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**EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT  
INTERNATIONAL TRANSPORT FORUM**

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**SOFIA MINISTERIAL MEETING 2007**

**POLICY RESPONSES TO CONGESTION : ADDING CAPACITY**

**Is investment in transport infrastructure a solution to congestion?**

**The scope and limits of investment policy**

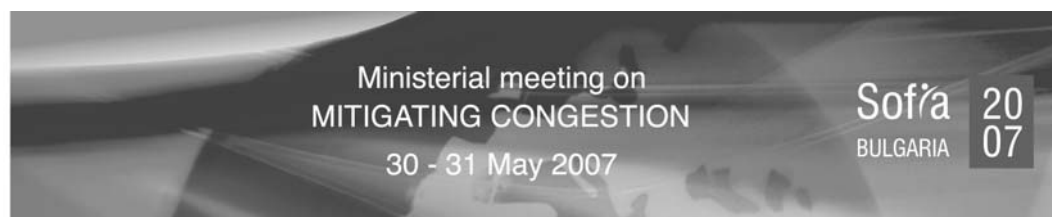
**Reference document for Session 2C**

*This document is submitted as a reference document for the discussion under Session 2C "Adding Capacity" of the Sofia ministerial meeting on 30-31 May 2007. This document is only available on the ECMT website and will not be distributed in Sofia.*

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**English - Or. English**



## **IS INVESTMENT IN TRANSPORT INFRASTRUCTURE A SOLUTION TO CONGESTION?**

### **THE SCOPE AND LIMITS OF POLICY**

#### ***Reference document – Session 2C***

### **GENERAL CONTEXT**

When no more can be done to improve the efficient use of existing infrastructure through better traffic management, more rational use of modes through complementarity or substitution, appropriate pricing or the elimination of administrative or legal obstacles to traffic fluidity, as discussed in sessions 2 A and 2 B, investment in the construction of additional infrastructure capacity is the ultimate response to the challenges of congestion.

There can be no doubt that infrastructure must play a key role in alleviating congestion and improving efficiency. However, this role is far from uncomplicated.

The supply of infrastructure is clearly important. Infrastructure that is insufficient or inadequate will lead to greater congestion. However, the equation does not stop there.

Increasing the supply of infrastructure does not augment the efficiency of transport, only the amount of transport that can occur based on existing practices. Also, traffic has been shown to increase to meet new infrastructure supply, meaning that new investments alone will not address congestion in a sustainable manner.

In supplying infrastructure, governments must work to avoid unduly favouring any mode over others without concrete policy justification for doing so. For the sake of efficiency, they should also seek to facilitate competition both within and between the modes.

Space and environmental considerations obviously also mean that the potential to build new infrastructure to meet ongoing demand is finite.

Furthermore, governments' capacity to fund infrastructure is inherently limited based on existing resources, especially in light of competition from other public policy priorities.

This means that all infrastructure needs are not likely to be met, and investments must be made in a manner that provides the greatest benefits to the greatest number of citizens.

Historical studies of investment in transport infrastructure generally show that, although some countries constitute an exception, investment tends to fall over time as a proportion of GDP during the 1990s, as does expenditure on maintenance (see CEMT statistics and Annex 1). When congestion is so obvious, this finding proves that investment in transport infrastructure raises a whole set of difficult problems which prevent projects from being carried out and need to be addressed at a political level. These problems include:

- choosing projects and setting priorities;
- funding investment;
- addressing environment and equity issues;
- implementing investment projects.

## **1. Choosing projects and setting priorities**

### **1.1. *Questions for the decision-taker***

When new infrastructure is needed to solve congestion problems, politicians have to make a number of choices and reply to the following questions:

- Should money be spent on new infrastructure or on maintaining, repairing and improving existing infrastructure? If the quality of the existing network deteriorates, it affects the quality of the service provided. This in turn imposes additional costs on users in the form of delays or accidents. Thus, the savings made by the infrastructure manager are counteracted by extra costs borne by users. In addition, when running repairs no longer suffice and major investment is needed, the savings made by delaying maintenance generate substantial extra costs.
- On what scale should future infrastructure be built? An oversized investment causes an economic loss. A certain degree of congestion is inevitable and even economically desirable, as CEMT Round Table 110 showed in 1998. A reference situation based on an empty road is pointless; it is more appropriate to establish an optimum level of congestion, for otherwise estimates of the cost of congestion (especially the famous 2-3% of GDP put forward by the European Commission) are greatly exaggerated. Optimum use is not easy to define. Congestion in many countries is an urban phenomenon and is only seen on a limited number of occasions in a few black spots at certain times of day or year.

- When investment is needed to solve congestion associated with a particular piece of infrastructure, which transport mode should it focus on? More roads are not necessarily the answer to road congestion. How can very different types of project be compared, especially when different criteria of indivisibility and critical size apply to different modes?
- How should priorities be set between all the possible investments, bearing in mind the financial constraints? How should the best use of public money be decided when investment in transport is in direct competition with other types of public spending? The main problem facing decision-takers is not so much that of projects with low socio-economic profitability, which should in any case be avoided, as that of projects with high socio-economic profitability but low financial profitability, which require a substantial injection of public money. How can a situation be avoided in which the project with the greatest discounted benefit will soak up most of the available public resources, thus squeezing out many projects which may be smaller in size but also require less public funding?

## **1.2. Decision support**

The first step to take when considering these questions is to **determine the advantages and drawbacks** of the planned investment. The criterion which should guide a public decision-taker, concerned for the general interest of the nation, is the social profitability rate, which links the total amount of the investment to the discounted net social benefit. To assess the utility of an investment in infrastructure, all the resulting advantages and all the costs involved must be taken into consideration.

One advantage is **faster and freer-flowing traffic**, i.e., the direct effect on congestion. This saves time, which is easily the most decisive factor in economic assessments of investment projects. But the time saved is extremely difficult to quantify, being based inter alia on an estimate of the value of time. For example, the values used for passenger transport in France in 2006 are approximately €7 per hour saved for personal journeys and €14 for work-related journeys. The figure varies according to the distance covered, initially rising before levelling off at around 400 kilometres. For each tonne of goods transported, an hour saved is worth €0.55 for road journeys and €0.19 for rail journeys. The value of time determined in this way has a major impact on a project's socio-economic profitability even though it makes use of many estimates and assumptions that are contentious by nature. Assessments of time saved must also take account of the new traffic generated by new infrastructure. The conclusions of Britain's Standing Advisory Committee for Trunk Road Assessment (SACTRA), as presented in a report prepared for CEMT by P.B.Goodwin, were that in the UK on average a medium-scale project could generate around 10% more traffic in the short term and 22% in the longer term, with a short-term bracket of 0-20% and a long-term bracket of 0-40%. Congestion of existing infrastructure, which is one of the main motives for investing in new infrastructure, is often treated as a cost and included in environmental costs. This approach is probably wrong, since congestion is first and foremost a variable on which the economic utility of a project depends.

The other advantages associated with new infrastructure derive from **easier access** to further afield for work or leisure. They are compounded by the overall effects on **economic growth**, since both quantitative and qualitative studies leave little doubt about the link between transport infrastructure and long-term economic growth, even if the relationship is a complex one and cannot be reduced to a direct chain of cause and effect between the amount of infrastructure and an economy's potential for growth. The question whether transport infrastructure contributes much or little to growth is probably not well put. There are simply too many factors at work. Some infrastructure contributes greatly to growth, other infrastructure contributes little. The question is not whether more or less infrastructure is needed, but which.

As far as costs are concerned, apart from a project's direct financial cost, consideration must be given to the **nuisance** directly attributable to the infrastructure or generated by the traffic using it, such as noise, pollution, greenhouse gases, cut-off effects, damage to the landscape, etc., which pose formidable problems of assessment, and more broadly all the **external effects** (which may also be advantages).

Politicians can use a generally recognised tool when comparing costs and advantages: **cost-benefit studies**, which would doubtless gain from being used more systematically when public choices are made. These studies may be used to establish discounted benefit to investment ratios and ratios of net value per unit of subsidy which can be extremely helpful to political decision-takers facing all the choices mentioned above.

Unfortunately, economic calculations have relatively little influence on political decisions, which are taken much more on the basis of redistribution factors, especially spatial redistribution, that are difficult to measure. It is true that cost-benefit studies raise methodological issues such as the geographical scope used to assess the impact of transport infrastructure (continent, country, region, city, countryside), calculation of the value of time, evaluation of nuisance and external effects, the opportunity cost of public funds and the choice of reference assumptions. It is also true than in the past such studies have displayed a certain tendency to underestimate costs and overestimate benefits (see for example the work of Prof. Bent Flyvberg), as a result of which countries like the UK have introduced systematic procedures to correct estimation errors.

Whatever solutions may be found to remedy the shortcomings of cost-benefit studies, politicians never take decisions on the basis of economic efficiency alone. They are at least equally, if not exclusively, attached to fairness. How can the two be reconciled? How can the economic calculation be given its rightful place and how can the notion of fairness be made relevant? That is the biggest challenge to be faced when supporting policy decisions about investment in infrastructure capacity. No doubt an exchange of experience on the subject could furnish a number of guidelines.

## **2. Funding investment and the role of PPP**

### **2.1. *The role of the private sector***

Private sector involvement in transport infrastructure has four potential economic advantages.

- If the private sector is consulted on a decision whether or not to build infrastructure, and assuming that it will have to pay the price for a wrong decision, it would be reasonable to expect higher quality traffic and cost projections.
- It would reduce the cost of building and managing infrastructure (some studies put the comparative advantage of the private sector at 15-20%).
- User charging, which is generally the quid pro quo for private sector involvement, reduces the opportunity cost of public capital (by an estimated 20-30%), inter alia by limiting the loss of activity due to adverse tax effects.
- In many cases, private sector involvement introduces helpful competition.

There are three drawbacks associated with private sector involvement.

- Charging may reduce well-being by crowding out some potential users, though experience has shown that crowding-out effects attributable to charging are not as great as may be thought intuitively.
- Charging introduces discrimination on the basis of wealth, which may be regarded as socially reprehensible.
- The greater the role of the private sector, the greater the need for regulation and supervision, which are difficult to implement. A regulator has to be established, objectives must be set, the means to achieve them must be provided and the regulator itself has to be overseen.

The outcomes of the various models for assessing these advantages and drawbacks are unambiguously very favourable to private sector involvement.

However, it should not be supposed that greater private sector involvement will solve all the problems. Public-private partnership is not a magic wand that will make an uneconomic project profitable. When the nature of a project means that a private entity will never be able to charge tolls and recover its investment (not least because tolls would put off too many potential users), the private sector will not get involved unless the authorities guarantee repayment of the initial investment and management costs. If toll revenues are insufficient, the only thing the private sector can do is lend money to the public sector, just as a bank would.

## **2.2. Possible financing models**

Ultimately, there are but two sources of funding for infrastructure – the user and the tax payer, the latter including future tax payers where infrastructure is financed by borrowing. User charging has an essential role to play in reducing demand and increasing efficiency, as well as in contributing to the development and maintenance of infrastructure. Thus, the choice of which blend of user charging and direct government subsidy to employ has important implications for how the infrastructure is used and the financing mechanisms that can be employed.

Innovative financing is most often associated with public-private partnerships (PPPs). There are many examples around the world where PPP projects have resulted in spectacular feats of engineering.

However, analysis shows that most land transport infrastructure is not provided by way of PPPs in most countries. Indeed, PPPs are perhaps best suited to discrete and limited pieces of infrastructure with relatively clear demand projections and revenue streams, including bridges and tunnels, and tracks of motorway. This, of course leaves government with the need to finance the rest of the system.

Beyond PPPs, other options are also available to government, including full privatization, as practiced in North American railways. Privatization in any aspect of transport infrastructure usually involves relatively mature assets, which have been developed over time with extensive involvement by government. State-owned companies are also a possibility; these predominate in rail in many parts of the world, and examples also exist for motorway financing, such as Austria's ASFINAG. Finally, private, not-for-dividend entities, like the UK's Network Rail, could also be considered. Outside of innovative corporate structures, the US has also pioneered new financing instruments to leverage public sector grants in order to access financing from capital markets, including state investment banks and private activity bonds.

The scope of innovative options available to any country will be highly conditioned by the circumstances surrounding the infrastructure to be built or maintained, and considerations of local legal traditions, politics and practice. For example, the extent to which users pay directly for the infrastructure will play an important role in determining the model employed. Other factors include the technical complexity and costs of the project, expected demand, competition with other infrastructure, etc. Modal factors are also key – motorways and railways are very different in terms of how they are used and paid for. Where rail is concerned, financing options will be influenced by the extent of vertical separation, and whether emphasis is placed more on freight or on passenger transport. Notably, PPPs are rare in rail, with exceptions including limited service, such as airport-city links, or the Channel Tunnel.

It should be noted that innovative financing is not without cost. By definition, PPPs involve a sharing of risks, and any assumption of risk by private parties must be compensated. Furthermore, private borrowing is typically more expensive than public borrowing. Innovative financing mechanisms do not create new sources of funds beyond users and taxpayers, although they provide greater flexibility where borrowing and

charging are concerned, and may allow existing funds to be employed more efficiently, including by way of more effective management practices and innovation.

There is also a political cost, in that any delegation of responsibility over aspects of infrastructure is accompanied by a commensurate divestiture of control, meaning that governments are less able to employ assets for achieving public policy aims. Also, innovative financing mechanisms do not involve a complete cessation of government responsibility, but rather a transformation of the public role.

Any financing mechanism must achieve all of the policy objectives associated with the infrastructure in question. These may include, *inter alia*, facilitating mobility, ensuring safety, minimizing environmental risk, enhancing efficiency in the use of transport, fomenting regional development, providing access to transport to the disadvantaged, etc. Such policy objectives are a fundamental element of the context in which the financing model is designed and may place limits on commercial viability. For example, pricing policies intended to maximize the social value of infrastructure may conflict with financial objectives. Infrastructure providers will expect to be compensated for providing services that are not strictly commercial, or for any limitation on their ability to extract revenues.

Ultimately, the justification for the choice of any financing model over another should be that it results in some combination of greater benefits and/or lower costs to society over the life-cycle of the infrastructure in question, with regard to achieving all of the policy objectives associated with it.

### **2.3. Conditions for success**

Over the last twenty years a variety of approaches have been deployed to utilise project based private financing in the development of transport systems in both developed and developing economies. The evidence record suggests that such techniques can be highly effective in securing the on-time, to-cost delivery of new assets and enhancements where sufficient project scale, clear risk allocation between public clients and private providers and innovative financing techniques have been combined to best effect.

Careful project selection and preparation with a focus on long term affordability and obtaining the best value from different options is necessary if such techniques are to yield superior outcomes compared to more traditional financing and delivery methods. However, by incentivising the private sector to deliver and linking private profit to the performance of assets over the long term (typically up to thirty years or more), the track record suggests that investment can be accelerated on an efficient basis and transport networks can be enhanced.

Notwithstanding this, the use of PPPs to finance inland transport infrastructure has been relatively limited in most countries, constrained by various obstacles as follows which have to be eliminated in order to facilitate the development of innovative financing in the future:

- an absence of charging mechanisms that allow for debt repayment obligations to be definitively transferred from public to private sector balance sheets;
- under-developed banking and debt capital markets setting risks at levels that undermine the relative value for money obtainable through private as opposed to government project delivery;
- limitations on the resources and expertise available to public agencies to pursue necessarily more complex and non-traditional procurement, often requiring facilitating legislative and regulatory changes.

Against this background it is interesting to note that the current period has seen:

- extension of PPP project structures from roads, bridges and tunnels to a greater number of rail and light rail investments;
- the successful introduction of direct charging systems and tolling innovations in a number of jurisdictions and a variety of situations, from heavy vehicle charging across substantial networks, to more general user systems associated with new arterial roads, to urban area zonal charging;
- the emergence of infrastructure investment as a global asset class of increased significance for pensions and savings institutions, comparable to commercial property investment and within which transport assets are a highly favoured subset.

This later factor is likely to have a number of important implications for policy, including:

- establishment of a potential basis for more robust risk transfer to private sector entities seeking access to assets;
- growth in the number of cross border entities both owning transport assets and operating them over the long term.

While the potential exists to significantly extend governments' use of private financing techniques linked to user charging in the future, this implies a progressive shift of emphasis of government activity from infrastructure provider to that of customer or regulator. Are policy makers ready to accept this change of role?

### **3. Environmental constraints**

The **environmental effects of infrastructure** can be included to a certain extent in the cost-benefit analysis of a project. The most important factor, however, is to have effective consultation and planning procedures. As various CEMT studies have shown, an optimum framework for strategic planning should include a strategic environmental assessment covering all transport on the basis of a multimodal analysis; well-established

guidelines for such an approach now exist. This type of assessment should therefore be carried out systematically before any money is spent on solving congestion problems by increasing capacity.

The problem of **atmospheric pollution** caused by **traffic attracted by the new infrastructure** has been broadly settled at technical level. Vehicles have become cleaner and this trend will continue with the implementation of new more restrictive EURO standards and the replacement of vehicles in circulation by cleaner vehicles. It should however be noted that the increase in the total number of vehicles in circulation reduces the real effect of the progress due to technical improvements in the design of each vehicle.

The problem of **greenhouse gases** is much more worrying (transport accounts for over a quarter of such gases) and emissions must unquestionably be restricted. Some have argued that a massive transfer of resources to public transport or the railways would be the optimum response, especially by systematically giving preference to those modes when investment in infrastructure is necessary to cope with congestion. This was the stance of the European Commission White Paper published in 2001.

Such an approach is a step in the right direction. Switching to more ecological modes of transport however requires substantial financial resources and raises the question of the alternative use of these funds, which may then starve further research, for example, into ways of combating the greenhouse effect. More fundamental and applied research and innovation in products and processes are needed if emissions of greenhouse gases are to be reduced and absorption levels increased. Excessive public investment to promote modal switching could deprive governments of the scope they need to encourage technological progress in environmental matters.

Such considerations are not intended to call into question policies that seek to solve congestion through better use of different transport modes and appropriate investment. They merely point out that such policies cost too much to be generally applicable. They are doubtless appropriate in certain cases (in specific zones, for example), and political experience should help to determine when and where.

#### **4. Implementing investment projects**

There are many difficulties in implementing investment projects once they have been decided. These difficulties, described below, make it problematical to use investment as a means of solving congestion problems.

##### **4.1. Lengthy planning and implementation procedures**

Infrastructure projects often take a very long time. As well as increasing their cost and reducing private sector interest, this can mean that infrastructure responses to the congestion problems they are supposed to solve come too late or are unsuitable. In addition, lengthy procedures may make investment in infrastructure less attractive to

politicians, since the person who takes the decision will rarely be the one who inaugurates the infrastructure and reaps the benefit. This is one of the peculiar features of the economic calculation when applied to transport: the fact that infrastructure currently under consideration will not be ready for use for at least ten years and will have a lifetime of 50 or 60 years means that long-term factors are particularly important in assessments, thus making them all the more open to argument. For all these reasons, exchanging information about experiences and about ways of streamlining the planning and implementation of investment in transport infrastructure could help to make them a more effective response to congestion.

#### **4.2. Lack of international coordination**

The pursuit of efficiency and reduction of congestion does not stop at any border. International co-operation on the provision of infrastructure could increase effectiveness in this area, although governments are limited by the need to promote their own countries' international competitiveness. Lack of international consultation on investment projects could have a number of undesirable consequences.

- **Disparities** may exist between countries because national or regional authorities have different priorities, resulting in bottlenecks that create congestion (there have been cases where a motorway on one side of a border continues as a single-lane road on the other side). This lack of consultation is particularly apparent in scheduling differences for cross-border projects, which again can generate congestion. Leaving aside administrative or legal obstacles (connected with controls at border crossing-points), the possible border effect on traffic clearance greatly complicates investment in infrastructure designed to facilitate clearance.
- **Cross-border infrastructure projects may be given insufficient priority**, resulting in congestion near borders which may be compounded by inadequate maintenance for the same reasons. Cost-benefit studies for such projects must take account of all the costs and benefits on both sides of the border and not only in the country where the investment is made.
- **Overlapping and over-investment** may occur when rival projects are carried out simultaneously in neighbouring countries, resulting in costly overcapacity. The risk exists for alternative ground transport routes but is most apparent at seaports, where congestion can cause neighbouring countries to invest very substantial amounts of money in ports situated within the same range. The investment needed to accommodate the latest container ships is one example. The discussions on the choice of ports and airports along pan-European corridors are a perfect illustration of the risk, generating a very large number of competing projects.

## ANNEX 1

### IS CONGESTION THE RESULT OF INADEQUATE INVESTMENT?

Until now, the reports on growth in investment in transport infrastructure published by the ECMT have repeatedly drawn governments' attention to the **worrying trends** observed in this area.

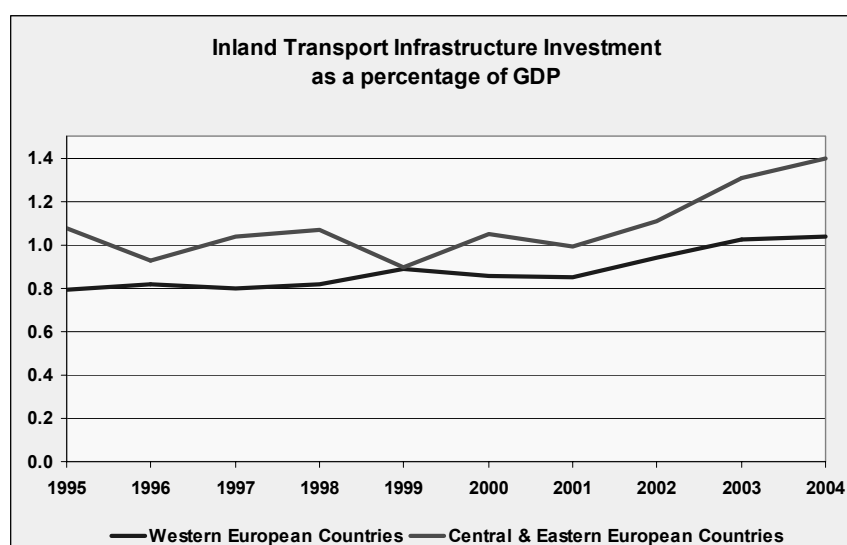
Given these developments, the conclusions set out in the last report submitted to the Council of Ministers in 2004 with regard to the period 1990-2000 were as follows:

- Overall investment in inland transport infrastructure declined during the 1990s in the long-standing ECMT Member countries in Western Europe. Investment transport infrastructure in those countries grew strongly towards the end of the 1980s and during the first two years of the next decade, but by the end of the 1990s had declined by 10%. While overall investment in Central and Eastern European Countries (CEECs) increased, there were marked differences between individual countries, with strong volatility over time.
- This trend is borne out by growth in the share of GDP devoted to investment in transport infrastructure. In Western European countries, the share of GDP accounted for by such investment fell to around 0.8% by the end of the 1990s (1.5% in 1975, 1% in 1985). In the CEECs, rising levels of investment reflect efforts to catch up in the accumulation of the transport capital stock. The share of GDP devoted to inland transport infrastructure rose to around 1% in 2000, although this figure only corresponds to the minimum level targeted by the ECMT Council of Ministers in Berlin in 1997 for the upgrading of transport infrastructure in those countries. Trends in the breakdown of investment between different modes in the long-standing ECMT Member countries differ sharply to those in the Central and Eastern European Countries that acceded to the Conference in the early 1990s. In Western Europe, the breakdown of annual infrastructure investment between, different modes failed to keep pace with changes in the modal split for transport demand. In these countries, the share of investment in road infrastructure fell from over 70% in 1990 to 66% in 2000 despite an increase from 71% to 77% in the modal share of road transport in tonne-kilometres over the same period. In the CEECs, on the other hand, strong growth in road traffic (53% of the freight market in 2000 compared with 31% in 1990 and 47% in 1995) was accompanied by a sharp increase in investment in road infrastructure whose relative share grew significantly at the expense of rail, rising from 66% in 1995 to 77% in 2000.

The latest ECMT statistical survey of the period 1995-2005 is still incomplete and, as a result, its findings are not entirely comparable to those of the previous survey in that the

field of countries covered is significantly different. The trends that emerge from this survey are nonetheless extremely interesting and reveal some **significant trend changes**.

- In Western European countries, the decline in investment that had characterised the 1990s appears to have come to a halt. From 2000 to 2005, investment in inland transport infrastructure in those countries has in fact increased on average by over 20% in real terms, with particularly strong growth in Sweden, Ireland and Spain. This trend is confirmed by the share of investment in GDP which rose from 0.8% in 1995 to 1.0% in 2004.
- In Central and Eastern European countries, growth in investment has accelerated strongly since 2002, rising by almost 60% in three years. As a result of this growth, the share of investment in inland transport infrastructure, which until 2001 had stagnated at around 1%, rose sharply to 1.4% in 2004, the best result ever reported by these countries since 1990. There can be no doubt that aid from the European Union as part of the accession process for most of these countries has played a major part in this development.



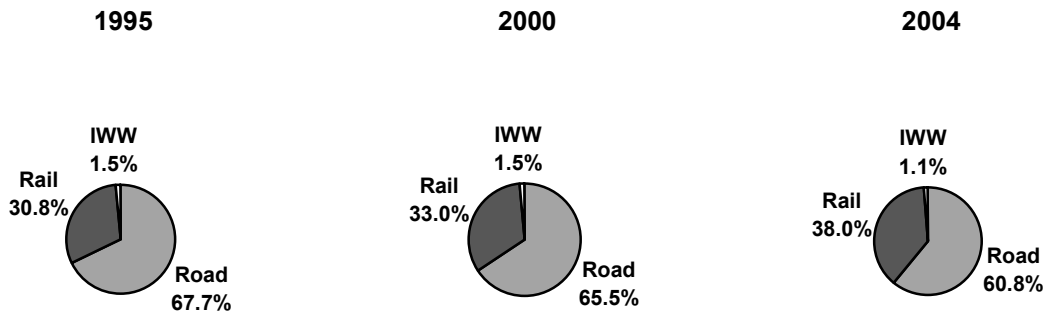
WEC: AUT, DNK, ESP, FIN, FRA, GBR, DEU, IRL, ITA, SWE  
CEEC'S: CZE, HRV, LTU, LVA, MKD, POL, ROM, SVK, SVN

- In contrast, the trends previously noted in the modal split for investment have remained unchanged in recent years. In Western European countries, the relative share of investment in road infrastructure compared with that in rail infrastructure has continued to decline and in 2004 amounted to no more than 61% of total investment in inland transport infrastructure. In Central and Eastern European countries, the relative share of investment in rail infrastructure has declined even further in recent years, falling to less than

16% of total investment in inland transport infrastructure in 2004, whereas investment in the road sector in that year amounted to over 81% of total infrastructure investment.

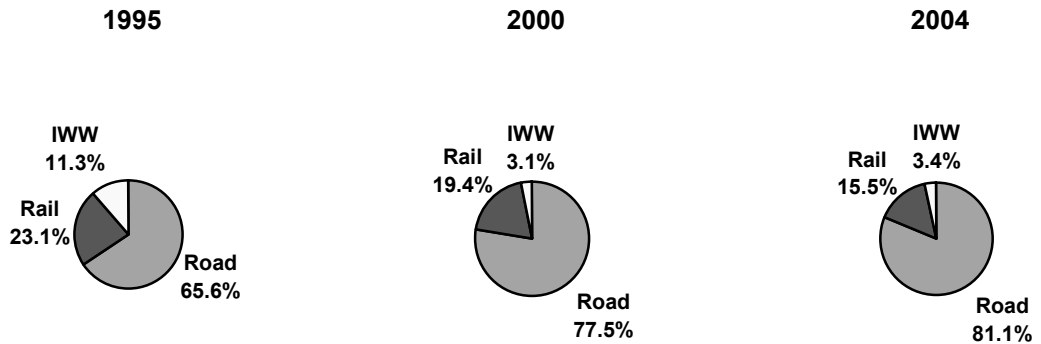
### Inland transport investment modal split

#### Western European Countries



WEC : AUT, DNK, ESP, FIN, FRA, GBR, DEU, IRL, ITA, SWE

#### Central and Eastern European Countries



CEEC'S: CZE, HRV, LTU, LVA, MKD, POL, ROM, SVK, SVN