levels of decision-making in the UK Department for Transport can be identified as being supported by integrated assessment methods:

- Decisions on individual transport schemes and projects.
- Decisions on transport investment programmes.
- Strategic policy making.



## **5.1 Project Appraisal**

The methods described in this paper were drawn up in order to assist with the appraisal of individual transport schemes. Decisions by policy makers include such choices as whether to build a bypass of a town and the route it should take or whether there is a good case for investing in a light rail scheme to relieve urban congestion and improve the environment of the city centre. Similar techniques for project appraisal are used in most OECD countries.

The result of each project appraisal is published along with all supporting evidence and is made available to the judicial public inquiry into the case for the scheme. In 1998 the Department carried out an extensive review of some 60 road schemes for which plans were available. The appraisal summary tables for all of these schemes were published in “A New Deal for Trunk Roads in England – Understanding the New Approach to Appraisal”, available on the Department’s website at [www.dft.gov.uk/itwp/appraisal/understanding](http://www.dft.gov.uk/itwp/appraisal/understanding). The Roads Review provided full details of the decisions Ministers had reached on whether to proceed with a scheme or reject it.

These decisions were analysed by the Institute for Transport Studies at The University of Leeds. The aim was to establish whether the different objectives delivered by the schemes had been given broadly comparable weights in each scheme by the decision-makers. This would demonstrate the extent to which the assessment of the separate impacts in the Appraisal Summary Table, whether expressed in money values or other terms, had been made on a consistent basis. The results of this analysis (The UK Roads Review - A hedonic model of decision making: J. Nellthorp and P.J. Mackie; Transport Policy Nov 2000-7(2) pp 127-138) showed that a broadly consistent approach had been adopted when reaching decisions about whether to proceed with a scheme or reject it. It was noted, however, that the importance attached to safety and regeneration benefits were, perhaps, greater than the values and other qualitative evidence would support.

## **5.2 Programme and Policy Appraisal**

Transport investment programmes usually comprise a number of schemes, often including different modes. Such programmes relate either to a specific corridor or region or to a programme for a given network – for example, a programme to improve the inter-urban motorway network. Assessment of such a programme cannot be carried out at the level of detail which is appropriate for an individual scheme. In particular, there is rarely sufficient information to enable all of the environmental impacts to be assessed in detail. But good quality assessment can provide decision makers with information about the more significant impacts that are relevant to the decision about the appropriate size and structure of the programme.

Similar considerations apply to the assessment of strategic transport policies, such as the implementation of the EU proposal for charges for the use of infrastructure. Considerable progress has been made in recent years in the development of strategic transport models at a local level to cover a specific city or conurbation and at the national level. Models, which represent changes in traffic flows and speeds, can serve to generate estimates of changes in emissions and often inform on the safety impacts of such policies. In addition, it is often possible to provide some assessment of the local environmental impacts by reference to the environmental quality and characteristics of the corridors examined in the studies.

Two years ago the Department for Transport published its 10-Year Plan for Transport – Transport 2010 ([www.dft.gov.uk/trans2010](http://www.dft.gov.uk/trans2010)). This was made up of a programme of expenditure and other measures for road, rail and local transport and improvements to freight. The overall cost of the

programme is around 300 billion euros. The Appraisal Summary Table attached as Annex B provides an integrated assessment of the major impacts of this strategic transport plan. It represents an attempt to apply integrated assessment at a strategic level and provide policy makers with the evidence they need to demonstrate the expected impacts of the chosen strategy. A wide range of policy options was tested before the mix of programmes and policies outlined in the UK's Transport Plan was decided upon. The analysis of some of these options is shown in Figure 13 of Transport 2010; the Background Analysis, accessible on the website above. Although the Appraisal Summary Table contains a number of entries described as "not available" or "unclear", it shows that the process of assessment and appraisal can be used at all levels of policy making. The integration of policy appraisal with scheme specific appraisal helps to provide decision-makers with the support they need in implementing strategies which are consistent with the projects that make up the strategy.

## **6. Conclusions**

There is already much good evidence on the drivers of transport demand and their influence on how people travel. Our understanding of the wider impacts of travel, including effects on the environment, on other aspects of the quality of life and on different groups in society is improving. By building on this evidence, through modelling responses, taking account of demographic and other changes and through good appraisal methods, analysts can provide decision makers with the support they need to be confident that their policies will be successful.

Annex A.

Option		Description	Problems	Present Value Cost to Government £m
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise			Net properties win / lose with scheme
	Local Air Quality			Concentrations weighted for exposure
	Greenhouse Gases			Tonnes of CO <sub>2</sub>
	Landscape			Score
	Townscape			Score
	Heritage of Historic Resources			Score
	Biodiversity			Score
	Water Environment			Score
	Physical Fitness			Score
	Journey Ambience			Score
SAFETY	Accidents			PVB £m
	Security			Score
ECONOMY	Transport Economic Efficiency			Users: NPV £m
				Private providers: NPV £m
				Public providers: NPV £m
				Other Government: NPV £m
				Score
ACCESSIBILITY	Reliability			Score
	Wider Economic Impacts			Score
	Option values			PVB £m
INTEGRATION	Severance			Score
	Access to the Transport System			Score
	Transport Interchange			Score
	Land-Use Policy			Score
	Other Government Policies			Score

**Annex B. Appraisal summary table - Ten year transport plan**  
**Public expenditure (including revenue support for private investment)**  
**Total: £132 billions, Additional £54 billions**

<b>Challenges</b>		The main transport challenges to be addressed over the next 10 years will be: the adverse effects of road traffic growth and congestion; increasing pressures on the rail network; overcrowding and congestion on public transport in London; inadequate public transport elsewhere; exclusion from the transport system for disadvantaged groups; and the need to improve transport safety.		
<b>Objectives</b>		<b>QUALITATIVE IMPACTS</b>	<b>QUANTITATIVE MEASURE</b>	<b>ASSESSMENT</b>
ENVIRONMENT	Noise	The Plan should reduce noise levels for many people through, for example, more widespread use of low noise road surfaces. However, some projects, such as the transfer of freight traffic from road to rail, may decrease noise near some roads but increase noise in locations near railways.	n/a	Unclear
	Air pollution emissions	The Plan should reduce traffic emissions in 2010 compared with baseline projections, although these may be partly offset by higher rail emissions.	Change 2010 Kt emitted NO <sub>x</sub> -5 PM <sub>10</sub> -0.1	Positive
	Landscape, townscape, biodiversity, heritage, water	Many projects may have adverse landtake impacts, but some could be beneficial for bypassed communities and brownfield sites.	n/a	Negative
SAFETY	Greenhouse gases	The Plan should help reduce overall transport CO <sub>2</sub> emissions in 2010, compared to baseline projections and compared to 2000.	Change 2010 Mt carbon emitted CO <sub>2</sub> -1.6	Positive
		The Plan should support achievement of the road safety strategy targets and the rail industry's safety target. It should also help improve personal security for public transport passengers.	n/a	Positive

## Annex B. Appraisal summary table (continued)

<b>ECONOMY</b>	Transport economic efficiency	The package of measures in the Plan, particularly fares support and extra investment in rail and local transport plans, should underpin growth in passenger rail, light rail and bus patronage and rail freight volumes, promoting modal shift and reducing road congestion compared with baseline forecasts. Additional expenditure on roads should also help reduce congestion. The Plan should also help deliver public transport quality improvements, including reductions in overcrowding and more reliable services.	% change 2010 congestion All areas -21 Large urban -23 Inter-urban trunk roads -33 % change 2010 transport usage Passenger rail (p-km) +28 Rail freight (bn t-km) +70 Light rail (p-journeys) +38 Buses (p-journeys) n/a	Positive
	Expenditure/ Revenues	The additional public expenditure over the Plan period (£46 bn excluding revenue support for private investment) should help increase total private sector capital investment to £56 bn. The Plan will result in additional charging revenues for local authorities of £2.7 bn and fare revenues for transport operators.	Additional expenditure (billion £) Strategic roads: 4 Local transport: 14 Railways: 10 London: 6 Other, unallocated & charging: 12	Additional expenditure (billion £) Total 46 Public capital 40 Public resource 6
	Wider economic impacts	The Plan includes many projects in regeneration policy priority areas specifically designed to assist economic regeneration by improving access to the transport network.	n/a	Positive
<b>ACCESSIBILITY</b>	Access to transport system	Increased funding for railways and local transport, such as improved links for deprived urban estates, and for rural transport should improve access for disadvantaged groups, people with disabilities, pedestrians and cyclists.	n/a	Positive

## Annex B. Appraisal summary table (continued)

Distribution of benefits by income group	It has not been possible to model the distribution impacts of the Plan in detail. However, a simple assessment suggests that all income groups benefit with the shares of benefits broadly proportional to the shares of total distance travelled, which rise in line with household income. The expenditure in the Plan is primarily financed from general taxation, which also rises with income.	n/a	Unclear
INTEGRATION	The Plan should improve integration between transport modes and between transport, land use planning and other policies.	n/a	Positive

## **IMPLEMENTATION ISSUES IN TRANSITION ECONOMIES**

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### **1. Introduction**

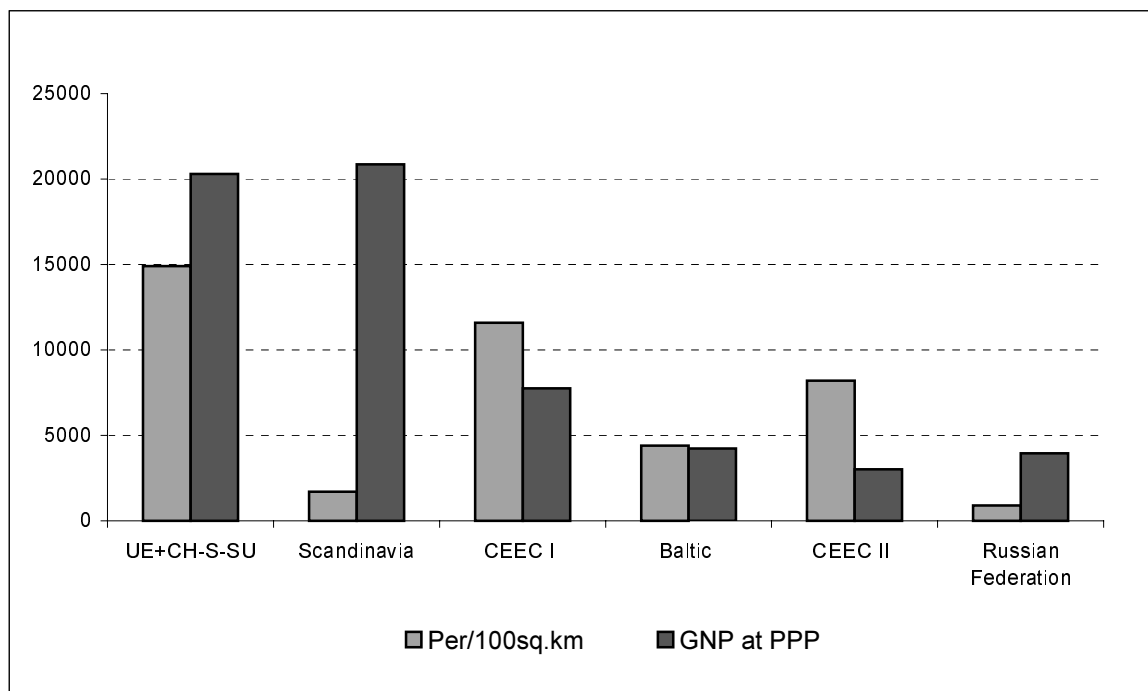
This text is based on earlier papers (Suchorzewski, 2000 and 2001) prepared by the author for other ECMT conferences. While these were devoted to broader issues of transport policies, demand for transport was discussed as one of the main topics.

As the starting point it was assumed that controlling demand for transport is one of the most effective means to meet objectives of sustainable development. However, it is necessary to stress that this assumption is sometimes questioned on the basis of its conflict with general objectives of social and economic welfare. For example, at the last ECMT Round Table 124 mobility-limiting strategies have been set against mobility-enhancing and accessibility-enhancing strategies (Handy, 2002). While discussions concerned mostly US cases, in transition economies of Central and Eastern Europe (CEE) governments and planners have the same dilemma although for different reasons. Nevertheless, in this paper emphasis is on ways and measures of controlling the growth of transport intensity through decoupling of transport demand and economic development.

### **2. Transport demand in Central and Eastern European Countries**

The spatial distribution of population, economic activities and welfare in Europe is uneven. There are significant differences even within European Union countries. But when looking at Europe as a whole, differences are much greater. In many Central and Eastern Europe (CEE) countries distances are much larger, population densities much lower (Figure 21) and average incomes sometimes many times lower than even in the poorest regions of EU countries (Table 8).

Figure 21. **Population density and GDP**



Source: Calculations of the author based on “World Development Reports 1998/1999, 1999/2000”, World Bank.

Table 8. **Basic characteristics of groups of European countries**

Group of countries	Area (thousand of km <sup>2</sup> )	Population (thousand)	Density per km <sup>2</sup>	GNP per capita (US\$ 1998)	GNP at PPP* per capita
UE + CH - S - SU	2 463	367 115	149	22 299	20 302
Scandinavia (N, S, SU)	1 112	18 430	17	27 292	20 857
CEEC I (accession countries)	611	70 968	116	4 341	7 762
Baltic accession countries	175	7 640	44	2 618	4 230
CEEC II: Albania, Belarus, Bulgaria, Moldova, Romania, Ukraine	1 224	99 902	82	1 121	3 023
Russian Federation**	17 075	147 100	9	2 300	3 950

\* GNP converted to U.S. dollars by the purchasing power parity (PPP) exchange rate.

\*\* Including Asian provinces.

Source: World Bank, World Development Reports 1998/1999, 1999/2000.



The political and economic reforms in countries of Central and Eastern Europe have caused great changes in volumes and directions of passenger and goods transport. In freight transport, in the early 1990's, economic reforms and, in particular, reduction of inefficiencies of centrally planned economies caused considerable reduction in the transport intensity of the economy. There was a shift of demand from the need to transport raw materials and products of heavy industries to lighter consumer goods, from demand for low quality services to high quality services, and from international traffic among the countries of "Eastern bloc" to traffic between CEE countries and EU countries. Rapid changes in modal split - from rail to road - were observed as well. Significance of changes can be seen from data in Table 9 concerning Poland and the differences between trends in groups of countries are clearly shown in Table 10. While in most accession countries a rapid growth in road transport is observed in the last few years, in several remaining CEE/CIS countries freight road transport is still decreasing.

Data on passenger traffic (Table 11) are less reliable, especially as regards trips made by private car and, in some countries, by paratransit. A reduction in travel by formal public transport is observed. This was caused by reduced subsidies but first of all by the rapid growth of motorization. In spite of a relatively low income level, the number of private automobiles is rapidly increasing and rates of car ownership per unit of GDP per capita became much higher than in more developed countries. For example, in Poland, in 1997, with GDP *per capita* equal to US\$3 700, there were 220 cars per one thousand inhabitants. This level of car ownership was passed in Germany in 1970 (GDP = US\$11 400) in Spain in 1985 (GDP = US\$9 700) and in Ireland in 1990 (GDP = US\$7 470). In the period 1997-2001, the car ownership rate has grown by 24% while in the same period GDP *per capita* has grown by only 15%. Even after taking into account differences in purchasing power<sup>13</sup> car ownership rates in countries such as Poland, Hungary and Ukraine (Figure 22) are much higher than levels that could be explained by income level (purchasing power) alone; 1.5 to 2.6 times higher than in highly developed countries such as Denmark, Germany, UK, USA and even 3.5 higher than in the Republic of Korea and over 4 times higher than in Turkey.

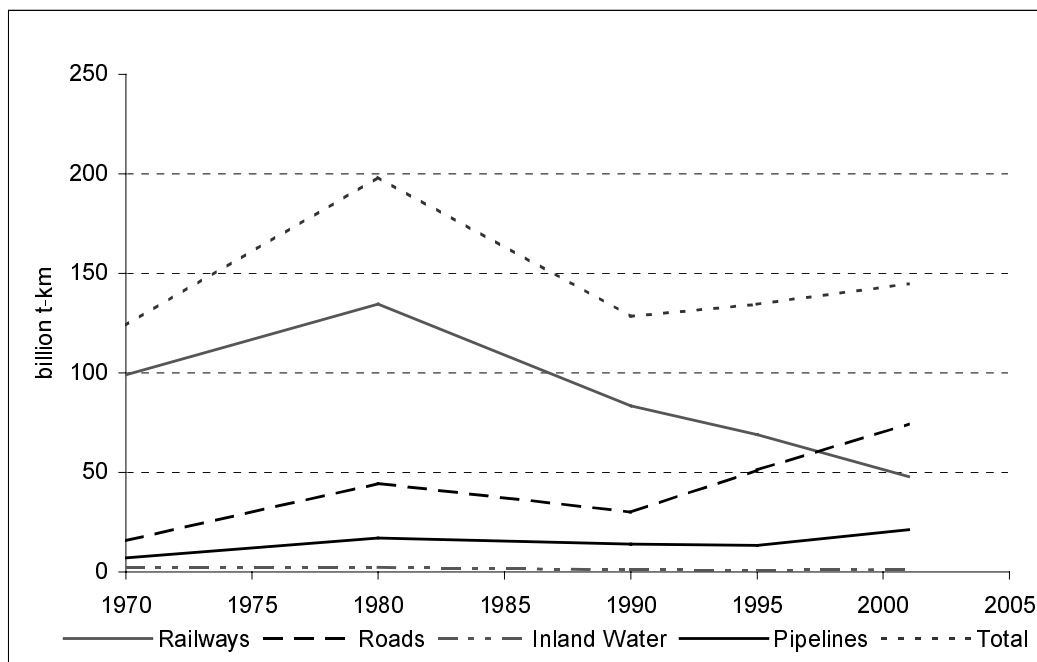
Table 9. Freight transport in Poland 1970 – 2001

	1970		1980		1990		1995		2001	
	billion t-km	%	billion t-km	%	billion t-km	%	billion t-km	%	billion t-km	%
Railways	99.0	80.0	134.5	67.7	83.5	65.0	69.0	51.3	47.9	33.1
Road	15.7	12.7	44.5	22.4	30.0	23.4	51.2	38.0	74.4	51.4
Waterways	2.3	1.8	2.3	1.2	1.0	0.8	0.9	0.7	1.3	0.9
Pipelines	7.0	5.5	17.1	8.6	13.9	10.8	13.5	10.0	21.1	14.6
Total	124.0	100.0	198.4	100.0	128.4	100.0	134.6	100.0	144.7	100.0

*Source:* GUS, National Annual Statistics.

13. GNP *per capita* converted to U.S. dollars using the purchasing power parity.

Figure 22. **Freight Transport in Poland 1970-2001**



Source: Calculations of the author based on «National Annual Statistics», GUS.

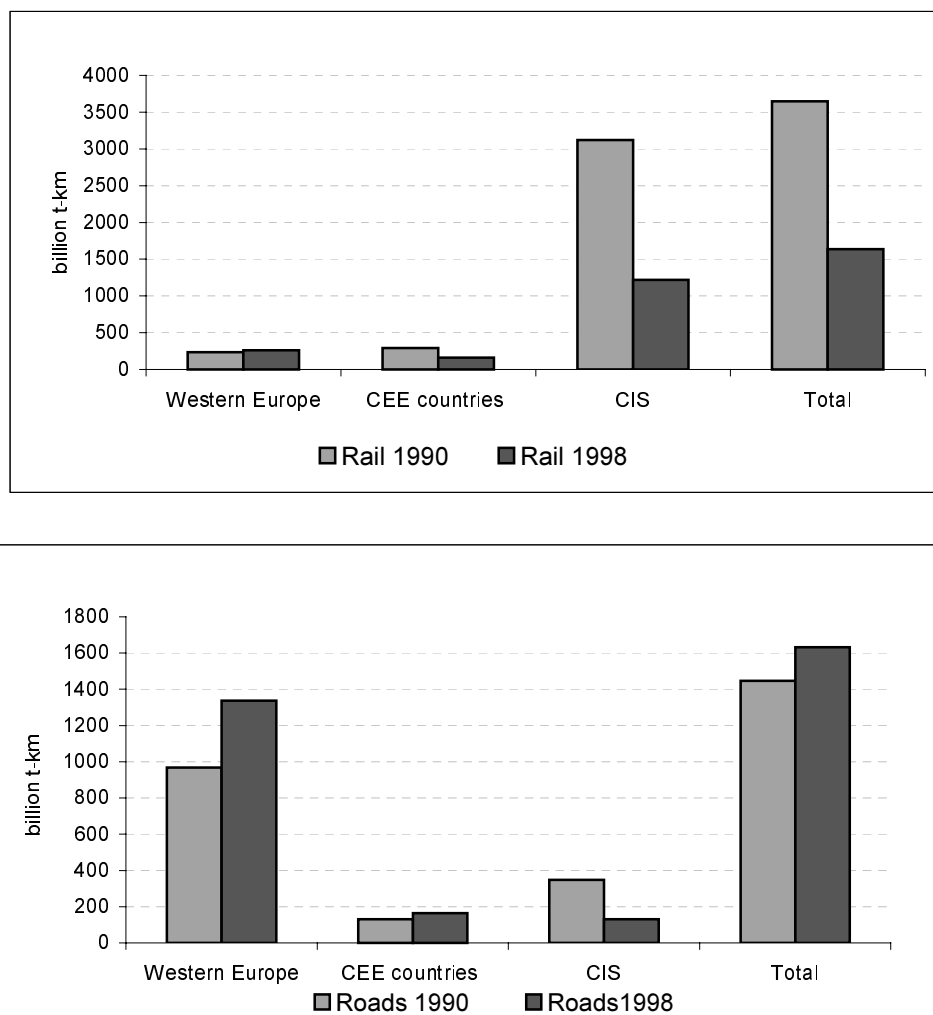
Table 10. **Freight transport 1990-1998 (thousands million tonnes-kilometres)**

Group of countries *	Rail		Roads		Total***	
	1990	1998	1990	1998	1990	1998
Western Europe	236	260	968	1 338	1 434	1 859
CEEC**	292	159	130	164	470	371
CIS	3 120	1 218	348	131	6 481	3 304
Total	3 648	1 637	1 446	1 633	8 385	5 534

\* ECMT classification.  
 \*\* Including Baltic States.  
 \*\*\* Including inland water and pipelines.

Source: ECMT, Trends in the Transport Sector - 1970-1998, Paris (2000).

Figure 23. **Freight Transport 1990-1998 (thousands t-km)**



Source : Author's calculations based on « Trends in the Transport Sector 1970-1998 », ECMT.

Table 11. **Passenger public transport 1990-1998 (thousands million passenger-kilometres)**

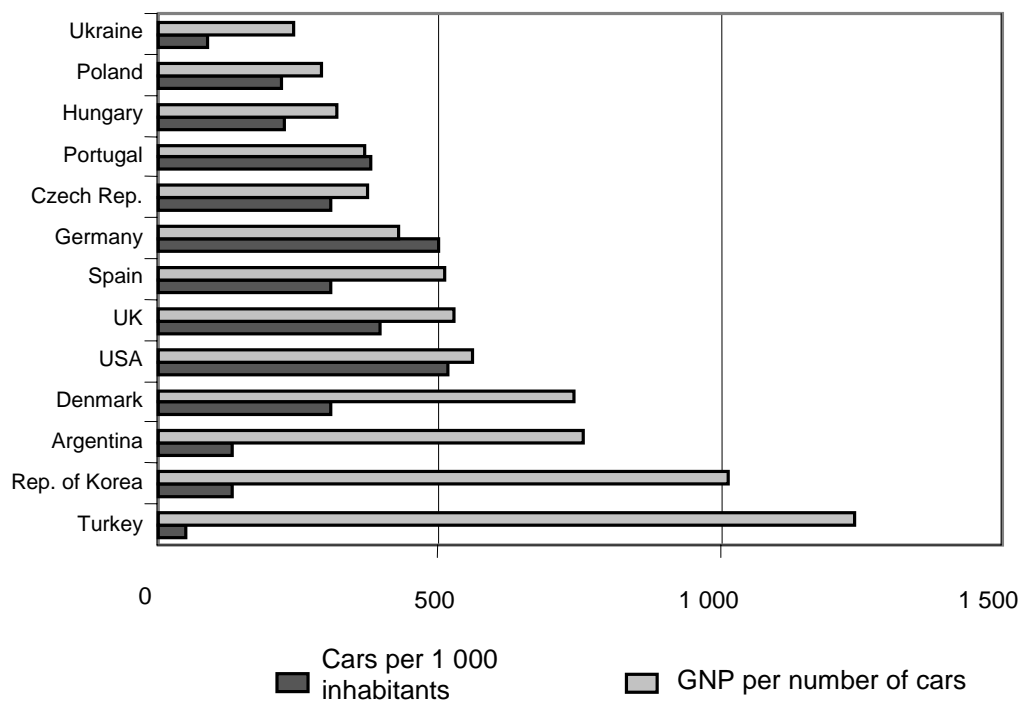
Group of countries *	Rail		Bus/coaches		Total	
	1990	1998	1990	1998	1990	1998
Western Europe	272	304	345	386	617	690
CEEC**	137	67	201	102	338	169
CIS	514	217	388	193	902	410
Total	923	588	934	681	1857	1 269

\* ECMT classification.

\*\* Including Baltic States.

Source: ECMT, Trends in the Transport Sector - 1970-1998, Paris (2000).

Figure 24. Car ownership in relation to GNP (ppp) per capita



### 3. Controlling transport demand in specific situation of CEEC

#### 3.1 Key issues

In the last decade, CEE accession countries made a great effort to move from centrally planned economies to market economies and, more specifically, to meet EU requirements. While there are differences in progress made by specific countries, there are some common features of the present transport policies: (i) liberalisation and deregulation in road transport takes place; (ii) commercialisation and privatisation of this transport sector is close to completion; (iii) in the case of railways the process is much slower; (iv) limited support for public transport is still provided; (v) there is growing interest in environmental aspects of transport and in some countries management of transport demand is considered as an important objective.

Remaining countries are less advanced in their transition to a market economy. It is, however, almost certain that in a few years the process of harmonisation of law and principles of transport operation will be accelerated. If the present plans of the UE enlargement are implemented, the Union will soon have 25 member states and remaining European countries will become more interested in functional integration of transport systems. As regards present transport policies, because of low quality of infrastructure, acute transport problems and backlogs in maintenance, environmental aspects of transport are not at the top of priorities. It is, however, highly probable that with growing awareness of the public this question will grow in importance.

The governments of CEE countries are forced to make difficult decisions. Among the most important issues the following are related to transport demand: (i) conflicting objectives of sustainable development: social, economic and environmental; (ii) desirability and possibility to decouple economic growth and transport demand; (iii) ways of reversing modal shift: from rail to road and air and from public to individual transport.

### ***3.2 Conflicts between objectives of sustainable development***

Finding a satisfactory balance between conflicting social, economic and environmental objectives of **sustainable development** is not easy. In many transitional economies with urgent social problems and the primary importance of economic development objectives, environmental objectives are often considered as less crucial, at least at the earlier stages of development. In particular, mobility is limited by lower incomes and shortages of transport systems. Consequently, improvement of mobility and accessibility is considered as no less important than reducing the negative impact of transport on the environment. Several governments have been making attempts to formulate national transport policies within the broader framework of national development policies. In most cases they accept the concept of sustainable development which includes - as an objective - management of transport demand. In this context a fundamental question is asked whether is it desirable and possible to decouple economic growth and transport demand?

### ***3.3 Decoupling economic growth and mobility***

After the period of stagnation in several CEE countries personal mobility is increasing faster than national income. If controlling mobility is considered as an important objective, four main types of strategies of decoupling economic growth and mobility are available: market based instruments, regulation (including spatial planning), information technology (including substitution effects) and lifestyle changes.

#### ***3.3.1 Market based instruments***

It is growing awareness among professionals (but so far not necessarily by politicians and the general public) that pricing and, generally, “user pays” principle are the right solutions. Following this path is envisaged in long-term and local transport policies in countries such as Poland. However, when considering transition economies, it is necessary to take into account that, with much lower income levels, economic and social consequences of higher transport costs may be even more difficult to be politically accepted than in developed economies. This was demonstrated by wide criticism of vignettes, which are to be soon introduced on selected Polish national roads.

The international finance institutions continuously recommend to CEE countries that price distortions within the transport system should be eliminated wherever possible. Among other, it means that all forms of subsidy to private and public transport should be phased out. Experience has shown that it will not be easy and, what is even more important, beneficial from the point of view of sustainable development objectives. In some of CEE countries, in the first years of the transition period, subsidies to urban public transport have been reduced to the extent rarely met in EU countries. For example, in Poland, the average cost coverage from the farebox has radically grown from 40% in 1988 to 74% in 1994. From 1995 on, this trend was reversed – the cost coverage decreased to 68% in 1996 to 63% in 2000.

The reduction of subsidies had serious impacts on urban public transport. Funds available for vehicle replacement and infrastructure development and maintenance were sharply reduced. Raising fares accelerated the shift of passengers from mass to private transport caused by the growth of motorization. In Poland, in the period 1985 – 1998, urban transport fares in relation to petrol price have multiplied by 8. It is hardly surprising that the share of urban public transport dropped from 90-95% in the late 1970's to 60-70% at present. The same has happened in intercity transport where strong pressure to reduce subsidies caused fare increases which contributed to modal shift.

Applying other fiscal measures in transitional economies will be even more difficult. In many cities even introducing parking charging appeared to be difficult to implement. Already low car and fuel taxes are opposed by the electorate. In fact, in the recent years, under strong pressure from the automobile industry, vehicle taxes have been gradually reduced. This is definitely counterproductive from the point of view of sustainable development objectives.

### *3.3.2 Land use planning and spatial development controls*

Land use forms reducing travel distances include high densities of residential areas and mixed uses reducing distances between local and regional employment, services and facilities. It is well known that practical use of these principles in Western European cities is limited because the development lies rather on restructuring than dynamic growth. The situation is different in transition countries, with regional and urban patterns inherited from the period of centrally planned economy. Many cities followed a controlled development path with the development of large industrial complexes and residential areas separated from employment and service centres. These patterns were creating an excessive travel demand and were inefficient from the point view of transport intensity.

In the period of reforms, there are rapid changes in the distribution of urban activities. On the one hand, in formerly mono-functional areas (such as large residential zones) employment opportunities and services are growing. It creates opportunities for short-distance commuting and meeting demand for shopping locally. Consequently, the need to travel is reduced. On the other hand, because of underdeveloped local retail market, there is extremely rapid retail development.

For example, in Warsaw (1.65 million inhabitants in the city and about 2.5 million in the metropolitan region), in 10 years, the retail space has more than doubled. Over the past 5 years, the city has gained almost 500 000 square metres of international-standard retail space, most of it in the form of large shopping centres, retail warehouses and stand-alone hyper markets. In 2001, there were 28 such centres operating and another 7 under construction. Unfortunately, most of this development was located at the edge of the city, not necessarily in the proximity to higher density residential areas. This has increased demand for travelling by car, induced modal shift and contributed to the rapid growth of road traffic.

The two processes described above work in different directions, but the final impact is still negative because increase in transport intensity caused by the sprawl of low-density residential areas and the development of peripheral shopping-service centres is much greater than the reduction of travel demand caused by the growth in the number of working places and services in residential areas. If this trend is not stopped, there will be no chance for reducing demand for travel in general and for travel by private car in particular.

Generally, in transition economies, using land-use planning and development control as a tool to reduce demand for travel and dependence on car, is more difficult than in more developed countries such as the Netherlands ("The Right Business in the Right Place"; A, B, C categories, etc.), the United

Kingdom (DOE planning policy guidance to local authorities), Switzerland (case of Zurich), Canada and other (ECMT/OECD, 1995). One of the reasons is that after decades of goal-oriented central planning the role of planning was dramatically reduced. As in other sectors of economy and political life, this was a natural reaction to the old system. And it will take time till the role of planning will be fully appreciated.

Fortunately, there are some signs of growing understanding of the importance of controlling the urban growth. For example, in the last years, urban transport policies declared by the authorities of some Polish cities addressed the issue of transport intensity of urban structures. Following Krakow, in which the principles of transport policy were defined in 1993, in 1995 Warsaw City Council adopted transport policy, which was called “a sustainable transport policy”. In 1996-2001 similar policy was formulated in other large cities such as Bialystok, Gdynia, Lodz, Poznan and Wroclaw.

In formulating policy proposals and their promotion extensive use was made of the results of the first OECD/ECMT project on Urban Travel and Sustainable Development (ECMT/OECD, 1995). It can be clearly seen from the selected points of the transport policy document adopted by the Warsaw City Council for Warsaw. Means and measures relating to urban planning and development control include: (i) *stimulation of the concentration of jobs and services in the centre and areas well served by public transport*; (ii) *stimulation of mixing of activities (residential, work, services, recreation) in order to limit the need to travel longer distances, and making possible the reaching of journey destination on foot or by bicycle*; (iii) *parking policy setting up a maximum number of parking spaces in the central area*.

### 3.3.3 *Information Technology (IT)*

There are two good reasons for considering IT as particularly promising for CEE countries. One is that there is a very rapid progress in bridging the present gap. The other is related to already discussed dispersion of the population and economic activities in the vast area of CEE. This may stimulate wider use of tele-commuting, tele-shopping, etc. and “distance learning” thus reducing the need to travel. IT services in banking, marketing and sales information, interactive media, etc. will also have consequences for transport demand.

### 3.3.4 *Life Styles and Attitudes*

Only 20 to 30% of the variation in travel patterns can be attributed to land use and physical characteristics, and the remaining 70 to 80% is accounted for by socio-economic characteristics of people (Banister and Stead, 1997). A better understanding of attitudes to travel, the formation of these attitudes and the effect of land use on these attitudes are necessary.

From the already demonstrated preferences of societies in transitional economies it can be expected that decoupling of passenger transport growth from economic growth in countries analysed will be very difficult. Strong tendency to own the personal car was discussed earlier. Travel behaviour surveys have also proved that the use of vehicles (measured by annual mileage) is increasing. Rapidly growing tourism and holiday travelling is also a sign of growing mobility.

### 3.3.5 Controlling modal shift

In practically all CEE countries, public passenger transport is still playing an important role, especially in urban areas. In freight transport, in spite of rapid growth of the share of road transport, railways still carry a considerable part of goods. However, as it was shown earlier, there is rapid modal shift from rail to road and air transport and from public to individual transport.

Stopping and, possibly reversing this trend is one of main challenges confronting governments. This is especially important in metropolitan areas and large cities where the provision of efficient and effective public transport alternatives is possible. But it does not seem to be so essential and appropriate in more remote and less densely populated areas of CEE/CIS with a sparse network of public transport with low levels of demand. In such places, it may be more efficient to travel around in an “environmentally clean” car, rather than in a public transport vehicle.

## 3.4 Demand for Freight Transport

In order to reduce the demand for freight transport, three basic strategies can be used: dematerialization of the economy, reduction of the spatial range of material flows and optimisation of transport organisation.

### 3.4.1 Dematerialization of the economy

*Dematerialization* of production and consumption, i.e. the reduction of the use of resources per unit product or service has been considered for some time as an important and promising element of sustainable development policy. One of most interesting ways of measuring the *material intensity of the economy* is through assessing the *total material requirement* (TMR) defined as a sum of *direct material inputs* used in production or consumed and *indirect material inputs*, which are related to or result from the abstraction or displacement of the first ones.

So far, only one attempt to analyse economy of transitional country with regard to *material intensity* is known to the author. The most important results of the study (ISD, 1999) concerning Poland are presented in Table 12. In this study methodology developed by the Wuppertal Institute for Climate, Environment and Energy was applied.

These comparisons demonstrated clearly that:

- *Material intensity* of the Polish economy *per capita* is still much lower than that of more developed countries; however, when related to the Gross National Product (GNP), in 1992 material inputs were approximately 4 times higher than in highly developed economies.
- In the last years, *material inputs* are growing with the most rapid growth observed in imported products, in which the share of hidden flows is very high in most countries (except USA); fortunately, because of the rapid growth of GNP, TMR/GNP index has been decreasing; in the period 1992 – 1997 it decreased from 12.63 kg/USD in 1992 to 8.57 kg/USD in 1997.



Table 12. **Material inputs in selected countries**

	Poland		Japan	Netherlands	Germany	USA
	1992	1997	1991	1991	1991	1991
DMI local (mln t)	453	479	1 424	236	1 367	4 581
DMI import (mln t)	39	62	710	303	406	568
DMI total (mln t)	492	541	2 133	539	1 773	5149
DMI per capita (t)	12.7	14.0	17.1	35.5	22.0	20.2
ER local (mln t)	485	467	1 143	69	2 961	15 494
ER import (mln t)	88	217	2 439	632	2 030	594
ER total (mln t)	573	684	3 582	701	4 991	16 088
ER/DMI (%)	116%	126%	168%	130%	282%	312%
TMR (mln t)	1 065	1 226	5 716	1 240	6 764	21 237
TMR per capita (t)	27.6	31.7	45.9	81.6	83.9	83.3
DMI – Direct Material Input. ER – Ecological Rucksack. TMR – Total Material Requirement. <i>Source: Institute for Sustainable Development, 1999.</i>						

Consequences of the observed trends for the transport demand are obvious. If present trends continue, and, as it was suggested in (ISD, 1999), dematerialization is chosen as one of the objectives of economic development – it may be expected that the growth in freight transport volumes in CEEC will be considerably slower than it is assumed in most transport demand forecasts prepared in recent years<sup>14</sup>.

#### 3.4.2 *Managing the spatial range of the circulation of goods*

Reducing the spatial range of the circulation of material is difficult but extremely important for countries and regions where population is dispersed and distances are long. Unfortunately, the transport and environmental impacts of business or political decisions are rarely taken into account. In addition, after the period of shortages of all categories of goods, companies in countries with transitional economies demonstrate strong interest in a variety of products imported from all continents. This leads to inefficiencies not only because of transport intensity but also relating to servicing, spare parts, etc.

Among sub-strategies, which should be considered by planners and economists in transitional economies, the following seem to be especially promising: (i) enhancement of regional consumer markets; (ii) strengthening of regional production networks and (iii) *Glocalisation*.

The strengthening of regional consumer markets is mainly a life-style and marketing question, but companies can also be encouraged by the state and local governments to produce near to their markets. This concerns in particular food production and building industries.

14. For example, within the framework of TINA project.

Regional production networks have been important motors of economic growth in the transition economies. Large international companies often make use of regional sourcing. Various policy measures can be used to strengthen this trend, for example all kinds of policies that increase the cost of transport. Unfortunately, for the time being, support by the structural funds is mainly founded on the “export-base” theory and requires that companies sell beyond regional markets.

There is also growing interest in *glocalisation* (*glocal production*) as a potential way to reduce transport demand without reducing access to the full range of products and services (POSSUM, 1998). *Glocal* production can be characterised by large network firms which combine economies of scale and scope and maintain a network of local and global organisational units with close communication links. Material flows can be decentralised without jeopardising the efficiency of a European or global company. In transitional economies, many examples can be found easily in the car industry or the fast food sector.

Unfortunately, as it was stressed in (POSSUM, 1998) “in the past decades the liberalisation of trade as well as technological changes have strongly loosened the linkage between material production and a specific territory.”

In addition, within the transport sector, there are internal factors which make decoupling of transport demand from economic development difficult. Public investment in the development of transport infrastructure and subsidising transport operation leads to the increase of transport speeds and reduction of transport costs. Together with the improved quality of services (e.g. logistics) this may induce additional transport volumes rather than reducing the demand.

Another problem is related to the potential conflict between objectives of economic development and reduction of freight transport intensity of economy. Proposals to moderate the growth in freight transport are often criticised because of fears that they may have negative effects on the economy and the labour market both within and outside of the transport sector. One view is that “decoupling freight transport from economic growth would mainly mean accelerating structural change in a certain direction. The losers represent the old, ripe material-oriented industries, the protagonists of the era of mass production, who still have considerable influence and power. The winners are linked to the rising service and information based industries. The potential of decoupling therefore is mainly limited by political and not by economic difficulties” (POSSUM, 1998).

### 3.4.3 *Conclusions concerning freight transport intensity*

There is large potential of slowing down the growth of freight transport intensity in CEE countries. Although precise estimates are very difficult, on the basis of rough guesses it was estimated (POSSUM, 1998) that the overall potential for decoupling freight transport growth from economic growth could be similar to that envisaged for EU countries, e.g. in the order of 35 to 50% compared to present trends. Therefore if appropriate measures are taken, freight transport instead of growing might remain at levels similar to those at present.

#### 4. Conclusions

1. In transitional economies of Central and Eastern Europe changes in transport volumes, distribution and modal split are multidirectional. Passenger traffic is growing, freight transport in the first half of the last decade was decreasing and then started growing slowly. Motorization is growing much faster than GDP, which has consequences in the transport sector and in other areas of activity.
2. There is a conflict between the needs to improve accessibility and to enable mobility and environmental objectives. The solution might be in combined strategies which should be differentiated taking into account the specific situation of a country and its regions.
3. Even if the present intensity of freight transport is low, it is high in relation to GDP. Controlling transport demand and modal split are crucial tasks. In order to assure sustainable development it is necessary to look for ways to decouple economic growth and transport demand growth. In points 3.3 and 3.4 various means and measures were examined from the point of view of their potentials in the CEE region.
4. Among researchers, professionals and planners, there is almost common agreement that pricing and charging systems are needed which are clearly and fairly related to the costs of infrastructure and external costs caused by its use. However, so far the main reason for using these measures is rather to collect resources for the Treasury and for the development of infrastructure rather than to control transport demand. Opposition against simple forms of pricing (parking charging, vignettes, etc.) has shown that wide application of pricing will be extremely difficult. Definitely, progress in this area depends on how successful the EC will be in introducing “user pays principle”. Nevertheless, the CEE countries should start working on the concept as it will take time to get political approval for wider application of charging.
5. If controlling transport demand is considered desirable because of sustainability goals, the State has the role to play. It should not be limited to purely transport policy but should include general economic/fiscal, industrial and spatial policies.

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## ACCEPTABILITY AND FEASIBILITY OF THE MEASURES

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### 1. Introduction

There is a widespread consensus within the transport sector that its current performance is not sustainable. We all more or less agree that the way our society has organised the transport of people and goods is partially socially unjust, economically unfair and environmentally unsound. Moreover, there is agreement on some of the basic principles with which to achieve sustainable transport, such as “internalising external costs”, “the user pays principle” or “fair competition between different modes”. But this is it. This is probably as far as the consensus goes. Although nearly all social actors are able to subscribe to the common vision of “sustainable transport”, the most influential of them are usually not willing to move towards its implementation. As if this lack of political will did not suffice, governments and industries often speak with one voice, when they reject implementation strategies with comments such as “not acceptable” or “not feasible”. Despite industries and governments embracing the common vision of sustainable transport, legal and regulatory measures aiming to improve both transport and the environment are turned down because it is said that such measures are neither socially accepted nor economically feasible. “Zero acceptability” or “beyond feasibility” are the general accusations which “green” transport activists and planners have heard over and over again. It is now time to deconstruct these empty phrases and show that sustainable transport is always socially acceptable and definitely economically feasible.

Therefore, in the first part of this paper, we outline why both the social acceptability and economic feasibility of sustainable transport are generally high. Consequently, we forward a number of well-established arguments for sustainable transport and transpose them into the context of debates on which measures count as feasible and acceptable and which do not.

The arguments mentioned here have framed the work of T&E throughout the past and will continue to do so in the future. It is essential to stress that despite the consensus on the unsustainability of transport, important policy recommendations of T&E and other environmental NGOs are far from being properly implemented into policymaking. This lacking consideration of sustainable measures by policymakers certainly justifies reinforcing our message that *sustainable transport is always socially acceptable and definitely economically feasible*. However, the prominent lack of a political will to integrate the environment into the transport sector (for instance within the European Commission) also prompts us to raise the question of “why is there such a lack?”, and even more important “what needs to be done to stimulate such will?”.

Therefore, in the second part of this paper a new concept is presented that seeks to provide some initial answers to these questions. This concept is that of “reflexivity”, i.e. the ability of an individual, an organisation or a sector as a whole to be self-referential, self-analytical, self-interpreting and self-

critical. We then propose to improve the *reflexivity* of crucial transport actors such as global corporations, European administrations and national governments. We argue that in order for sustainability to work these institutions have to change their outlook on transport and mobility. We claim that sustainable transport policy starts within the organisations that are making transport policies. In fact, it begins in the mind of the desk officer, engineers or planners, who provide their input into this policy process. All of these individuals and organisations need to come up with a more “reflexive mobility view”, in order to develop the political will to implement sustainable transport policies.

This proposal must be seen as a result of us rethinking our daily work as an environmental NGO. We have come to understand that *making transport more sustainable* is not possible without *making relevant organisations more reflexive*. Using this assumption as a starting point for our argument, we suggest to complement *sustainable transport* with the notion of *reflexive mobility*.

The notion of reflexive mobility aims at highlighting an alternative social vision for future transport. It fully supports sustainable transport policies as well as the principles promoted by them. But it also reaches beyond the transport sector and seeks to provide a leitmotif for all kinds of different mobilities. The leitmotif that it introduces to the transport debate is that of “reflexivity”. Reflexive mobilisation, then, describes the attempt of a society to allow for a fairer distribution of mobility.

By introducing the notion of “reflexive mobility” to a debate on “the fundamental drivers of transport demand”, this paper seeks to go beyond a mere management of these drivers. Rather than managing social, economic or technological drivers, we need to change them! In light of this, reflexivity appears as an instrument to transform the public and private organisations that are reproducing these drivers of transport demand. Reflexivity, then, aims at implementing an often-cited “global responsibility” within transnational organisations like the aviation industry or the European Commission. The claim is that managing the fundamental drivers of transport demand requires, first and foremost, a different (and more reflexive) mobility view within these organisations – it requires changing the way people and organisations conceptualise transport and mobility.

## **2. Definitely economically feasible**

Sustainable transport is definitely economically feasible. In general, it makes little sense to claim that internalising the external costs of transport is economically unfeasible, or even worse, bad for the economy. In fact, the opposite is the case: *less transport is good for the economy*. Why, a reduction of transport will increase both economic efficiency and productivity. It will stimulate a more efficient use of scarce resources, such as energy, land or clean air, and it will increase the economic productivity in those regions that have suffered from an unbalanced distribution of wealth due to spatial concentration and centralisation processes.

What kind of economic instruments have to be introduced in the transport sector to enhance efficiency and productivity, and promote sustainability? In order to bring about sustainable transport, it is vital to implement appropriate charging schemes that take the external costs of transport into consideration. At the time being, political decision-makers in Europe are caught up in a discussion on the accuracy of different methodologies to estimate the social marginal costs of transport. Economists have proposed a number of ways to reach the “perfect price” by considering people’s “willingness to pay”, or determining the actual costs to avoid a further degradation of the environment. These scientific debates were of crucial importance at a time when it was necessary to raise awareness and improve knowledge about the monetary dimension of transport’s damaging impacts on human health and natural environment. As we have come to understand the relationship between transport, the

economy and the environment, it is now time for immediate and consistent political action. Instead of finding the exact price to cover the social marginal costs, we need to ask ourselves and decide “how much transport do we want?” So instead of “short-circuiting” a political debate on sustainable transport, economists ought to help implementing the economic and fiscal measures designed to reach the political goals that civil society has set for itself.

Transport pricing is an efficient measure to meet international targets for the reduction of GHG-emissions, to reduce noise and air-pollution in urban areas and to make the roads safer for all citizens. The way forward is to set targets such as those in the Kyoto Protocol and ensure that the transport sector will meet them. The price for transport in the European Union is thus inevitably linked to the environmental indicators and targets that were agreed upon by European governments. The purpose of pricing is to improve economy and environment, not to perform an academic exercise in transport economics.

Any transport pricing reform will have to reflect the need for reducing transport volume. The way to achieve this is by increasing the costs of infrastructure use and making the user/polluter pay for it. Consequently, transport has to become more expensive in relation to other factors such as labour. If the costs of labour are reduced and those of transport increased, regional production, distribution and consumption cycles will benefit – and if the costs of unsustainable transport modes are increased relatively more than those of less polluting ones, the environmental performance of the whole sector will improve.

In order to facilitate this “levelling of the playing field”, the revenues from environmentally differentiated charges should be used to promote the less polluting modes of transport. Once the “sticks” are bundled with “carrots”, feasibility and acceptability of any price-reform within the transport sector will certainly grow. In a highly mobile society, the feasibility of restricting the use of unsustainable modes is essentially a function of the successful provision of other, less polluting means of transportation.

### **3. Always socially acceptable**

The social acceptability of policies that are of benefit to society as a whole is *per se* high. The fact that certain social groups may find their privileges threatened should not have an influence on whether the very policy in question counts as socially acceptable or not. Making transport more sustainable qualifies as such a policy because it offers mid-term benefits as well as instant gratification for future and current generations. The negative stance of certain industries, such as the aviation or shipping industry towards more sustainable pricing policies is understandable, but cannot prohibit the social necessity of integrating the environment into the transport sector.

Not only are certain transport industries unwilling to accept that which is socially necessary, they are also employing the term “acceptability” to dismiss any progressive policy towards more sustainable transport. The opponents of truly sustainable transport frequently bring the notion of acceptability into play in order to evoke the myth that “people do not like a certain policy”, and thereby justifying one’s own unwillingness to act. Using social acceptability in order to promote self-interest, however, reflects a distinct degree of social ignorance (rather than a social responsibility that one should expect from the global transport industry).

Moreover, when speaking of “acceptability”, it is in many cases helpful to be more to the point and to replace the term “social” with “individual”. Changing the transport patterns of society begins with changing the transport behaviour of individuals. Hence, it is important to achieve both an overall

social acceptance and an individual acceptance of sustainable transport policies. Below, we will now demystify the notion of “acceptability” and try to explain what makes sustainable transport policies both individually and socially beneficial and acceptable. The argument is that once the benefits of sustainable transport are immediately realised, widely perceived, and better communicated, their individual and social acceptance will improve.

### ***Individual acceptability***

In order to increase individual acceptability of sustainable transport policies, local, regional and national governments need to address the lack of awareness, concern, information, adequate professional advice, and rational behaviour. This is usually done by “greening” the cognitive-rational responses of individual transport users to the environmental problems of motorised transport. The focus is on *explaining* the citizen, why there is a need to change transport patterns, and that doing so is of benefit to the environment as well as future generations. Undoubtedly, this approach is an important step to achieve individual acceptance.

However, it should be emphasised that because much of what underpins contemporary modal choice is simply based on habits, affection and emotion, providing information and hoping for so-called rational behaviour has its limits. Hence, instead of providing more “public education” we would also suggest offering more “public seduction”. What does that mean?

*Helping the citizen to understand* the environmental problems of unsustainable transport behaviour is the precondition of changing it – but *seducing the car driver to use* a bike or take the train is the key to inducing change. Rather than changing the *transport attitude* of citizens, their actual *transport behaviour* ought to be addressed directly – since a specific attitude does not necessarily determine a specific behaviour.

One way to bring about this behavioural change is, for instance, to seduce car drivers into walking, biking or using public transport. Once the virtues of “not having to drive or park a car” are experienced first hand, a change of attitude will follow more or less automatically. Helping the citizen to “feel” and not just “understand” the advantages of leading a car-free life, will as well have repercussions on individual attitudes towards and cultural myths about motorised transport. Positive examples and best practices that support this approach are provided by research on the changing behaviour of transport users who “converted” from owning a private car to sharing a public car. More support can be found in research on the experienced gains in quality of life amongst the members of car-free households. Most important, though, are the insights into the aesthetic, emotional and non-rational dimensions of transport that are offered by the car industry itself. It could very well be argued that the ongoing success of the car is a result of an “awareness campaign” that seduces rather than informs and that appeals to an instinct rather than to an enlightened concern for health and the environment.

The success of such a campaign is illustrated by the continuous reproduction of “car-myths<sup>15</sup>” like the one that a “car-based life can be extraordinarily rewarding. Those who live it travel with comfort, convenience, and privacy unknown in times past even to royalty” – a quote that could be part of a contemporary car-advertisement, but is unfortunately found in the draft version of a forthcoming OECD report on environmentally sustainable transport. It is equally important for any attempt to

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15. For demystifications also see the T&E publications on “car-myths” *Transport and the Economy* (2001) and *Transport and the Society* (forthcoming).



overcome individual barriers and attain sustainable transport, *to emphasise the inconveniences that come along with car-ownership and point at the personal benefits derived from walking and biking.*

### ***Social acceptability***

The social acceptability of measures to change people's transport patterns increases as these measures are introduced. But in order to stimulate the introduction of such measures and to show how socially acceptable sustainable transport is, the "mobility view" of decision-makers has to change. Just as much as the success of sustainable transport policies depends upon individual transport behaviour, it needs political action to establish a framework for social acceptance. Studies have shown that dominant beliefs among transport politicians often underestimate the electorate's acceptance of what is good for the environment. In other words, people are generally more positive towards measures that promote sustainable transport, than political decision-makers believe them to be.

Therefore, in order for sustainable transport to be implemented, we need a new social contract on mobility – a contract questioning the general belief that *modernisation means mobilisation*. Modernising the way we travel cannot automatically be tantamount with "speeding-up" and "moving more". Especially not when personal time-gains as a result of faster means of transportation are continuously reinvested into ever-more travel, movement and mobility. If modernising individual transport means travelling more in less time – then social development enters a vicious circle that will eventually prove of no benefit to anyone.

A mobility view that seeks to break the current link between modernisation and mobilisation has already been translated into transport economics by emphasising the need to decouple transport from economic growth. The core measure to bring about this decoupling is "getting the prices right", that is to say internalising the external costs of transport. But apart from using economic instruments to render the transport sector more sustainable, new socio-cultural visions and distinct political targets have to be devised. Already now, there are a number of available approaches upon which to hinge a more reflexive, i.e. self-critical, mobility view. They comprise instruments such as "sufficiency" and "transport avoidance" or more radical notions such as "slowness" (as, for example, employed by the "slow city" movement and "street reclaiming").

What these themes have in common is that they advocate a mobility reform that is essentially social, because they question the way we interact with and relate to each other. As a result, they often reward the communities which seek to slow down and travel less, with a perceived increase in quality of life. This sort of instant gratification must be seen as a crucial argument to communicate the social acceptability of sustainable transport. It is an important addition to the argument that sustainable transport is of benefit to *future generations*, because it as well highlights the immediate benefits to *current generations*.

To summarise, the above arguments mainly illustrate two points. Firstly, they show that sustainable transport policies are socially (and individually) acceptable as well as economically feasible simply by highlighting their beneficial contribution both to the economy and society. Secondly, it becomes clear that both terms are often employed for blocking necessary measures to change a currently unsustainable transport system. On this view, acceptability and feasibility appear as mere constructions – as "empty phrases" – used to counteract policies that will challenge current power structures within the transport system. Dominant transport actors frequently evoke such phrases and question the acceptability and feasibility in order to protect their very own interests, rather than to recall their social responsibility.

Any move towards a more sustainable transport system relies essentially on a changing world-outlook within the relevant industries and of current political decision-makers. The promotion of another “mobility view” amongst those actors is necessary. A key characteristic of such reformed mobility views is the degree of reflexivity of an organisation or institution active in the field of transport. In other words, there is a necessity to look upon our own doings in a more self-critical fashion and measure the validity of our actions against the negative impacts they have on other social subsystems, such as the economy or the environment. This need for more self-critical action within the transport sector may be captured under the leitmotif of “reflexive mobility”.

#### 4. Reflexive Mobility

If one checks out the relevant documents published over the last decade by any European transport professionals; if one looks into the pamphlets of car-manufacturers, airlines or public transport companies; if one sifts through the policy documents of lobbyists, transport planners and decision-makers or if one screens the daily papers and life-style magazines in any European language for articles on transport, traffic or mobility a great alliance will emerge. Across the trenches, all organisations within the field of transport claim to promote sustainability. Any organisation, disregarding whether it produces SUVs, operates airports or plans Trans-European Networks maintains acting in a sustainable way. It seems as if environmental activists have achieved their ultimate aim: a comprehensive integration of the environment into the transport sector.

However, a closer look reveals that this is not the case. Despite the claims of industry and governments, environmental performance of transport is declining. True sustainability is far from being achieved within the sector. On the one hand this is due to a variety of interpretations of what counts as sustainable and what does not. On the other hand, it is due to the contradictory outcome of some so-called sustainable actions. We have come to learn that certain measures intended to promote sustainability may sometimes very well be charged in ambiguity. A few examples will clarify this point:

- The technical improvements of passenger cars which make the single vehicle cleaner and more efficient *may very well turn against themselves* and pave the way for a persistent increase in total number of cars. Some end-of-the-pipe technologies help to mitigate air pollution and hence improve air and life quality in urban areas. But the immediate gains in quality of life may turn out to be mid-term losses as an increasing mass of clean cars conquers ever more urban space. By solving one problem, some technical solutions may create others.
- Measures to promote public transport, as well-intended as they were, have often caused a mere re-balancing of the modal split amongst the already environmentally sound modes. Green commuters oscillated between bikes and buses, while drivers remained in their cars. Here, as well, a sustainable policy *has somehow turned against itself*.
- The ecological production of food does not necessitate ecological distribution and consumption of food. The environmental balance of Egyptian eco-potatoes sold in bio-food stores in Germany is shattered by the unsustainable transport from one continent to another. Often enough, as green food has entered the global market, it has also *come to turn against itself*, that is to say, it can no longer be considered as fully sustainable food.

What these examples illustrate is the fact that certain measures and policies, which are presented as making a contribution to sustainability, may not do this in a sustainable way. The label

“sustainable” (as it is currently used by various many governments and industries) may not guarantee that a measure does not turn against itself and contradict its intentions.

It is important to recognise that this “Turning-Against-Itself” of all sorts of social or political processes appears to be one of the crucial characteristics of modern societies. It also has become one of the key-categories that govern social research ever since the 1990’s. Its rise to popularity begins with Ulrich Beck’s notion of the *Risk Society* – a society that is no longer merely concerned with the production of “goods”, but with the distribution and re-distribution of “bads”, i.e. risks to both the natural environment as well as human health. Beck and others understand this “Turning-Against-Itself” as somewhat of a reflexive process. Here, reflexivity is used as a descriptive term. It describes how the unintended consequences of (transport) policies impact upon the very policy itself.

Against this background, reflexivity could serve as a descriptive characteristic of certain phenomena we often witness in relation to transport politics. As the above examples illustrate, current transport policies seem to be charged with a variety of reflexive processes that contradict the policies’ very own intentions.

However, apart from this “descriptive” use of reflexivity, one can also envision a more normative employment of the term. In this light, reflexivity may also be understood as an overarching leitmotif for that very structural change T&E and others have been campaigning for. As such a leitmotif, reflexivity would be totally in line with the principles of sustainability as they were outlined in the Brundtland report. Sustainable transport is then the objective of a policy that aims at promoting *reflexive mobility*.

This invention of *reflexive mobility politics* appears necessary as we have come to notice that sustainable transport is endowed with numerous issues that are normally not covered by transport experts. Societies at the beginning of the 21<sup>st</sup> century are confronted with the complex task of providing, managing, and controlling the mobility of people and goods. The actual transport from A to B is merely one of the many problems faced by future mobility managers. What they will be confronted with is an array of interdependent problems that stretch over different policy areas. For instance, transport politics border on justice and home affairs in the case of immigration. International airports, the channel tunnel and port-cities are more than transport hubs or missing links, they are turned into sites for a struggle over European security issues. Technology politics are merging with transport planning and allow for the improvement of “intermodality” so that traditional distinctions between public and private, rail and road, motorised and non-motorised transport fade away. Geographic positioning and satellite systems in conjunction with road pricing are raising new questions at the border of traffic system management and civil surveillance. Demographic changes (an increasing share of elderly people), cultural transitions (integration and assimilation issues), and new social conflicts (between a “mobile” global and an “immobile” local class) will also have their implications on the future of sustainable transport.

These are but a few of the issues in the structural transformation of transport and mobility. Introducing reflexivity amongst experts and decision-makers will help to deal with such necessary structural changes in a more sustainable way. Now, and in order to render “reflexivity” more practicable and translate it into policymaking, a first step could look like this. Let’s envisage a cycle called the reflexivity cycle. Within that cycle, reflexivity has four stages, spanning from a descriptive to a more normative interpretation. The stages are a) self-reference, b) self-analysis, c) self-interpretation and d) self-criticism. How are these stages to be understood in the context of transport and traffic?

- *Self-reference*: Self-reference describes the fact that transport development has turned against itself. It has come to threaten its own foundations; it destroys the resources it relies on. The daily traffic jam is the most illustrative example of how a certain form of mobility has produced its own contrary – immobility – and thus turned against itself.
- *Self-analysis*: From this sort of “simple reflexivity” (understood as self-reference) a process of self-analysis would be the next logical step. An illustration of how self-analysis has become an integral part of transport politics and planning is the environmental impact assessment (EIA) and the strategic environmental assessment (SEA). With the EIA and SEA, reflexivity has reached another stage: from a mere turning against itself and has become a tool for policy-making.
- *Self-interpretation*: This is clearly the stage at which complexity rises. The results of the SEA or EIA are fed back into transport policy making. However, even the clearest outcomes of such assessments are open to different interpretations from various sides. The way the results are read and reintroduced into politics is not necessarily predetermined by the assessments’ methods, but also depends on their interpretation by politicians and planners. In order to be in line with the leitmotif of “reflexive mobility”, such political interpretations ought to be self-critical, that is to say, critical of the interpreter’s very own role.
- *Self-criticism*: Any organisation, policy or action that endorses this last stage of “reflexivity as self-criticism” has certainly made a big step forward in implementing reflexive mobility. It has moved from forwarding simple “solutions” to complex transport problems, to promoting “structural changes” of everyday mobility.

Clearly, self-reference, self-analysis, self-interpretation and self-criticism are to be seen as guiding principles for any organisation active in the field of transport. Transport planners, suppliers and politicians must reflect upon the negative environmental impacts of their plans, products and politics. They ought to be aware of the unintended consequences that are likely to exist for any plan, product or policy, which is being developed. This change in individual attitude, company culture or world outlook is a necessary condition for organisational reflexivity and reflexive mobility to work. Already today *some* of these principles are part of *some* company plans or integrated into *some* governmental policies.

For instance, an early illustration of such a shift towards more reflexivity can be found in the Danish national transport plan from 1993, entitled “Traffic 2005”. Unlike the two predecessors from 1987 and 1990, this plan openly questions the assumption that transport and mobility produce societal benefits only. It expresses doubts, for instance, as to the status of traffic forecasting. Whereas the other two plans by and large interpret such prognoses as facts, this plan understands them as possible, rather than likely, future traffic scenarios (*Trafik 2005*: 5, 6). *Traffic 2005* reacts to anticipated traffic growth in other ways than merely providing more infrastructure; it also considers *proactive* responses, that is, to step in and change various collective and individual transport demands<sup>16</sup> (*Trafik 2005*: 10, 13). Furthermore, it acknowledges the negative consequences of road building and seeks to introduce other means of both ensuring traffic flow and protecting nature and culture from the side-effects of car-use (*Trafik 2005*: 30, 67). The implicit doubt and “openness” of the plan is, however, best expressed in the catalogue of questions concluding the introductory chapters (*Trafik 2005*: 12, 13). Here, traffic is

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16. Commenting on this assumption, Lykke Magelund from the former Danish Transport Council emphasised the “change of transport demand” that is addressed by the plan as a “milestone” and one of the most significant transformations in Danish transport politics.

explicitly dealt with in terms of the questions and ambiguities it produces, rather than in the “old” terms of providing access and sustaining flow.

Clearly, for the most part, the plan is anything but overly optimistic towards the social benefits of new transport technologies. For example, it either openly recognises that certain technological interventions will increase road capacity and, thus, enhance traffic growth, or it assumes a critical stance towards the potentials of intelligent transport systems (*Trafik 2005*: 35). This partial technoscepticism is accompanied by an emphasis on individual mobility behaviour and transport demand. The plan suggests that in addition to *planning for the traffic system*, future policies should be *working with the transport user* (*Trafik 2005*: 15).

This Danish example provides an illustration of how to make transport politics more reflexive. But it also highlights that such a shift may not be durable, as the recent transport political transformations in Denmark suggest. With the closure of progressive institutions and proposal of unsustainable and unsafe transport measures Danish transport politics has now lost its reflexive momentum again.

## **5. Conclusion – Making reflexivity work**

Against this background, transport and mobility appear to be important areas for the implementation of reflexive politics. If, in addition to sustainability, reflexivity is introduced in these areas, sustainable transport will be complemented with reflexive mobility. What, then, does reflexive mobility actually mean? The term reflexive mobility captures those mobilities that are self-critical. In other words, mobilities that take a more critical stance towards their own unintended consequences. An example for a certain type of mobility becoming more reflexive is automobility itself, i.e. the type of everyday mobility that is performed by car. With car-sharing, automobility has developed some sort of a reflexive branch. As some countries and cities have implemented car-sharing schemes for their citizens, they take a more critical perspective on one of the fundamental drivers of automobility, which is private car-ownership. Car-sharing must then be understood as a reflexive approach to the self-produced capacity problems of the private car in urban areas. An entirely non-reflexive approach tackling these “bottlenecks” would be the continuous extension of road infrastructure, because no attention is paid to the unintended consequence of such a measure, which is to say the creation of an ever increasing demand for cars. From a sustainable transport perspective hardly any road infrastructure extension appears to be reflexive, since more roads will induce further growth. The cardinal goal of making mobility more reflexive is therefore to *reduce* and *avoid* certain unsustainable forms of transport.

To summarise, the purpose of the second part of this paper was to outline the necessity for a more self-critical view amongst the dominant transport actors. Only by establishing a more reflexive relationship towards mobility can sustainable transport be achieved. Reflexivity is, hence, the precondition for sustainability. It is the cognitive-rational basis for “sustainable transport conduct” on both a personal and organisational level.

All actors in society, whether they are individuals or groups, need to ask themselves if their mobility view is reflexive. Or, in other words, there has to be a continuous public debate on where we want *to move* towards: do we want to pursue the traditional development path and provide ever-more infrastructure for ever-faster means of transport in order to travel ever-further at ever-higher frequency? Or do we wish to perform a U-turn, step aside and stop riding the juggernaut. Wouldn't it be better to leave this “rushing standstill” of our presence in order to pave the way for a more

sustainable kind of transport and mobility in the future? If our answer to the last question is “yes”, then a more reflexive relationship towards transport and mobility will certainly help us.

To conclude, we propose the following *policy recommendations*:

- In order to ensure the economic feasibility of sustainable transport it is now time for immediate and consistent political action. The way forward is to set targets such as those in the Kyoto Protocol and ensure that the transport sector will meet them. Instead of continuing the debates on finding the exact price to cover the social marginal costs, political decision makers at EU level should finally adopt the long-awaited Framework Directive on Infrastructure Charging and start working on relevant Daughter Directives for all modes of transport.
- Social acceptability of measures to promote sustainable transport expands exponentially whenever their success is tangible and direct personal benefits are experienced. This sort of instant gratification is most strongly appreciated, where transport problems are most severe, such as in Europe’s urban areas. Therefore, European legislation on urban transport is most needed. The European Commission ought to expand its activities in this field and move from promoting Best Practice to implementing binding targets and legislation.
- An initial step on an EU-level towards more reflexive mobility politics would comprise the establishment of a *sustainability impact assessment*, as requested by the Gothenburg Council in June 2001. Any transport-related policy, plan or project ought to be subject to an assessment that scrutinises their impacts on all three dimensions of sustainability. In addition to subjecting transport programmes to an SEA and transport projects to an EIA, European policies in areas like taxation, technology, competition, etc. ought to be subject to this assessment. The sustainability impact assessment should then clearly show what the positive and negative feedbacks are for the overarching goal of achieving sustainable transport and reflexive mobility. It should provide the yardstick by which to measure the reflexivity of transport-related policies in the EU.

## **ACCEPTABILITY AND FEASIBILITY OF THE MEASURES DISCUSSED**

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Influencing transport demand is no more than an auxiliary means for achieving sustainable transport. There are clear limits to the use of this instrument in achieving general objectives such as economic growth and integration, or regional development.

For the IRU, sustainable transport should be achieved primarily through measures that tackle social costs at the source and by policies that support innovation, provide incentives and secure the availability of adequate infrastructure.

This seminar has identified infrastructure charging as a valuable instrument for influencing transport demand. As providers of road transport services, road transport companies can accept such charges, if they effectively and efficiently contribute to sustainable road transport and if the additional cost is borne by the shippers.

Road user charges as implemented by some European countries today and as envisaged by the EU carry a strong risk that these objectives will not be reached. Congestion charging for heavy vehicles and not for other road users is both unfair and ineffective. Likewise, a charge for the social costs of road accidents should apply to all road users. Revenue must be used to improve road infrastructure, thus promoting sustainability and efficiency.

Nevertheless, infrastructure charges for road transport of goods require that other aspects of road use also be reconsidered. Lorry bans force goods vehicles to use roads when they are congested. Present limits to weights and dimensions of commercial vehicles should be revised in order to allow operators to make new optimum choices taking into account the higher charges for using road infrastructure.

Finally, acceptability critically depends on adequate possibilities for passing on the burden to the shippers of the goods and for financing additional costs.

In Germany, larger road haulage companies are forced to pay charges of hundreds of thousands of Euros that they will at best recuperate from their clients many months later. In view of the low profitability of the sector, companies have major difficulties in obtaining suitable financing arrangements from their banks.

The IRU urges that these practical aspects of introducing road user charges be duly considered when implementation is prepared.





## *Conclusions*



## **CONCLUSIONS FOR MINISTERS**

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### **Introduction**

The ECMT Seminar, held on 16 December 2002 in Brussels, worked to an agenda opened by the Federal Minister for Mobility of Belgium, asking sharp questions about the need for practical policy advice. Ten technical presentations were given by transport specialists, covering freight and passenger transport, spatial planning, logistics, pricing at sectoral, national and European levels, appraisal methodologies and transition economies. There were prepared and spontaneous contributions to the discussion from many of the participants. Tentative policy conclusions were presented, then discussed and amended. Naturally a range of different views were expressed but the following main themes were widely supported by those present.

### **1. General Principles for Transport Policy**

Current transport problems in Europe are serious, and in some respects are getting worse. Swift and decisive action is necessary, at local, regional national and European levels. In many cases what needs to be done has been well established for many years, but there are prolonged delays trying to reach a full consensus. This is understandable, but can be dangerous, as delays sometimes cause a loss of momentum and reduce, rather than increase, public and stakeholder support. There are now many examples where decisive practical action has helped to build support and experts have felt competent to assist Ministers in making rapid progress. Two good Swiss examples were presented at the Seminar: integrated land use and suburban rail planning to maximise accessibility in and around Zurich; and introduction of the HVF distance and performance based charge for trucks. At this time the general mood among experts is not 'more research needs to be done' (though of course this will always be essential) but that 'it is time to take action'. The action will, inevitably, have to be adapted for specific countries and locations, whose needs and problems vary widely.

The physical volume of movement (as measured by vehicle, person or tonne kilometres) should not be treated as an objective in its own right, but only insofar as it develops a better quality of life and more efficient economies. In current circumstances, transport is sometimes a 'victim of its own success', with excessive traffic causing environmental damage and economic inefficiency, and undermining the value of infrastructure investment. In these circumstances, managing transport demand is a legitimate and necessary activity of Governments, including transport ministries and also ministries of finance, economics, environment, social policy and development.

Without the management of demand, most transport policy objectives of efficiency and sustainable mobility will be weakened or ineffective. This has been a widely supported view among transport professionals for many years, and the experts feel that the political difficulties, though real, have been exaggerated and should not stand in the way of rapid action. Nevertheless politicians need more effective support from the experts to help them achieve public acceptance.

Demand management requires the use of a wide variety of skills and measures – economic instruments, but also psychological, marketing, educational and cultural influences. Most delegates see this as being assisted by framework legislation at international level, with strong discretionary powers at national and local level to allow important differences in implementation according to context.

It is recognised that many of the main drivers of transport demand are not directly subject to transport policy control: they include technical and scientific development; economic growth and rising incomes; demographic and social trends including ageing and household size; life-style patterns and individual preferences on housing, work and other activities including vehicle ownership and related affective motives; pressures of competition in regulated and unregulated markets; logistical organisation of production and distribution. They are also modified by policy objectives in other areas of Government activity, including taxation, and the spatial arrangement of health, education and other services. Transport policy which ignores these wider concerns is likely to be ineffective.

However, this does *not* imply that transport policy instruments are without impact. Theoretical and empirical evidence, and practical experience, show that prices, speeds, the quality of transport alternatives offered, spatial planning and regulation are powerful instruments which have a large effect on the volume and character of travel, especially in (consistent) combination, and when sustained for long enough to enable people and firms to adjust their behaviour, which takes several years. Research evidence on the effects of transport pricing shows that this is not usually the biggest influence on choices, but is big enough to make a substantial contribution to congestion (for better or worse), because in congested conditions relatively small changes in traffic volumes can have disproportionately large effects on delays. Effects of price changes on fuel consumption tend to be larger, in the long run, than the effects on traffic volumes.

The benefits of managing demand are substantial, but not always believed, and implementation plans must be able to deliver tangible and real benefits ('making things better', not 'slowing down the pace at which they get worse'). Public acceptability is essential, and this can be assisted by careful and honest explanation, a well-understood long-term perspective, good support systems of data and analysis.

## **2. Prices**

Transport pricing is an important concern for Ministries of transport, and also for Ministers of finance and economic development. Evidence shows that the relative and absolute level of transport prices have a significant influence on travel choices and traffic patterns – not usually the biggest single influence, but in most cases enough to create a substantial effect on the characteristics of demand: volume, pattern, timing, location, vehicle design, fleet, utilisation, etc., and of course pricing has consequential effects on revenues. The current price system is badly distorted, with different principles being applied to public and private transport, road, rail and air transport and passenger versus freight transport. The costs that transport users impose on other transport users (such as congestion) and non-users (such as neighbouring communities) and society as a whole (such as effects on health and the environment), are real burdens on the economy as a whole, not imaginary or theoretical. Congestion costs and environmental costs are often large, and when they are not properly reflected in prices, this

causes distorted patterns of movement, and longer term effects on production and distribution, where the indirect costs can be greater than the direct benefits.

Most speakers at the seminar judged that economic efficiency and sustainable growth would be improved, not harmed, by the application of prices in all parts of the transport sector that reflect full marginal costs, including the 'external', or 'social' costs mentioned above. This is not seen as an 'extra burden', but as a means of reducing real, but poorly perceived, present burdens. Lower prices are an illusion if they cause higher costs.

It is recognised that the immediate, simultaneous and complete application of a radical change is impossible: there will need to be an implementation plan over a number of years, though short enough not to lose momentum and the advantages of synergy. This means that it is of the highest priority to get the *sequence* of implementation right, since it can be very damaging if short-term measures, in the wrong order, make things worse before they get better.

Thus to harmonise fuel taxation across Europe, for reasons of competition (outside the transport sector), *before* provision is made to include environmental and congestion costs in specific locations, would be a bad idea: it should be the other way round, allowing local or national authorities to implement contingent prices even before there is 'absolute' unanimity on the precise values of external cost.

Similarly, in locations where the main source of external costs is private car use, implementation of prices affecting these should take precedence over the implementation of social costs on public transport or freight transport, to avoid shifting behaviour in a counter-productive direction. (Similarly, where freight vehicles are the biggest sources of these costs, pricing should focus first on them, etc).

A related question of sequence is the effect that distorted patterns of pricing have on the value for money of infrastructure investment, reducing the relief from congestion provided by new roads or railways, and leading to the design of projects with the wrong capacity, in the wrong places. Since transport infrastructure has a lifetime of many decades, it is essential that such projects are appraised on the basis of the demand patterns that will exist in the future, as a result of more sensible prices, not those which are extrapolated on the assumption of permanently distorted prices. If price decisions are wrong, they can be changed, relatively swiftly, whereas if infrastructure decisions are wrong the effects will last for very long periods. There is currently work on methods of assessing the combined effects of good pricing policies and good investment decisions, and in the longer run this will be a much firmer base for policy appraisal.

Any effective use of pricing as an instrument of policy will involve some prices going up, and others going down, compared with the current distorted situation. This will involve the generation of new revenues in situations where costs are currently not being paid by users. In all such cases it is essential that the use of those revenues is transparent, well understood, and calculated to increase the overall benefit not reduce it. However, judgement about the specific use must allow discretion to take into account local circumstances. In some cases it will involve, for example, spending revenues from charges on car use, on improved public transport. In other cases it may mean using the revenues from the new charges to reduce some existing charges, or to reduce labour costs, or to mitigate environmental damage.

### **3. Speed and Quality of Transport**

Often, changes to the speed and quality of transport have even bigger effects on traffic volumes than price. However, not all of these effects are desirable. In particular, changes to relative speeds in recent years have encouraged a travel pattern of longer average distances, which in the short run does not 'save time' but 'increases choice'. In the longer run, the process has accelerated urban sprawl, the decline of accessibility to local destinations (for example when local facilities close down because of competition with more distant destinations which have not had to pay the full costs of their development).

It is important to recognise that the effectiveness of policy is not only measured by changes in modal split for a given journey pattern: these changes are useful, but sometimes quite small. Changes in the relative quality of different modes of transport have an effect on the whole pattern of travel: a walk trip to a good local destination does not necessarily provide less benefit than a vehicle trip to a more distant destination when the local one has closed: to say 'mobility has increased' in these circumstances is misleading, since accessibility has decreased, which is more important. Similarly consumers enjoy access to a wide variety of goods from distant destinations, but if their prices are artificially cheap due to under-priced transport, this can reduce the viability of local economies and reduce benefits overall.

Quality should be defined in a broad way. Speed is not always the most important component, and assessments sometimes give too much weight to this aspect. Comfort and reliability can be more important. The provision of reliable, safe, clean, secure and healthy transport is an increasing subject of public concern, and policy makers need to focus on these aspects.

### **4. Regulated Planning and Market Developments**

If land use planning proceeds without consideration of prices and transport facilities, well-intentioned policies can be undermined. For example, plans to locate homes and workplaces reasonably close together are intended to reduce average journey distances. But if the relative prices and service quality of public transport and car use encourage journeys by car, with widely scattered origins and destinations, the overall effect may be the opposite of what is intended, and journey distances can increase. However, if the objectives of land-use planning are reinforced by the transport provisions, planning can have rapid and positive effects.

The best results are likely to be those where planning is working with the grain of the market, rather than against it. For example, in many cities there is a spontaneous market-led trend to redevelop central and inner areas, by conversion of existing buildings and new apartments, as popular places where young and rich people want to live. This is a reversal of long-standing trends, and gives great opportunities to develop public transport, walking and cycling, as well as economic regeneration of the city centre.

### **5. Caveats**

Particular stakeholders are always concerned with the specific effect on their constituents, which is natural. Transition economies are often more aware of the immediate advantages of a rapid increase in car ownership than of the costs this imposes on their economies. Freight operators will be concerned if an unintended side effect of current policies is to make freight movement relatively more difficult or more costly than private car leisure traffic, since this would tend to encourage a shift in the

apparent priority of freight traffic and leisure traffic which would not necessarily have economic benefits. Elected politicians need policies whose time scale is compatible with electoral timetables. All decision-makers expecting controversy will want the best possible scientific evidence, and in the nature of science that is sometimes an excuse for extended delays, waiting for the ‘final research project’ which never comes.

## **6. Summary**

‘Demand management’ is sometimes resisted as restrictive or unfair. But professionals and specialists in the transport sector see it as a necessary condition for making economies more effective, reducing environmental damage, and improving the quality of life. There are practical and proven methods of doing it, using pricing, quality, planning, market and political levers. It is important that these levers should all be used in combination, and should be consistent with each other for full effect. Failure to grasp the opportunities for managing demand will undermine the value for money and effectiveness of infrastructure improvement, and lead to increasing congestion and environmental damage.

OECD PUBLICATIONS, 2, rue André-Pascal, 75775 PARIS CEDEX 16  
PRINTED IN FRANCE  
(75 2003 05 1 P) ISBN 92-821-1376-0 – No. 52957 2003