

Unclassified

ECO/WKP(2010)60

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

06-Oct-2010

English - Or. English

ECONOMICS DEPARTMENT

ECO/WKP(2010)60
Unclassified

HOW THE TRANSPORT SYSTEM CAN CONTRIBUTE TO BETTER ECONOMIC AND ENVIRONMENTAL OUTCOMES IN THE NETHERLANDS

ECONOMICS DEPARTMENT WORKING PAPER N°804

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JT03289672

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ABSTRACT / RÉSUMÉ

How the transport system can contribute to better economic and environmental outcomes in the Netherlands

Congestion has become a burden for the Dutch economy. Commuters and businesses are suffering from the time lost in traffic and the unreliability of travel time. Expanding infrastructure can potentially solve such problems, albeit only in the long term and at a high cost. Thus short to medium-term solutions will have to be oriented at improvements in the use of existing infrastructure, more efficient public transport and better demand management. In this light the Dutch government proposed an innovative country-wide road pricing scheme. This scheme aims to make users pay for road usage and could bring about significant benefits in terms of lower congestion and less pollution. The full benefits of road pricing can be reaped by adjusting the prices to encourage more efficient economic and environmental outcomes. If the implementation of a fully-fledged road price system is delayed or aborted, the government should rely on alternative measures such as fuel taxation and congestion charges to obtain similar outcomes. Reforms to the transport system, including public transport, together with a more flexible housing market should reduce the economic and environmental burden of transport, thereby improving prospects for sustainable long-term growth.

This Working Paper relates to the 2010 OECD Economic Survey of the Netherlands (www.oecd.org/eco/surveys/netherlands).

JEL classification: H54, R41, R42, R48, J61.

Keywords: transport, congestion, road pricing, infrastructure, public transport, labour mobility, environment.

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Comment le système de transport peut contribuer à de meilleurs résultats économiques et environnementaux aux Pays-Bas

La congestion est devenue une charge pour l'économie néerlandaise. Les migrants alternants et les entreprises pâtissent des pertes de temps que les transports leur occasionnent et de l'imprévisibilité de la durée des déplacements. Un renforcement des infrastructures peut résoudre le problème, mais seulement dans le long terme et à grands frais. A moyen ou court terme, la solution doit donc être recherchée dans la rationalisation de l'utilisation de l'infrastructure existante, l'amélioration des transports publics et l'amélioration de la gestion de la demande. Dans cette optique, le gouvernement néerlandais a proposé d'instaurer un système national novateur de tarification routière qui oblige les usagers à payer pour l'usage qu'ils font des infrastructures routières et qui pourrait être source d'avantages appréciables en termes de réduction de la congestion et de la pollution. L'ajustement des prix permettra de maximiser les retombées économiques et environnementales de la tarification routière. Si la mise en œuvre d'un système complet de tarification routière est retardée ou empêchée, l'État devra faire appel à d'autres mesures telles que les taxes sur le carburant ou les péages de congestion pour arriver à des résultats comparables. Les réformes du système de transport, notamment des transports publics, de même qu'un marché du logement plus flexible, devraient réduire la charge que les transports font peser sur l'économie et l'environnement et améliorer, ainsi, les perspectives de croissance durable à long terme.

Ce document de travail se rapporte à l'Étude économique des Pays-Bas de 2010 (www.oecd.org/eco/surveys/netherlands).

Classification JEL : H54, R41, R42, R48, J61.

Mots clés : transport, congestion, tarification des routes, infrastructures, transports publics, mobilité des travailleurs, environnement.

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HOW THE TRANSPORT SYSTEM CAN CONTRIBUTE TO BETTER ECONOMIC AND ENVIRONMENTAL OUTCOMES IN THE NETHERLANDS

By Tomasz Koźluk¹

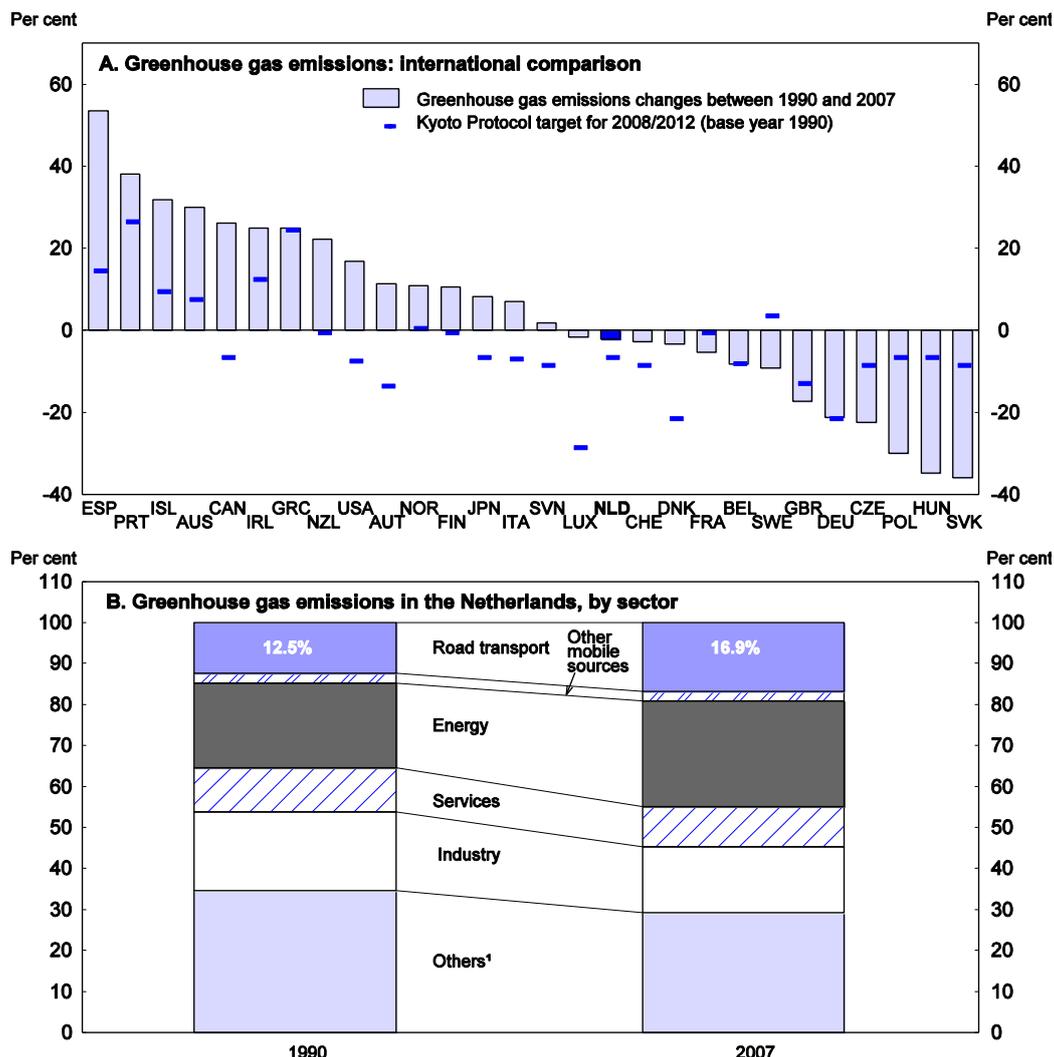
Transport has a fundamental role to play because of the way it impacts on all aspects of the economy, in particular on labour mobility and the environment. Geographical labour mobility is the outcome of location and commuting decisions. In the Netherlands, a rigid housing market poses a barrier for individuals to move closer to their work place (OECD, 2010). Given the relatively small size of the country, the large amount of commuting is leading to high congestion. Despite a dense road (and in particular motorway) network, the transportation system is often clogged during rush hours, leading to lower productivity and negative environmental outcomes. This paper provides an overview of the main transport issues in the context of facilitating labour mobility and meeting environmental objectives. It starts with an overview of the Dutch transport system, providing background for the current situation. Next, it provides insights on how to improve the provision of infrastructure and assure its more efficient use while minimising the environmental externalities. The issues discussed concern: streamlining investment planning and making it more responsive to demand; managing demand through road pricing and congestion charges; and improvements in public transport. A concluding box summarises the main policy recommendations.

The expansion of transport has led to environmental costs and congestion

The increase in mobility and the associated rapid expansion of transport have burdened the environment and increased congestion in the Netherlands. The Kyoto Protocol emission targets stipulate a reduction of Dutch CO₂ emissions in 2008-2012 by 6% relative to 1990 benchmark (Figure 1, Panel A). By 2008, only half of the reduction had materialised. Achieving the Kyoto objectives is expected to be aided by measures such as Dutch capital investments abroad and transactions on the EU Emission Trading Scheme (EEA, 2009). While overall emissions have been relatively stable over the past two decades, the share of emissions from road transport has been increasing, from below 13% to 17% (Figure 1, Panel B). Hence containing emission growth in transport will be particularly important for meeting future abatement objectives.

1. Tomasz Koźluk is an Economist on the Belgium and the Netherlands desk in the Economics Department of the OECD. This Working Paper is based on Chapter 3 of the OECD's 2010 Economic Survey of the Netherlands which was prepared under the responsibility of the Economic and Development Review Committee. The author is grateful for the valuable comments received from Jens Høj, Andrew Dean, Bob Ford, Pierre Beynet and other colleagues in the Economics Department. He would also like to thank Stephen Perkins and Kurt Van Dender from the International Transport Forum, Nils-Axel Braathen from the Environmental directorate at the OECD and Jan Persson from the Norwegian Ministry of Finance. Special thanks go to Sylvie Foucher-Hantala for statistical assistance and Maartje Michelson and Sylvie Ricordeau for secretarial assistance.

Figure 1. Greenhouse gas emissions



1. Includes agriculture, refineries, households, trade, services and government sectors.

Source: United Nations Framework Convention on Climate Change (2009), "National Greenhouse Gas Inventory Data for the period 1990-2007", and Statistics Netherlands.

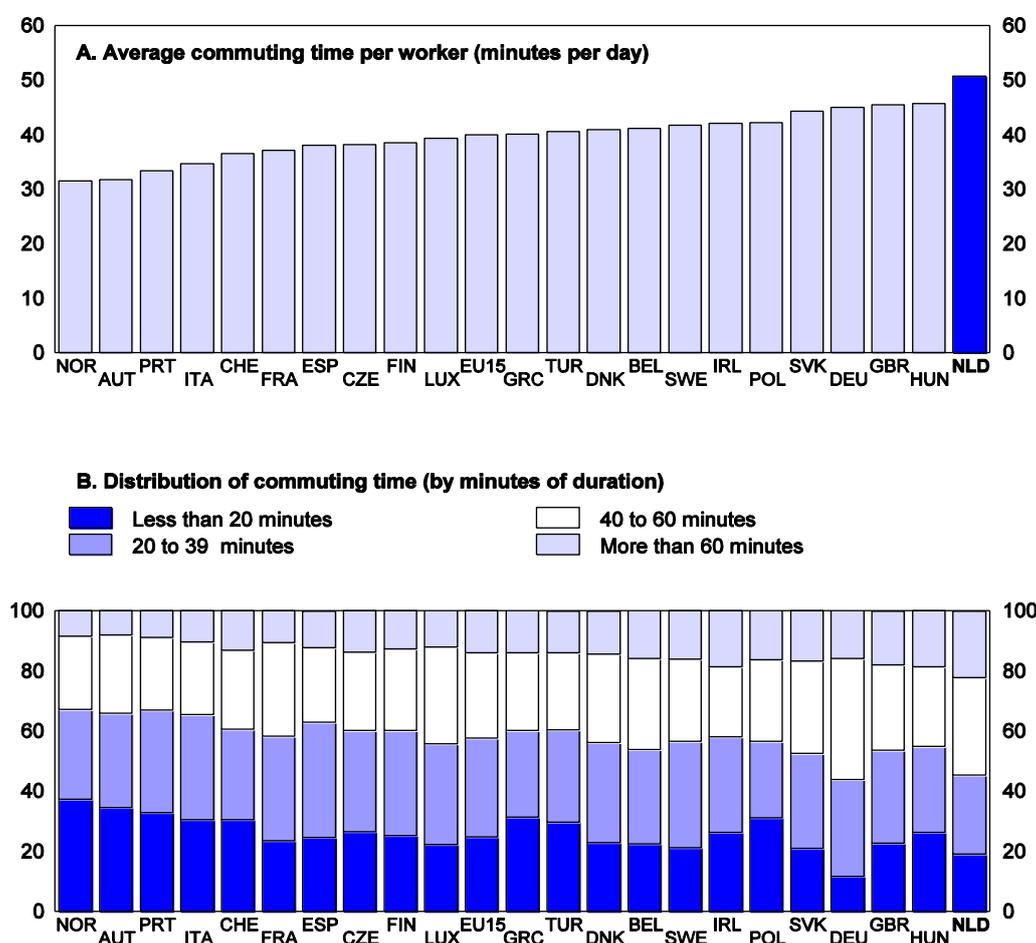
The transport system has not coped with the increase in travel

Congestion in the Netherlands results largely from the fact that over the last 20 years or so commuting by car has doubled and the average commuting distance has increased by 45%. Traffic jams have become frequent, typically occurring on motorways in rush hours and often exceeding 10% of the entire network. As a result, at 51 minutes on average per working day, Dutch workers spend more time commuting than workers in other European countries (Figure 2). The share of commuters who spend more than one hour commuting is also the highest in Europe. While there are many potential explanations (*e.g.* differences in commuting distances, labour force, urban patterns, habits, and a rigid housing market), the amount of time spent commuting is striking given the relatively small geographical distances in the country.²

2. According to the Ministry of Transport, while the travel time and number of trips per person have remained roughly unchanged over the past 25 years, the average distance travelled in all modes increased by 25% (KiM, 2009a).

Figure 2. **Commuting times are longer than in other countries**

2003

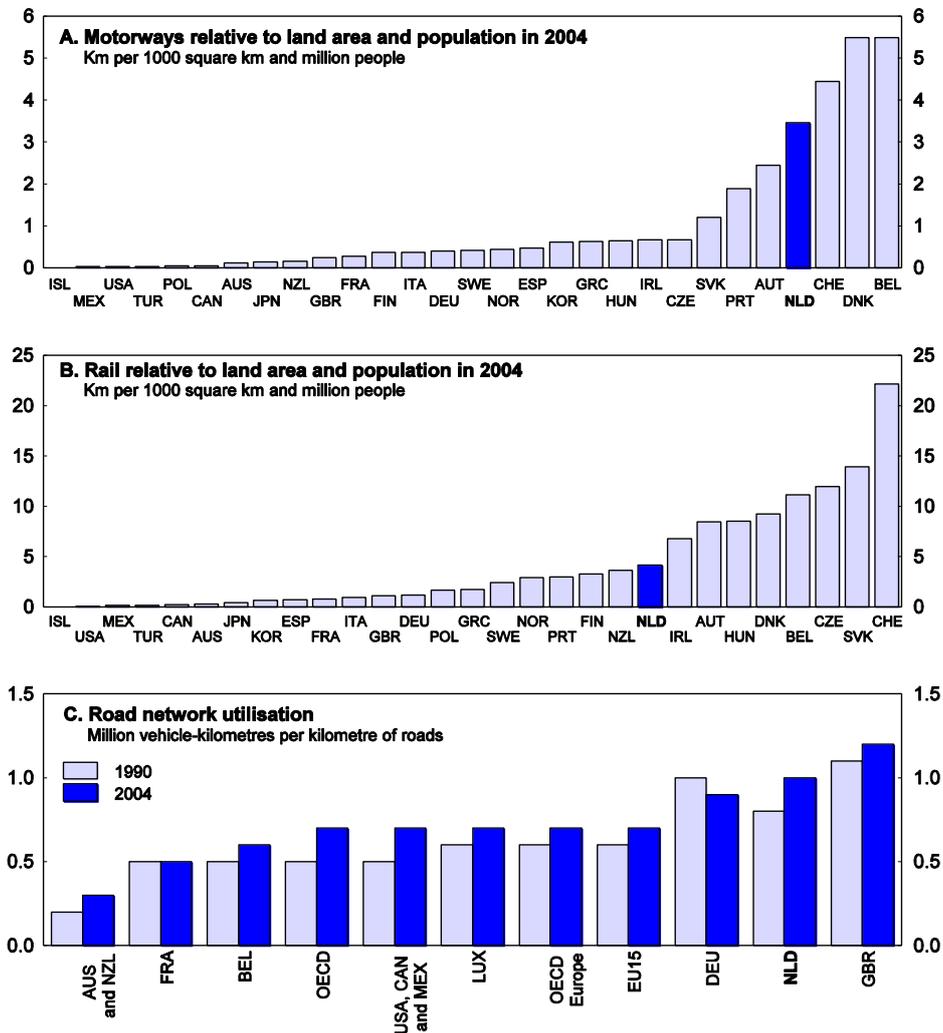


Source: European Working Conditions Survey (2005).

Overall, passenger road transport (passenger-kilometres) has increased fivefold since the 1960s, in line with economic activity. Relative to 1985, car use has increased by more than a half and freight transport has almost doubled (Box 1). At the same time, the length of roads only increased by 20% (by 18% for motorways). The increased car use in the past two decades reflects the growth of the average home-to-work distance (the relocation of commuters and employment to outside city centres), the higher frequency of commuting trips (due to higher labour force participation, in particular of females) and population growth (KiM, 2009a).³ So despite the high density, road and motorway networks are among the most heavily utilised in the OECD (Figure 3). Most of the road traffic is by far due to passenger cars (78%), compared with delivery vans (14%) and lorries (5%). Half of all traffic is on motorways, and the majority is in the densely populated Randstad area, where motorway use is significantly higher than in other multi-city metropolitan areas such as the Ruhr or the Flemish Diamond (OECD, 2007).

3. There are somewhat fewer vehicles per capita in the Netherlands than on average in the EU-15 (about 7.5 million passenger cars and 1.1 million commercial vehicles for a population of 16.5 million), but the stock of vehicles has been growing faster over the past decade.

Figure 3. Transport network characteristics

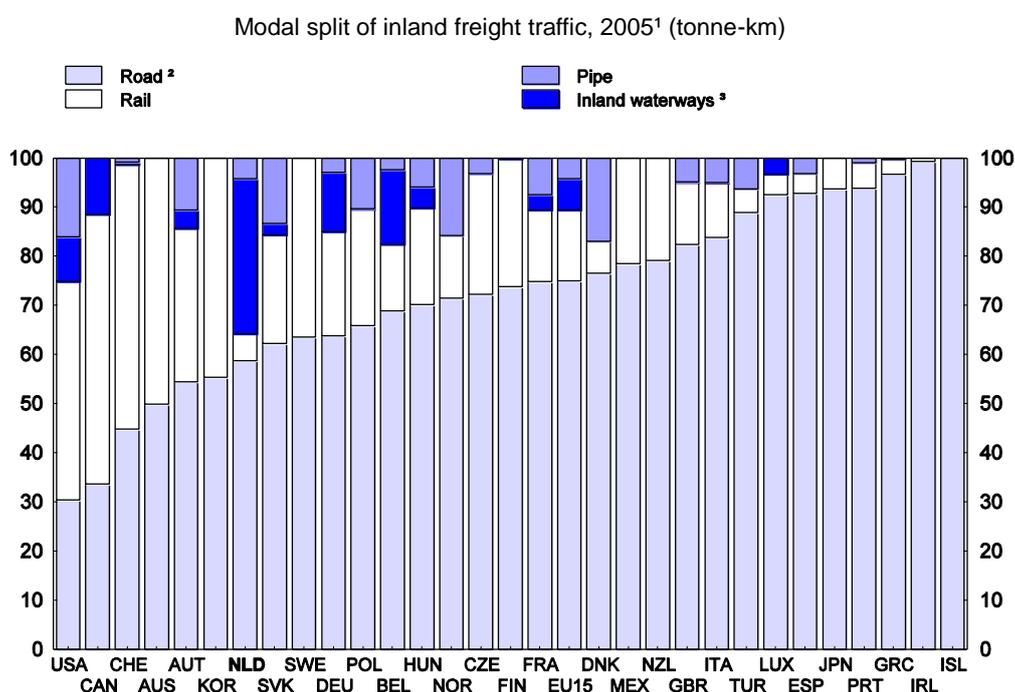


Source: OECD Environmental Statistical Compendium, Eurostat, International Transport Forum.

Box 1. Freight transport patterns

The importance of the transport sector for the Dutch economy is in line with the OECD average, both in terms of employment (7% of the non-financial sector) and share of value added (8% of the non-financial sector). Roughly half of the employment occurs in land transport, where a third of value added is generated and a quarter (both of employment and value added) is in services associated with transport. Such classification does not include the provision of transport services in specific industries (e.g. does not reflect the provision of in-house transport services in other sectors such as construction and retail), so the real importance of the transport sector can be significantly higher. Over the past two decades, road freight in the Netherlands increased by 80% in terms of tonne-kilometres, while rail freight more than doubled and inland waterway (IWW) freight increased by a third. Inland waterways account for an internationally high share (Figure 4). The different freight modes are not perfect substitutes: the 'just in time' transport is done by road, container transport is mainly road and rail, and most bulk transport is by IWW. The share of rail freight remains relatively low, even if IWW transport is excluded. The Netherlands is a transit country for a large part of goods traded in the EU, in particular due to the presence of the Rotterdam (and Amsterdam) container ports, among the largest in the world (den Boer and Verbraak, 2009). The share of international freight is among the highest in Europe for all three modes: road (20% of load carried), rail (80%) and IWW (75%) (Eurostat, 2009).

Figure 4. In freight, the use of inland waterways is much higher than elsewhere



1. Or latest year available.

2. Australia for hire or reward only. Canada: for hire only, carriers with revenues over CAD 1 million. Mexico: on federal highway system.

3. For United States, inland waterways exclude traffic between United States and Canada on the Great Lakes.

Source: OECD Environmental Data Compendium, 2006/2007, Eurostat/DG Transport and Environment.

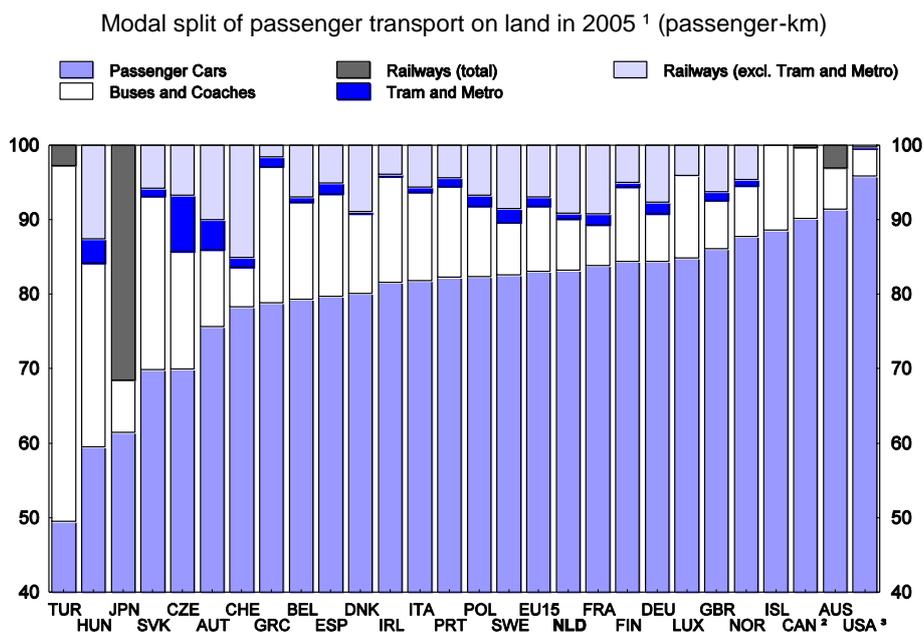
A major bottleneck in the Dutch transport system is the very limited secondary network. While the motorway network is dense and in the recent years many sections were upgraded (by adding lanes), a capacity problem remains as only a small share of the motorways have a parallel regional road network, which could unload motorway traffic of local traffic or for emergency needs (Hilbers and Wilmink, 2002). The lack of a secondary “national-road” network is a policy choice – many national roads were upgraded to motorways due to cost and safety considerations.⁴ As a result, motorways deal with a large amount of short distance traffic and have relatively frequent entries and exits, which slow down the traffic flow. The dense network of local roads has limited capacity, partly due to safety considerations, not offering a viable alternative.

The use of public transport has also intensified. Passenger rail transport has doubled over the past two decades but has not been accompanied by any increase in the track length, which remains fairly short compared to other small OECD countries (Figure 3). Despite the capacity increases through a substantial expansion of multiple tracks, the network remains one of the most heavily utilised in Europe (CBS, 2008). The network is focused primarily on passenger transport and is often described as running close to full capacity, in particular on main routes and in peak times when trains run up to 10 times an hour. The Randstad network is also regarded as strongly underdeveloped compared to major urbanised European

4. Road fatalities (per capita, per vehicle and per passenger-kilometre) have been falling and are among the lowest in the OECD.

areas (OECD, 2007). At the same time, the system is often found to be the most economically efficient in Europe (Coelli and Perelman, 1999, Freibel *et al.*, 2008, Savolainen, 2007). On the other hand, busses and coaches remain relatively few and provide less transport than in other OECD countries (Figure 5). Commuting is primarily done by car, with only one in ten commuters using public transport, most commonly the train (Table 1). Urban transport is largely done by tramway, while subway networks (in Amsterdam and Rotterdam) are relatively underdeveloped. Notably, about a quarter of trips are undertaken by bicycle, carrying an estimated 8% of all passenger-km (Box 2).

Figure 5. **Cars and trains are relatively popular as opposed to busses and coaches**



1. Or latest year available.
2. Intercity passenger services only for rail and includes light trucks in cars.
3. Private cars include vans and recreational vehicles.

Source: DG Transport and Environment, OECD Environmental Data Compendium, 2006/2007.

Table 1. **The car remains the most popular mode for commuting**

2007

		All modes	Car (driver)	Car (passenger)	Train	Bus, Tram, Metro	Motorbike	Bicycle	Walking	Others/Unknown
Commuters (persons)	Share in %	100	54	5	5	5	2	25	5	2
Commuting (passenger-km)	Share in %	100	69	7	11	4	1	6	1	2
Average distance (one way)	km	17	22	25	37	14	7	4	2	20
Average time (one way)	minutes	27	28	31	63	44	19	17	10	30

Source: CBS Statline.

Box 2. The Dutch and the bicycle

The Dutch are intensive bicycle users. Although comparable data is unavailable, there is little doubt that the Dutch use the bicycle more than just about anyone else in the OECD. Bicycle ownership is unparalleled, with more than one bike per person. One quarter of all journeys is by bicycle, much higher than in most other places, and for short-distance journeys (up to 7.5 km) the bicycle is the most popular mode of transport. The most bicycle-intensive trips concern going to school/university, recreation and shopping, but also as much as a quarter of commuting trips is done by bike. An average Dutch person covers 2½ km a day cycling and travels 5 times a week. Over 8% of total passenger travel (in person-km) is done via this mode. Cycling is equally popular among groups with different education levels, slightly more popular among men and decreases somewhat with income. Although in general the flat landscape and compact nature of Dutch cities favour bicycle use, there are notable differences across the country. In the less densely populated north and north-east areas as much as 30-40% of trips are undertaken by bike, while less than 20% in some southern areas and in Rotterdam. There are a number of tax incentives that encourage bike use. Under the current legislation, once every 3 years an employer can provide his employees with a tax free bicycle (up to a value of EUR 749). From 2011, a new work-related costs scheme will be introduced. An exemption of 1.4% of the pre-tax wage will replace 29 categories of tax-free allowances and in-kind benefits (including bicycles). The surplus will be taxed against a final rate of 80% at the level of the employer. Moreover, the tax-free commuting allowance (EUR 0.19 per km of commuting) favours cheap modes of transport as the employee can keep the difference between the allowance and the actual cost of travel. The bicycle infrastructure has evolved with the support of various initiatives of the central and local governments. This is one of the factors lying behind the relatively high road safety levels of cyclists, which have been improving over the past years.

Source: Cycling in the Netherlands, 2009, CBS, Federation of European Employers.

Congestion has substantial economic costs

Congestion is costly in terms of lost time and in terms of the behavioural changes that it leads to (such as lower labour mobility). Businesses suffer from increased duration and unreliability of travel time. Time spent in traffic jams is not productive and congestion may encourage individuals to narrow the geographical area of job search, accept less suitable jobs (*e.g.* in terms of skill match or pay) or not to take up a job at all (due to a higher reservation wage). These effects lower welfare and long-term growth and may be further amplified in the presence of a rigid housing market, which makes it harder to locate in the vicinity of an attractive job (OECD, 2010,).

Traffic jams lead to higher emissions per kilometre driven and higher localised pollution although may in principle have an overall emission-reducing effect, through discouraging travel, or shifting travel to alternative (less polluting) modes. In practice various approaches to estimating costs of congestion yield a wide spectrum of results (Table 2). Recent government estimates of the cost traffic jams and associated delays are around ½ percent of GDP per year (KiM, 2008). Some older estimates indicate that Dutch congestion costs (relative to GDP) are higher than in any other of the 17 surveyed European countries (INFRAS, 2000 and 2004).⁵ Congestion (measured as the time lost in traffic jams) has increased by 70% in the past decade (abstracting from a conjectural 14% reduction in 2009). It is expected to increase further, in line with economic growth (KiM, 2008, Molenkamp, 2007). If no new policies are implemented, the government expects that by 2020 (relative to 2000):

- Total traffic will increase by 50% in the whole country, including the most congested Randstad (by 2005 a fifth of this increase had materialised).

5. Standard approaches calculate the deadweight loss due to congestion (with respect to the socially optimal level of congestion) or the value of time lost in traffic jams (with respect to free-flow). The deadweight loss arises from the fact that individual making their travel decisions do not take into account the costs imposed on others. It can be recuperated with appropriately designed (Pigovian) road prices which lead to a socially optimal level of congestion. This is not the case for the total lost time, where liquidating the costs of congestion would require (costly) infrastructure capacity expansion.

- Congestion (defined as the sum of all travel time lost as a result of recurring traffic jams) will double on main roads and increase threefold on other roads.
- The increase in congestion will be less spectacular inside the Randstad area (80% on main roads, 170% on other roads), as Randstad roads are already clogged-up during peak hours.
- Overall passenger rail traffic will increase by 15 to 40% and grow in rush hours by 60 to 70% (LCMA-Spoor, 2007).

Congestion can be eased by improving infrastructure supply

The government's goals and strategy for improving mobility and accessibility in the period 2006-2021 are summarised in its Mobility Policy Document from 2005. By 2021 the government aims to reduce hours lost due to congestion to 1992 levels, improve the reliability of transport, in particular in rush hours, and reduce travel time. The strategy consists of three pillars: building infrastructure, improving its utilisation and pricing road use. By 2020 the government plans to invest an accumulated EUR 41.3 billion in road infrastructure, mainly to widen existing motorways and add ring roads, EUR 33 billion in railways and EUR 10 billion in waterways. The road investment plans are expected to reduce congestion by 25-30%. Arguably, benefits of road investments should not be overestimated as the improvement of the network attracts ever more users, implying that often such investments are not cost-effective solutions to congestion (Winston and Lager, 2006).

New infrastructure is costly and most benefits occur in the longer term

The effects of the proposed investment programme on growth may be limited. Contrary to many of the older empirical findings, recent OECD research finds little ground for believing in strong positive effects of transport infrastructure expansion on long term growth and GDP levels (Sutherland *et al.*, 2009a). In particular, while transport infrastructure investment is likely to raise output in case of additions to underdeveloped networks (*e.g.* as in the 1960s and 1970s in many OECD countries), the additional benefits tend to evaporate in the presence of highly developed road networks, such as in the Netherlands today. Moreover, infrastructure investment costs in the Netherlands are high, despite the favourably flat landscape. The costs of building motorways and rail tracks are inflated by high population density, legal and regulatory aspects (*e.g.* complicated and lengthy land-freeing procedures, environmental regulation), a high number of crossings with existing infrastructure and waterways and problems associated with building on wet land, particularly reclaimed from the sea. Importantly, the traffic absorption capacity of the main cities is limited; hence the expansion of capacity outside the cities may not suffice, while expanding it in the bottleneck areas, where most economic benefits can be reaped can be particularly costly (Besseling *et al.*, 2005, The Eddington Transport Study, 2005).

The average time from a road proposal to construction in the Netherlands is over 20 years (Molenkamp, 2007), reducing the attractiveness of infrastructure-based solutions to congestion. The implementation lags could be shortened by streamlining the strict land release procedures. Indeed, about 70% of land is devoted to agriculture, and even in the most densely populated Randstad the share of agricultural land is two thirds (TNO, 2006). This is a result of policies preserving the largely agricultural Green Heart in the middle of the highly urbanised Randstad (OECD, 2010,). The share of land devoted to transport purposes is low in international comparison, in particular given the high population density, and increasing it would ease some of the congestion-related problems.⁶ As for the Green Heart itself, one possible solution could be to prioritise its objectives (*e.g.* recreation and nature versus agriculture) and

6. According to Eurostat data from 2000, the share of land used for transport and communication (4%) is significantly lower than in other relatively densely populated *e.g.* Belgium (6.4%) and Germany (4.9%).

align its utilisation with these purposes. This could entail releasing some of the agricultural land for transport routes.

Table 2. **Various estimates of congestion costs in the Netherlands**

Source	Cost of congestion % of GDP	Year	International comparison	Methodology	Remarks
INFRAS/IWW (2000)	0.8	1995	The highest in 17 European countries, average of other countries 0.5% of GDP.	Value of deadweight loss due to non-optimal pricing.	
INFRAS/IWW (2004)	1	2000	The highest in 17 European countries, average of other countries 0.5% of GDP.	Value of deadweight loss due to non-optimal pricing.	
Koopmans and Kroes (2003)	0.2-0.4	2000	–	Speed flow curves and the monetary value of consumer surplus.	Excludes freight traffic, international traffic and local trips from estimation.
KiM (2009a)	0.6	2008	–		Estimates of costs of congestion, accidents and environment are 2.5-4.4% of GDP.
INFRAS/IWW (2000)	2.9	1995	The highest in 17 European countries, average of other countries 1.8% of GDP.	Value of time lost in traffic jams.	
INFRAS/IWW (2004)	4.2	2000	The highest in 17 European countries, average of other countries 2.1% of GDP.	Value of time lost in traffic jams.	

The long-standing Dutch practice of planning and analysing infrastructure investment projects is commendable (Box 3). In particular, the systematic and standardised use of cost-benefit analysis (CBA) is often regarded as international best practice (Flyvbjerg, 2007) and is increasingly used to evaluate investment projects (Annema, *et al.*, 2007). CBA remains a difficult and complex task and international experience points to poor reliability of CBA for infrastructure projects as cost over-runs and benefit shortfalls are prevalent (Flyvbjerg, 2007). This situation can be improved through systematic *ex-post* evaluations, which are becoming increasingly popular in a number of OECD countries (United Kingdom, France, Australia, New Zealand and Norway, among others). CBAs are carried out by a wide variety of private (and public) institutions, so a publicly available database covering general CBA results for historical projects could facilitate improvements of the applied methodology, increase its transparency and facilitate the coordination of proposals.

Box 3. Cost benefit analysis and planning of infrastructure investments in the Netherlands

Since 2000 cost benefit analysis (CBA) has been obligatory for all infrastructure projects of national importance. The minimum threshold for provincial projects is EUR 112.5 million (EUR 225 million in case of the largest urban regions). The use of CBA to assess the net social returns for investment decision-making is widespread and often applied to smaller projects. A first rudimentary CBA analysis is often made at an early explorative phase of the planning in order to select projects for consideration. One or more subsequent CBAs are made close to the point of decision-making. The provider of the project is responsible for supplying the analysis. This is usually done by a private consultancy firm in attempt to assure neutrality. The Central Bureau of Planning may provide a second opinion. No systematic assessment on the quality of CBA (such as *ex-post* analysis) is in place.

In 2000, the government issued national guidelines on methodologies, including cost parameters to be used in deriving benefit values, to improve coherence and comparability of CBAs. The parameters in the guidelines (*e.g.* to value private travel time, fatalities and the discount rate) are in line with international averages (Odgaard *et al.* 2005). The results from CBA's are indicative and hence not binding for the final decision. For example, of a sample of 9 rail and 7 road projects for which the CBA was conducted between 2000 and 2008, five of the rail projects were implemented despite zero or negative net benefits (KIM, 2008). According to the results from the CBA, the discounted net cost to society of these investments amounted to more than EUR 1 billion. Similar practice can be found in other countries and can to some degree be explained by the fact that governments take additional considerations into account (*e.g.* equity concerns).

In a number of cases (particularly in railways) politicians have overruled negative CBA results and allowed the investment project to go ahead. In such cases, decision-makers should be required to specify the reasons behind their decision in order to enhance transparency and consistency. The planning and CBA process could be further streamlined by using the *ex-post* evaluations to feed back into the CBA tool to remove systematic errors and omissions and through regular monitoring of the most commonly used parameters (such as the monetary value of mobility and costs of congestion). Such a strategy would also help understand and communicate the returns on investments. Moreover, all existing measures to reduce congestion (traffic management, peak-hour lanes etc.) should be evaluated on a systematic and coordinated basis due to the large potential spill-over and network effects for the transport system.⁷

Infrastructure investments are financed at various levels of government (Box 4). Attempts to involve private financing have not lived up to initial expectations (Koppenjan, 2005). The main reasons for the relatively few public private partnerships (PPP's) included high transaction costs, the lack of experience and the lack of political commitment (according to the governmental *Ruding Commission*). However, the government will be facing mounting resource constraints as a result of the economic crisis and the increasing ageing costs in the coming years (OECD, 2010,). At the same time, the Dutch pension funds have an interest in low-risk long-term projects with stable incomes (Inderst, 2009) and perhaps even more so after the recent crisis-related negative experience with equity investments (OECD, 2010,). Dutch pension funds are already investing in infrastructure abroad (*e.g.* in France and the United Kingdom) while their direct investment into Dutch transport infrastructure is negligible. The Ministry of Transport recently adopted a number of measures to have a more systematic approach to PPP's (*e.g.* standardisation of contracts, benchmarking and accountability issues) and to improve the involvement of local authorities (*e.g.* knowledge centres, guidelines). Toll payments or shadow toll arrangements based on traffic flow would be necessary to provide revenues to the investor. Project availability should be coupled with a systematic approach to the size and design of contracts and regulation in order to assure best results in terms of costs and value for money (Sutherland *et al.*, 2009b, Valila, 2005).

7. Under the proposed road pricing scheme, which will address many of the congestion problems, many of the local measures (such as peak-hour, priority, and car-pooling lanes) may no longer be needed.

Box 4. Financing of transport infrastructure in the Netherlands

Dutch infrastructure is financed from various sources:

- Local government budgets – can be used to finance infrastructure (and public transport) needs.
- The national infrastructure budget:
 - the so called “Chapter XII” – roughly EUR 2 billion (0.3% of GDP) is transferred to local authorities without the national government intervention. The local authorities make autonomous decisions on financing infrastructure and public transport. The national government is monitoring scores of local governments on achieving national policy objectives.
 - the Infrastructure Fund and part of the gas-revenue funded FES (Fund for Enhancement of Economic Structure). In 2009 about EUR 7.7 billion (1.3% of GDP) is to be used to finance national infrastructure.
- Special arrangements for national/local projects when needed (e.g. dedicated funds or co-financing).
- A small number of PPP projects.

The capacity and utilisation of existing infrastructure can be improved

The need for budget consolidation in the near future emphasises the importance of assuring more efficient use of the existing infrastructure and improving its traffic capacity. In many cases this can be a less costly method of reducing congestion (for example converting hard shoulders to peak lanes has been found 2.5 times more cost-effective than building new roads, Adams, 2007). Projects to improve the use of existing infrastructure are already widely used in order to contain the effect of congestion. Between 2000 and 2007 opening of new roads resulted in a 2% reduction, while additional peak-hour lanes and road-widening schemes led to an 8% reduction. Furthermore, traffic management measures, widely used in the Netherlands (through Intelligent Transport Systems, adapting traffic management to the real-time road developments, using on-route information about bottlenecks, accidents etc.) resulted in a 3% reduction in hours of delay (KiM, 2009b). Other measures aim at discouraging car use in general or in peak-hours (e.g. parking fees and restrictions, or Park and Ride facilities outside city centres, van der Shaaf, 2006).⁸ Dedicated lanes and parking facilities provide incentives for car-pooling, although the latter has seen its share in commuting halve over the past decade. Other measures aim to reduce the effect of freight (e.g. separating various types of traffic – long and short distance, freight and passengers – into physically separate corridors). In rail freight, a variation of corridor-policy is the Betuwe route from Rotterdam Harbour to Germany.

Local traffic could be shifted to the secondary road network, but this would require significant investments. At the moment, local authorities have little interest in traffic being diverted away from motorways, as this increases local pollution and worsens road safety. Thus, they are hesitant (also for budgetary reasons) to support the development of secondary road capacity. Reducing the resistance of local (and provincial) authorities to the development of such networks and encouraging their involvement can be done in two ways. Closing off some of the motorway entries and exits could provide significant improvements to the problem of congestion and safety (Commissie Luteyn, 2003, as cited in OECD, 2007). It would force local traffic to use the local roads, giving an incentive to local authorities to invest in secondary networks and ring roads. Local authorities can also be compensated for the external costs from (existing or new) secondary road traffic through shadow toll arrangements or revenue sharing from a road pricing scheme.

8. Parking in Amsterdam is among the most expensive in the world (Colliers, 2009). Parking fees constitute 20% of revenues of local governments in large cities (25% in Amsterdam, CBS, 2009b).

Road pricing can address congestion and environment concerns directly

The government has proposed an innovative and comprehensive road pricing scheme as a demand-side solution. This scheme, if adopted, would be fully operational by 2017. Road pricing in most OECD countries, including the Netherlands, consists of both a fuel tax and some kind of road tax or vignette system. Various targeted road pricing schemes are also in place, with differing primary objectives such as raising revenues or managing demand. For example, tolls are charged for motorways in many countries and in most countries for particular segments, such as bridges and tunnels. GPS-based per-kilometre charging systems exist in Germany (for trucks on motorways) and recently Slovakia (for heavy vehicles on main roads), while congestion charges for accessing city centres are present in London, Oslo and Stockholm.

The Dutch road pricing proposal is innovative in a number of ways. It includes both a per-kilometre price and a peak surcharge for busy areas and times. The system is to be GPS-based, covering all roads in the country, and practically all types of transport (Box 5). The road prices are to be designed in such a way that the revenue from the kilometre charge will replace current vehicle taxes without affecting gross government revenues. The per-kilometre charge will depend on vehicle type, weight, CO₂ emissions and emission class, reflecting the structure of current vehicle taxation. The peak-surcharge is to be uniform across vehicles but may vary across time and space. The surcharge is to be introduced only once all vehicles are equipped with the tracking device. The new scheme will facilitate the gathering of (anonymous) information on travel behaviour which may result in a better understanding of the weak points of the transport system. This may facilitate improvements to the system and stimulate the development of new technologies that make use of such information. However, as these are difficult to quantify, the prudent approach to such benefits is justified.

Box 5. The road pricing proposal

The cabinet approved the road pricing scheme in mid November 2009, and the scheme was expected to pass Parliament during spring 2010, had the previous government not resigned. Road pricing issues (such as higher fuel taxes, toll roads, congestion charges) had been discussed for several decades, but they failed to become concrete due to the lack of public support. In 2005 the government devised a panel of all interested parties to come up with a consensus solution. The resulting proposal is to move away from fixed taxation of vehicle purchase and ownership to charging the use of vehicles (per kilometre), which is behind congestion and emissions. The current fixed taxes include motor vehicle ownership tax (MRB), the provincial surcharges to the MRB for passenger cars and the registration tax (BPM) and, under the current plans are being gradually phased-out. The new charge will be a function of vehicle type, weight, CO₂ emissions and emission class, so owners of more polluting vehicles will pay more. The fixed per-kilometre charge is to be in the future combined with a congestion fee, applicable during peak periods and in congested areas. This fee is to be equal for all vehicles but differentiated across time and space. The Euro-vignette for lorries on Dutch highways will no longer be in place, and the technical details on how to charge foreign-registered vehicles are being established.

The scheme would be introduced in annual steps, starting in 2012 for freight and fully implemented for all vehicles by 2017. The scheme's coverage would include all roads in the country and all cars and trucks, but not motorcycles. Revenues from the road pricing scheme are to be earmarked to the Infrastructure Fund in contrast with the current car tax revenues. Each vehicle is to be fitted with an onboard device that will use GPS technology, tracking travelled kilometres, in total and in peak hours/areas. This information is aggregated and relayed via the GSM technology to the operator, who subsequently issues a monthly bill. The gathered information will be restricted for privacy/confidentiality reasons.

The per-kilometre charge would reflect current taxation of vehicles. The base per-kilometre rate for a standard passenger car is EUR 0.03 in 2012, gradually increasing to 0.067 in 2017. The final charge would be adjusted to secure sufficient levels of revenues. Diesel and high emission cars will face higher charges. The final basic rates for delivery vans (EUR 0.017), busses (EUR 0.028) and lorries (EUR 0.024) are lower.

The one-off investment costs to get the system up and running were initially estimated to be about ¼ per cent of GDP and the annual maintenance and depreciation costs at 15 to 30% of annual revenues (Ministry of Transport, 2005). The government is aiming at reducing the operational costs to 5% of revenues. The intention is for a 5% collection surcharge to cover the operational costs while the general revenues are to be neutral with respect to vehicle taxation which is being phased out.

The government expects a 15% reduction of the number of kilometres travelled in 2020 and a halving of traffic jams. Road fatalities are expected to fall by 7% and CO₂ and fine particles emissions by 10%. The demand for public transport is expected to increase by 6%. Research conducted as part of the preparatory work for the road pricing proposal yielded estimates of an annual 0.3% positive effect on GDP, and a slightly smaller effect on welfare, by 2020 (arising from improved travel quality, labour market matching, road safety, and environmental effects). A significant part of the benefits is assumed to come from the congestion charge, which the law does not specify, leaving details to be established in the future. The estimates are highly uncertain due to the innovativeness and large scale of the scheme.

Road pricing will align private travel decisions with economic incentives

As part of preparatory work, the effects of a similar proposal have been evaluated in detail and compared with alternative schemes (Table 3). The (variable) financial cost of travelling will rise roughly by a half for a standard passenger car, and possibly triple during rush hours, forcing individuals to reconsider the necessity of a journey and mode of transport, thereby ultimately leading to less traffic (particularly for leisure and social reasons).⁹ The scheme should lead to better economic incentives, as the per kilometre charge links higher (lower) road use with higher (lower) costs, and the congestion charge is a cost-efficient rationing mechanism for a scarce good (road capacity). The government expects a shift of the transport cost burden from households to companies, with the latter to be compensated by less congestion. Still, about 15% of households are to end up paying more. Reductions in traffic, and even more so in congestion, are expected to be significant, but all such estimates are unusually uncertain due to the unprecedented nature and magnitude of the scheme. The fall in traffic and the switch to more environmentally friendly transport solutions (increased use of public transport, bicycle and car-sharing, but also potentially a switch to less-polluting vehicles) are estimated to reduce 2020 emissions by 10%. In particular, congestion charges have the potential to secure significant improvements in local environmental outcomes. Privacy considerations have led to requests that the data collected and made available in the payment invoice be very general (*e.g.* the sum of total kilometres and the sum of “congested” kilometres driven). While the vehicle license plate holder will have *ex-post* access to all relevant data, such implementation may complicate informed *ex-ante* decisions on travel, reducing the effectiveness of the scheme and impeding verification. Hence, the information on the total road price (kilometre price plus potentially the congestion charge) or the total costs of individual trips and alternatives should be easily available to the car user in real time to allow the user to realise the full incurred cost.

The full effect of road pricing will be determined by a number of factors

Road pricing is essentially equivalent to a tax on travel. According to OECD estimates, the scheme will increase the variable cost of commuting by car for an average worker (under unchanged commuting patterns) by more than EUR 60 a month, and potentially more if the congestion charge is applicable.¹⁰ Workers may adjust in various ways, notably by switching to alternative modes of transport or travelling less. The government expects a large reduction in leisure travel and a 17% decrease in commuting by car (vehicle-kilometres). In the longer term, people will eventually adjust their habits by, for example, moving closer to work or switching to alternatives (*e.g.* car-sharing, Park and Ride schemes, and bicycles for part of the journey).

9. This is based on a EUR 0.067 charge per kilometre and a car consuming 8 litres of petrol per 100 kilometres. The price of petrol is assumed at EUR 1.4 per litre.

10. The figured of EUR 64.9 is obtained by multiplying the per-kilometre price (EUR 0.067) by the average daily commuting distance for workers commuting by car (44 kilometres both ways) and the average number of working days in a month (22).

Table 3. **Taxation of vehicles and mobility**

Instrument	Description	Revenue (2008)
		% of GDP
Vehicle purchase tax (BPM)	One-time registration tax, based on vehicle type, fuel and emissions. Passenger cars and vans are subject to a tax of 40% of the net list price, with various environmentally related surcharges/reductions. By 2013, the tax is to be transformed into a tax based on CO ₂ emissions.	0.4
Vehicle ownership tax (MRB)	Annual road tax. Depends on the type of car (passenger, van etc.), fuel type and weight of the car.	0.6
Provincial surcharges on MRB	An annual supplement to the MRB levied by the provinces.	0.2
Fuel taxes	Petrol: EUR 0.71 per litre, diesel: EUR 0.42 per litre, LPG: EUR 0.07 per litre (2009).	1.2
Income tax on company cars	If the car is used less than 500 km per year for private reasons, no income tax is levied. If it is used more, 25% (20%, 14% and 0% for low/zero emissions) of the car price is added to taxable income.	n. a.
Income tax on company-provided bicycle	A bicycle supplied for travel to work purposes is tax-free up to a value of EUR 749, plus EUR 82 per year for accessories. The bicycle can be purchased every three years and must be used on at least 50% of the days commuting (Box 2).	n. a.
Tax free allowance for commuting	Employers can pay a tax-exempt allowance of EUR 0.19 for every km of commuting to and from work to employees who commute more than 15 km a day, irrespective of the mode of transport.	-0.3
Tax free allowance for relocation	Fixed tax allowance for individuals who change housing.	-0.02

n. a.: not available.

Source: Dutch Government, IEA Energy Prices and Taxes, 3rd Quarter 2009, Federation of European Employers.

Road pricing will increase the incentives for alternative work arrangements, for example teleworking. Studies for other countries show some (marginal) traffic-reducing potential of teleworking (Lake, 2008 and Møller-Jensen *et al.*, 2008). Teleworking does not seem more popular in the Netherlands than in other EU-15 countries,¹¹ despite various measures to encourage it. Until early 2000s tax benefits were offered to employers and employees (a tax free allowance for setting up a home office). In 2006, employers were allowed to treat the use of the internet and telephone by teleworking employees as business costs (van het Kaar, 2008). In 2007, the government broadened the tax-deductible commuting allowance (see below), so that all people who work at least 70% outside their home can benefit from it. In 2008 a government task force recommended further widening this rule, lowering the criterion to 60%.

11. The CBS estimates about 3% of the active labour force to be engaged in teleworking, which is somewhat below various estimates for Denmark (4%) and the United Kingdom (5-6%) but the applied definitions are not directly comparable. The European Foundation shows that in 2005, roughly 3% of the Dutch workers were teleworking most of their time, while 14% of the workers teleworked between 25% and 75% of the time, which is among the highest shares in Europe (Gareis, 2007). By the end of 2007, about half of (mainly large) Dutch companies allowed some employees to telework, up from only a quarter in 2003.

In order to avoid the congestion charge, workers may also change commuting times to less expensive off-peak hours, although their ability to do so depends on working time as well as childcare flexibility and school opening hours. Encouragingly, Dutch workers have relatively flexible working time compared with other EU countries. About two-thirds of workers (both male and female) are able to make some adjustments and a full one fifth of workers are able to choose their working time freely (EWCO, 2005). To a limited extent, improvements in the time-distribution of working hours and the flexibility of working time could be achieved through further liberalisation of shop opening hours (OECD, 2006). Availability and opening hours of childcare facilities are also an important determinant of commuting times for a large part of the labour force. Recommendations in these areas were provided in the *2008 Economic Survey of the Netherlands* (OECD, 2008). The Child Care Act of 2004 introduced several improvements and delegated supervision and quality control to municipalities. School childcare facilities are now open between 7 a.m. and 7 p.m., although in many cases pre-schools open only at 8 a.m. (van Bostelen *et al.* 2007). These measures were primarily intended to increase female labour force participation and further steps will be necessary to encourage more flexibility. Longer opening times of child-care facilities, especially in the morning, would particularly benefit blue-collar workers, while additional facilities in non-standard hours may be desirable to facilitate extended working hours, *e.g.* for night and shift workers.¹² Furthermore, the availability of places is often problematic and should be closely monitored. Similarly, the possibilities to improve the flexibility of nationwide school time rules should be explored. Increasing the flexibility of schooling hours is under discussion in the government and pilot projects in this direction are on course (Dutchnews, 2009).

The user-pays principle is being proposed in the presence of a number of existing tax measures, some of which discourage commuting while others encourage it (Table 3). Road pricing would give incentives conflicting with the tax-deductible commuting allowance which allows employees to be compensated with a tax free EUR 0.19 per kilometre of commuting, regardless of the chosen mode, implying a reduced value of taxes (and social security contributions) of EUR 0.09 per kilometre for the average-income worker and higher for higher-income workers.¹³ For car travel, this was initially limited to the first 30 km of a daily journey, favouring alternative travel modes, but the 2004 Tax Plan abolished this limit, increasing car use for longer distance. This led to an additional 3% of hours lost because of delays between 2000 and 2007 with a further effect of 6% expected over the following years (CPB, 2004). The allowance is intended to favour commuting over leisure travel, but nevertheless favours longer distance commuting. To make the commuting allowance neutral vis-à-vis distance and prevent interference with the incentives provided in the road price scheme, it should be provided as a lump-sum allowance for all commuters (*de facto* equivalent to extending the initial income-tax exemption bracket) or scrapped. However, the road pricing scheme would also increase the risks of job market exclusion for some difficult-to-employ groups, such as low-income workers commuting over long distances. In order to preserve their chances on the labour market, targeted and time-limited subsidies for such groups should be introduced. If such a subsidy turns out difficult to implement, focusing the commuting allowance on the difficult-to-employ should be considered.

12. This could be done by offering employers part of the subsidy for the provision of child-care facilities.

13. The calculation is based on the effective marginal income taxation for the average income worker (45%).

More intensive use of existing measures and congestion charges are a viable alternative

If the road pricing scheme is delayed or not pursued, other measures should be considered to improve the transport system. Using existing fuel taxes more intensively and introducing congestion charges in large urban areas are a possible alternative. Fuel taxes are a kind of road use tax which in principle is particularly good at addressing negative environmental externalities (in particular greenhouse gas emissions),¹⁴ though they are less useful for reducing congestion. Currently, fuel taxes are close to the OECD average for diesel and higher for gasoline, reflecting that gasoline is taxed some 70% more than diesel (Box 6) despite the fact that the carbon-content of diesel is roughly 15% higher.¹⁵ This differential reflects the need for competitive fuel taxes to protect the international status of the main ports and to prevent fiscal leakage, given a high price elasticity of diesel (Brons *et al.* 2008). On the other hand, LPG is tax-favoured, leading to a somewhat higher share of LPG-powered cars than in most OECD countries. To offset the incentives for households to purchase relatively polluting diesel cars, the government is taxing ownership of diesel cars relatively heavily (Table 3).¹⁶ The administration of fuel taxes is simple and implementation lags are short (Table 4). Moreover, the risks of fiscal leakage are relatively contained and may be lower in the coming years, as neighbouring countries are likely to increase or are increasing fuel taxes (Belgium) in response to growing budgetary deficits and the need for implementing emission abatement measures.¹⁷

A congestion charge is a relatively low-cost measure (Table 4) due to the small implementation scale (only in congested areas) and the use of different technology. It has been found a cost-effective solution to combating congestion (Besseling *et al.*, 2005). Introducing a congestion charge as soon as possible would tackle the most pressing problems of bottlenecks, hence bringing forward in time substantial economic and some (mainly localised) environmental benefits. In particular it would increase the incentive for the relatively flexible freight traffic to travel outside peak times. It would also have less adverse effects on economic activity in relatively rural areas and for low-wage workers commuting by car outside peak-hours. The application of congestion charges only on main roads may increase traffic on the secondary network and on local roads, potentially providing an incentive to increase their capacity.

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14. On the other hand, fuel taxes may be less effective than emission standards in combating some types of emissions, *e.g.* fine particles.
 15. Currently, diesel-powered engines are generally more efficient (in terms of distance driven per litre of fuel) than gasoline-powered engines of similar size. This fact does not affect the argument for environmental taxation of fuels.
 16. The tax structure (purchase, ownership and fuel taxation) sets the gasoline/diesel breakeven point for an average car at 15 000 km annually (*i.e.* if one drives above this threshold, a diesel powered car becomes the cheaper alternative), however there are additional costs of buying and owning a diesel which typically set the actual break-even point higher (VROM, 2009).
 17. Besseling *et al.* (2005) shows that a EUR 0.06 increase in the fuel levies would have negligible effects, while a EUR 0.30 (necessary to finance the scrapping of the MRB road tax and a quarter of the BPM purchase tax) increase would lead to a EUR 1 billion (0.2% of GDP) revenue loss. Most of the loss is due to (diesel using) freight as the majority of (gasoline-using) passenger car traffic is concentrated in the Randstad, relatively far from the border.

Table 4. Evaluation of alternative road pricing schemes

Scheme	Expected reduction in congestion in 2020, relative to baseline scenario				Details	Expected reduction in emissions		Start-up time	Expected start up costs	Expected maintenance and depreciation costs (annual)
	Entire country		Randstad			CO ₂	NO _x and particulates			
	Main roads	Other roads	Main roads	Other roads				Billion 2005 EUR	Billion 2005 EUR	
1. Per kilometre charge + congestion charge ¹	-60%	-40%	-60%	-40%	Replaces EUR 3.4 billion of vehicle taxes: motor vehicle taxation (MRB) and 1/4 of the vehicle registration tax (BPM). A congestion charge of EUR 0.11 per km in busy locations.	-6%	-11%	by 2017	2.2-4.1	0.9-1.9
Alternative schemes										
2. Per kilometre charge (I)	-30%	-30%	-25%	-30%	Revenue neutral, replaces MRB and 1/4 of BPM.	-5%	-10%	by 2017	2.1-3.8	0.8-1.8
3. Per kilometre charge (II)	-40%	-40%	-40%	-40%	Revenue neutral replaces EUR 5.7 billion of vehicle taxes (MRB and BPM).	-7%	-14%	by 2017		
4. Congestion charge (I)	-50%	-20%	-50%	-15%	Congestion charge of EUR 0.11 per km (constant) at busy locations (flow to capacity ratio > 0.8).	-2%	-2%	by 2011	0.1	0.03-0.05
5. Congestion charge (II)	-55%	-35%	-60%	-35%	Variable congestion charge in busy areas (between EUR 0.055 and 0.22 per km depending on actual congestion).	-2%	-2%	by 2011		
6. Fuel taxes	-15%	-15%	-15%	-15%	Revenue neutral increase, replaces of EUR 3.4 billion of vehicle taxes (MRB and 1/4 of BPM).	-3%	-1%	rapid	~0	~0
7. Toll at six locations	-15%	0%	-25%	0%	Toll in six locations on main road network.	1%	1%	by 2012	0.1	0.1-0.2
8. Morning entry charge in four major cities	-25%	-10%	-35%	-15%	EUR 2.90 charge for entering one of the four major cities during morning rush hours.	-1%	-1%	by 2011	0.1-0.2	0.04-0.07

1. A combination of the following schemes: 2. per-kilometre charge (I) and 4. congestion charge (I).

Source: A Different Way of Paying for Road Use, 2005 Ministry of Transport, Public Works and Water Management.

Box 6. External costs, fuel taxation and road pricing

The taxation of gasoline and diesel, net of VAT, is respectively EUR 0.71 and EUR 0.42 per litre (IEA, 2009) and has little relation to any external costs of travel (Vermeulen, *et al.*, 2004). With the current tax structure, passenger car transport is generally taxed higher than its estimated marginal external effects, while commercial vehicles are effectively subsidised through the tax system (Table 5). This discrepancy will be amplified if the road pricing proposal is introduced, as the per-kilometre price for passenger cars would be significantly higher than for commercial vehicles. Furthermore, rail and in particular inland waterway freight transport are subsidised in a similar manner, paying charges equal to a fraction of their external costs.

The assessment of external costs of transport is a complex issue and is highly dependent on the underlying assumptions, in particular on the price for CO₂ emissions. For example, taking the recent EU Emission Trading Scheme price of CO₂ emissions (EUR 14 per tonne) would yield EUR 0.033 per litre of gasoline and 0.039 per litre of diesel – a fraction of current fuel taxes. Taking an upper-bound valuation used by INFRAS (2004), based on the objective of 50% emission abatement by 2030 (relative to 1990) would yield taxes ten times as high.

Table 5. Marginal external effects and level of taxation
(2017, in 2005 prices)

		Cents/vehicle-kilometre								
		Road wear	Safety	Noise	CO ₂	Non-CO ₂	Total external effects	Fuel duty	Road pricing charge	Total (fuel duty plus road pricing charge)
Passenger car	Gasoline	0.2	2.7	0.3	1.0	0.3	4.4	4.5	6.7	11.2
	Diesel	0.2	2.7	0.4	0.9	1.1	5.2	1.9	8.5	10.4
	LPG	0.2	2.7	0.3	0.7	0.3	4.2	0.4	7.1	7.5
Van	Diesel	1.1	2.3	0.7	1.2	3.9	9.2	2.7	1.7	4.4
Trucks (total)	Diesel	9.6	5.4	2.4	5.5	3.9	26.8	9.0	2.4	11.4

Source: Besseling *et al.* (2005) and Vermeulen *et al.* (2004).

The road pricing system should be fine-tuned to reap further economic benefits

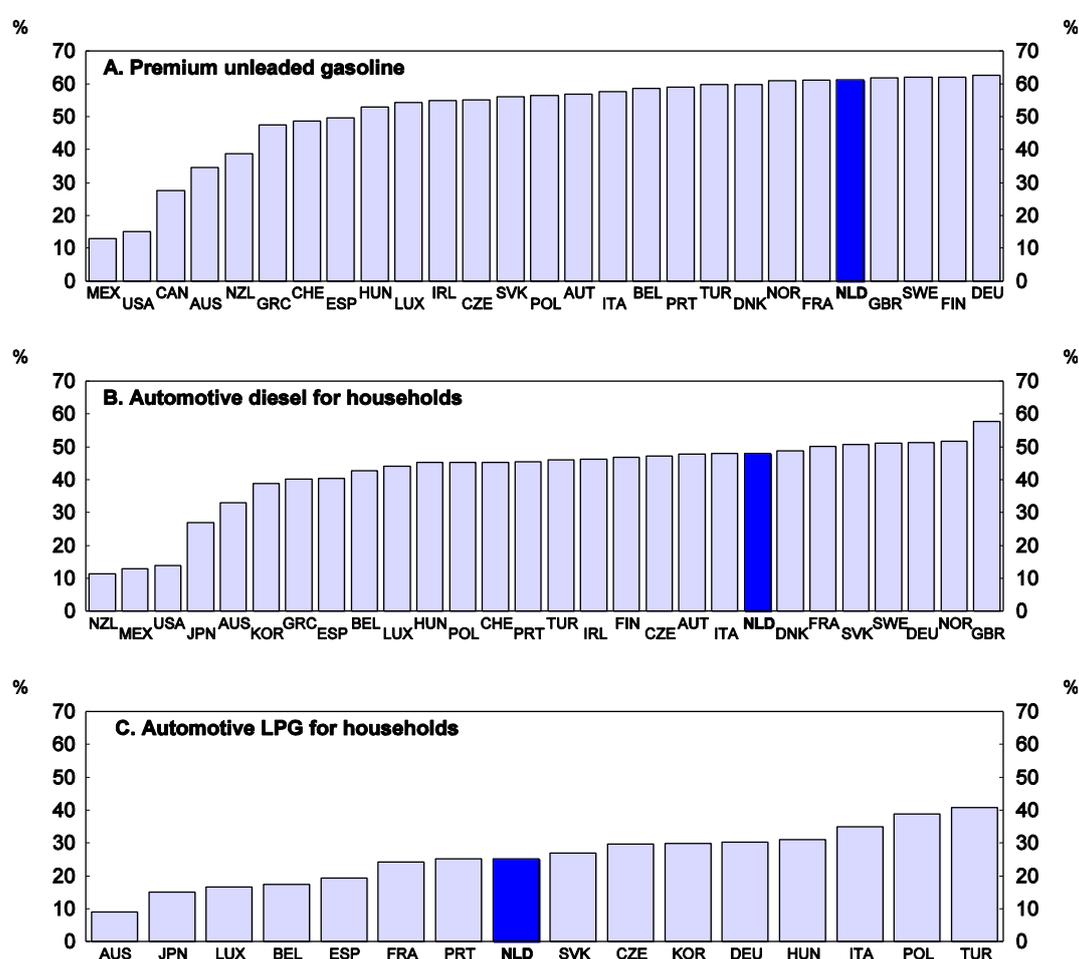
Once road pricing is implemented, the government should be prepared to closely monitor its effects on traffic and be able to make necessary adjustments if the outcomes are different from those desired. Moreover, the system should be fine-tuned to further improve its design in terms of economic efficiency. In the current proposal road prices would be set to reflect the original vehicle taxes and as such would not fully address the negative externalities of road transport (except for differentiating by emission class within a vehicle category), effectively subsidising relatively polluting and congestion-generating freight transport. Consideration should be given to how the price structure can better reflect the negative externalities associated with road transport, and at the least road prices for freight transport could be adjusted to discourage road haulage during rush hours and encourage travelling during low-usage periods. These measures should be combined with fuel taxes to reflect the emission abatement objectives of the government. Further refinements could include differentiation of road prices according to vehicle class so as to better reflect the road maintenance costs and social costs such as noise and road safety. The exclusion of motorcycles from the scheme may pose a threat to the safety objectives, as it may increase the demand

for the use of two-wheelers, which generally have a poorer safety records. Furthermore, many two-wheelers have significant negative environmental impacts, which will not be addressed under the current proposal. Thus a way to include motorcycles in the scheme should be devised.

The revenue neutrality principle, proposed largely for political reasons, may lead to some other less-than-optimal outcomes: in case the traffic-reducing effect is smaller than expected (and more revenue is generated), the road charge will be lowered (likely to further increase traffic) and *vice versa*. Furthermore, in order to keep the overall revenues constant the per-kilometre rates will be adjusted if the revenues from the congestion charge are different than currently estimated. Hence, if revenue neutrality is to be preserved, it should be done through the adjustment of other taxes, for example on income or consumption.

Figure 6. **Fuel taxes are high, in particular for petrol**

As a share of fuel prices, 2008



Source: OECD (2008), Energy Prices and Taxes, Fourth quarter 2008.

The revenues from road pricing are to be earmarked to the Infrastructure Fund. The political economy argument points to a higher public acceptance of a road pricing charge if the revenues are used to improve road infrastructure (Schuitema *et al.* 2008). In general, and not precluding the need for transport infrastructure investment, earmarking should be avoided to prevent a sub-optimal use of revenues.

An effective road pricing scheme needs improved public transport

The success of the road pricing scheme, or any alternative scheme (such as increase in fuel taxes and/or congestion charges), depends on whether public transport can break the trend decline in its market share (passenger-kilometres). For such a significant change to materialise, capacity and availability will need to improve substantially. The road pricing scheme is expected to result in a 6% increase of public transport use in 2020. The road-pricing induced demand for public transport is likely to occur during rush hours and on congested routes (in which case the expected increases in demand reach 50%), where public transport is already often described as running at close to maximum frequency and capacity (OECD, 2007). The government's Action Plan is aiming at a 5% annual growth of rail passenger transport (by 2012) through track capacity expansion, more and larger trains and improvements in connections between transport modes. No additional expansion is foreseen due to the road pricing scheme. Incorporating demand signals through more competition, improving pricing to take account the actual costs of travel and allowing for market initiative in route design could facilitate a more efficient service provision.

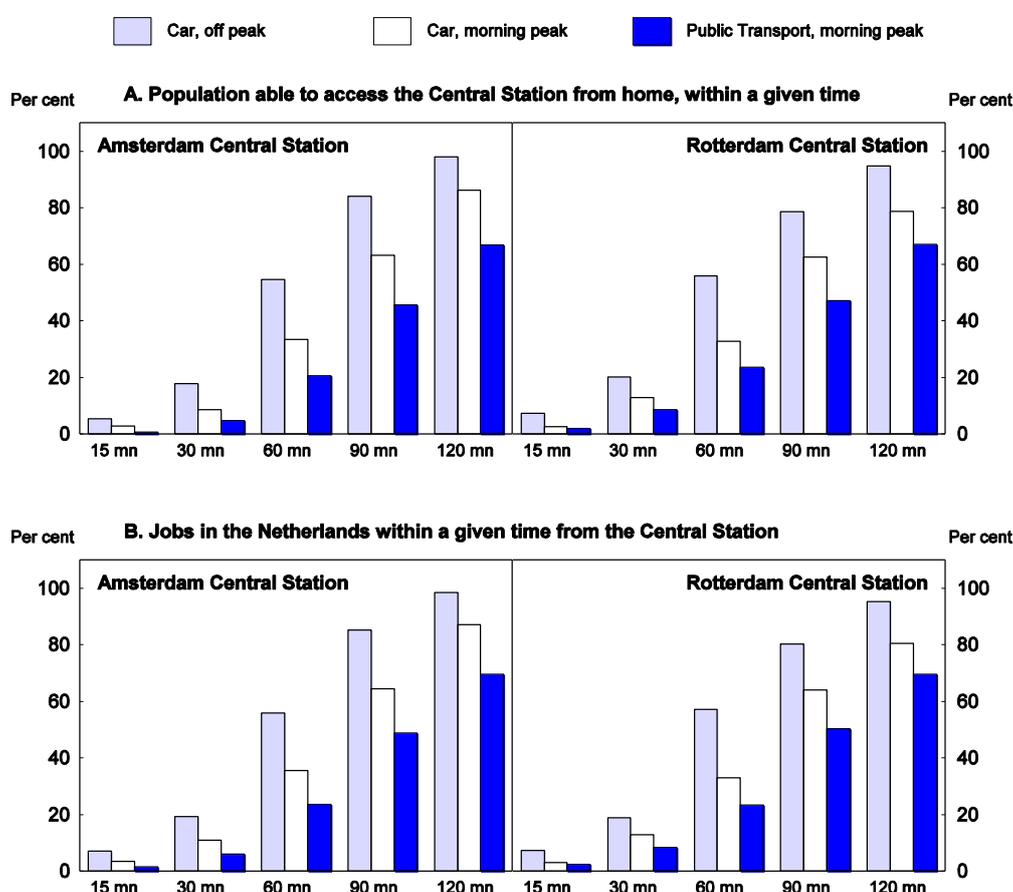
Public transport would be more efficient if more responsive to market signals

Recent years have brought significant steps in introducing competition forces in public transport. In 2001 competitive tendering was introduced in public transport contracts (mainly urban and provincial bus transport) and the public transport responsibilities were delegated to the provincial (and urban city) governments who became public transport authorities. Initially, competition did not increase, but the situation improved after the government responded with general procurement guidelines. Nevertheless, a number of further steps are required to make public transport more responsive to present and future demand. Despite the mandatory tendering, public transport remains in the hands of local authorities in the centres of the four main cities (Amsterdam, Rotterdam, The Hague and Utrecht).¹⁸ The 2001 Law also resulted in a localised planning system, where local governments have the monopoly to design local routes and connections, potentially impeding the adjustment of services to better meet travellers' demand through operators' own market initiatives (van de Velde, 2006). The lags in planning and its under-responsiveness to demand are particularly visible in the Randstad where over 30% of the new housing areas (with 42% of new houses) do not have public transport facilities within walking distance (*i.e.* 500 meters to a bus or tram stop or 750 meters to a metro station) and in many cases private cars remain a faster alternative (Snellen *et al.*, 2005 and Figure 7). One of the explanations may be that the low-density nature of such new housing makes it less economically viable to provide dense public transport coverage under the current setup. More flexibility and more reliance on market forces may thus facilitate adequate servicing of such areas.

For bus and coach services, where the infrastructure, set-up and route-modification costs are relatively low, the lack of market initiative inhibits making the most of the flexibility to adjust to changing demand patterns. Furthermore, there is a widely adopted guideline that new routes cannot compete with existing rail connections in rural areas – even when these are running at full capacity. Though similar conditions exist in other countries (*e.g.* France and Germany) they help explain the internationally low share of (long distance, inter-urban) coach and bus travel. Therefore market initiative for such services should be enabled, in order to improve competition in public transport and serve commuters better. There should be no impediments for new bus and coach lines to compete with existing train lines and the provincial regulators should guarantee access to the necessary infrastructure (bus terminals/stations, bus stops). Finally, the tendering of franchises should be enforced in the main cities.

18. In 2007 the government introduced competitive tendering in all forms of public transport, but was blocked by parliament (van de Velde *et al.*, 2008). The four major cities have used legal loopholes to postpone or possibly avoid competitive tendering. The importance of tram and metro and strong lobbying have been raised the main reasons for this development (van de Velde, 2006).

Figure 7. **The car, even in peak times, is a relatively fast mode of transport**
2008, in minutes



Source: Based on www.bereikbaarheidskaart.nl.

A number of steps have been taken towards liberalising rail transport. While the passenger operations on the main (international and inter-regional) rail network are franchised to the state-owned incumbent NS (Nederlandse Spoorwegen) until 2015, the responsibility for regional operations has been decentralised. Services are being gradually opened up for tender, starting 1998 on an experimental basis and more extensively after 2004. Still, the majority of operations lie with NS and only 8% of all services are decentralised and in principle subject to tendering (van Dijk, 2007). The main objective of the reform was to minimise subsidies, and the lines up for tender are rather peripheral, outside the main commuting paths, leaving the more lucrative segment to the incumbent. In 2005, the government decided it will continue the tendering of regional passenger rail services. Nevertheless, new entry of competitors remains difficult due to dominance of the incumbent arising from the ownership of rolling stock, ticket vending machines etc. The lack of market initiative in the design of connections leads to a focus on the needs of the regional authorities rather than of passengers (van Dijk, 2007). Moreover, the small size of contracts limits efficiency gains coming from the economies of scale, scope and network effects, which are further hampered by the obligation of the new contractor to employ the personnel of the previous operator. Finally, the alternative operators have complained about the infrastructure operator (Prorail) being slow to implement transparent admission procedures for new, lighter (and more efficient) rail stock and not meeting the deadlines for capacity allocation. In 2008, the company was fined for such anti-competitive practises.

In order to benefit from market signals, the personnel transfer obligation should be further restricted to core-personnel. Larger contracts would facilitate the introduction of new rolling stock. In light of the relatively long time horizon of contracts (typically 7 to 15 years), operators should be given more freedom to adjust to demand signals, *e.g.* during different periods of the day or week. The latter can be done by restricting contracts to minimum service requirements. The introduction of market initiative is more problematic than in bus and coach services, due to coordination problems on highly utilised tracks, but should be considered. Further decentralisation will require the regulator to closely monitor the coordination of connections among the regional authorities.

Public transport is often regarded as more environmentally friendly than car transport, which is likely when public transport operates at full capacity during peak-time demand (STREAM, 2008). However, off-peak services, and particular low-load routes are often operated in line with specific public service obligations and capacity utilisation can be very low. As a result, the average load factor on trains is only 0.28, implying that the environmental performance of public transport is often quite poor. Empirical studies (STREAM, 2008) show that on short journeys (the typical commuting distance of below 50 kilometres) average emissions per passenger-kilometre from a (gasoline-powered) passenger car are about 50% higher than from trains and similar to those of city busses. But whereas cars have similar average load factors in peak and off-peak times, the environmental benefits of public transport tend to disappear during off-peak hours. Indeed, per passenger emissions of public transport can be twice as high off-peak than during peak time (Rietveld, 2002). Moreover, part of the environmental advantage of public transport may disappear as the result of strict emission standards for new passenger cars. Therefore, capacity utilisation is the key to improving the environmental performance of public transport, requiring better response to demand, in particular outside peak hours and on underutilised connections. These arguments strengthen the need for using competitive forces, and point to the need for charging public transport the full cost of the environmental externalities. This has to be combined with more flexible contracts to allow better adaptation to demand fluctuations across time and market initiative in route designs.

In order to improve the travel decision making, public transport pricing should be reconsidered. Pricing of public transport is a non-trivial issue and there is still economic debate on what is the most appropriate (and feasible) pricing mechanism (Nash, 2003). The current, recently introduced system (OV-chipcard) is based on a fixed fee per travel and a per-kilometre charge. This system has a number of virtues, including the technical easiness of adjusting prices. Nevertheless, a number of principles should be respected. Price-setting, should remain regulated, due to the imperfect competition in the sector. However, in order to improve the competitive neutrality between different modes of transport (in particular under road-pricing) ticket prices should reflect the internal (operational) and external (social, environmental) costs (and benefits) it generates so that individuals pay a price that reflects the marginal social costs of their travel. Such changes would be in line with the incentives provided by the road pricing scheme, in particular if the road prices are adjusted according to the recommendations given in this paper.

The rationale for subsidising public transport is that it fulfils a number of government objectives which may not be dealt with otherwise, thus yielding external, public-good type benefits. At the moment ticket revenues cover roughly 35-60% of total operating costs of urban public transport (including vehicle maintenance and investment, Rietveld, 2004). Therefore, for the sake of transparency all subsidies (coming from various levels of government) should concern clearly identified objectives (*e.g.* equity considerations, improving mobility of certain social groups, universal services). Such information should be made public so that the tax-payer knows how much is being paid and for what.

Box 7. Policy recommendations to improve the transport system

Investment planning should be made more responsive to demand signals

- Streamline land release procedures and reconsider land use, in particular in the Randstad. Encourage the development of the secondary road system by giving local authorities part of the revenue coming from traffic (shadow toll or road pricing) and reducing the number of motorway entries and exits.
- Introduce systematic *ex-post* evaluations for infrastructure projects and use the results to improve the cost-benefit analysis (CBA) methodology. Improve the transparency and public availability of the results of CBA and require explicit justification in cases where CBA results are overruled. Monitor the need for existing measures to improve traffic-flow under the road pricing scheme and withdraw the unnecessary or distortive ones.
- Increase the amount of infrastructure projects available for private financing with the view of encouraging pension funds to participate in financing such projects.

How to make the most of the road pricing scheme

- Implement the road pricing scheme. The roll-out of the scheme should be closely monitored and the government should be ready to introduce necessary adjustments if effects are different from those initially expected.
- Relative and absolute prices should be adjusted to better reflect the social and environmental (external) costs of different modes of transport. For the same reason, the scheme should be extended to motorcycles. The relative road prices should take into account existing charges through fuel taxation. If revenue neutrality is to be preserved, it should be done through the adjustment of other taxes, for example on income or consumption.
- The tax-free commuting allowance creates incentives which interfere with the road pricing scheme and with work-place neutrality. It should be reconsidered to focus on low-wage workers for whom the higher commuting costs due to road pricing may increase the chances of dropping out of the labour market. Alternatively the allowance can be replaced with a lump sum deduction and/or a time-limited subsidy for the hard-to-employ groups (in particular low-income, long-distance commuters).
- The ability of workers to adjust their travel time would benefit from greater availability (in terms of places and longer and more flexible opening hours) of childcare facilities and lifting shop-opening hour regulation.
- If the road pricing scheme is not pursued, an alternative combining higher fuel taxes and congestion charges should be considered.
- Taxation of diesel should be raised to better reflect the relative environmental costs of fuels.

Making public transport more flexible and responsive to demand

- Increase the flexibility of regional train contracts allowing contractors to better adjust to demand over time and space. Increase the amount of connections subject to public tendering, in particular on key commuter routes, allowing contractors to reap economies of scale, scope and network effects. To facilitate new entry and environmental improvements, procedures for the introduction of (more efficient) rolling stock should be streamlined.
- New entry in public transport should be facilitated by allowing for new connections to compete with existing train services and by facilitating market initiative in the design of new routes and modifications in existing connections.
- Proceed with the tendering of public transport franchises in the main cities.
- The regulated ticket prices for public transport should better incorporate the marginal social (in particular environmental) and operational costs (and benefits) of such transport to improve the neutrality with respect to private transport. The subsidies issued to public transport should be made transparent and should be clearly targeted at well-identified government objectives (e.g. universal services, equity, and mobility of specific groups).

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