THE IMPACTS ASSESSMENT OF REVENUE USE FROM TRANSPORT RELATING TAXES AND CHARGES

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ABSTRACT

This paper aims at providing an overview of possible options related to the use of revenues from transport relating taxes and charges. This is a significant problem in the context of current transport policy instruments implementation, including the internalization of external costs of transport. The analysis on the impacts of transport pricing reforms based on social marginal cost put also great attention into the matter of revenue generated by the implementation of reforms. The question is how to avoid the risk of uneven effects distributed across modes and countries.

The structure of the paper is as follows. Firstly an overview of the state of the art from scientific literature. Afterwards, an overview is given on the current practice in EU Member States with regard to raising revenues and the use of revenues from transport related taxes and charges. Then the impacts of various options for the use of revenues are discussed. The authors would like to show possible options and explain advantages and disadvantages of different choices. For the assessment of revenue use impact it is necessary to mention that institutional arrangements and flow of funds have a significant influence on efficiency, equity and acceptability issues. Finally, the main conclusions are summarized.

The paper is based on the results of IMPACT project: *Internalisation Measures and Policies for All external Costs of Transport* coordinated by CE Delft (IMPACT D4, 2008). It was a project carried out in the years 2007-2008 for the European Commission. The central aim of the study was to provide a comprehensive overview of approaches for estimation and internalisation of external cost and to recommend a set of methods and default values for estimating external costs. The Greening Transport Package released in July 2008 was partly based on IMPACT results.

Keywords: revenue use, transport pricing, impact assessment

OVERALL SUMMARY OF STATE OF THE ART

The analysis on the impacts of transport pricing reforms based on social marginal cost put great attention into the matter of revenue generated by the implementation of reforms. Very general opinion is that reforms will generate effects unevenly distributed across modes and countries. The EC is turning a growing attention to the issue of how revenue should best be used, i.e. how the government that receives the money should best transfer back the benefits to the community. Both research and experience show that alternative ways of spending revenues are likely to have significant effects on:

1. the efficiency of the scheme itself,
2. on income distribution (between groups, between regions, etc.)
3. on public acceptance.

In particular, it can be said with a reasonable degree of confidence that the balance between revenue and needed funds will not be equal on the whole network. It means that substantial surpluses can be expected on more congested roads, while substantial deficits are more likely to happen on the other roads and on rail lines IMPRINT-NET (2005).

The debate on the use of revenues assumes relevance in a context where the EU and Member States are facing both pressing:

1. infrastructure investment financial requirements;
2. stringent budget constraints.

It is important to understand the complexity of the transport revenue collection and allocation mechanisms, starting from an overall picture of the financial flows between the different actors. This is provided in the scheme on Figure 1 in behalf of REVENUE project Ricci et al, (2006).

The scheme illustrates the overall public finance mechanism, not only transport financing. It pinpoints the main fiscal flows — which are represented as flows of taxes paid by the taxpayers and charges paid by the users of public services to the different levels of government: local, regional, national.

Depending on EU member states fiscal laws, taxes and charges are paid by the households and business sectors (taxes) and by the users of the public services (charges) – included in the “society” box - respectively to the local, regional and national governments. In principle, revenues are pooled at municipal, regional and national levels in order to finance government activities and public investments which cannot be realised by single individuals or private companies on the market (as it is the case for pure public goods), and which is more efficient to realise by pooling public revenues at the appropriate spatial scale.

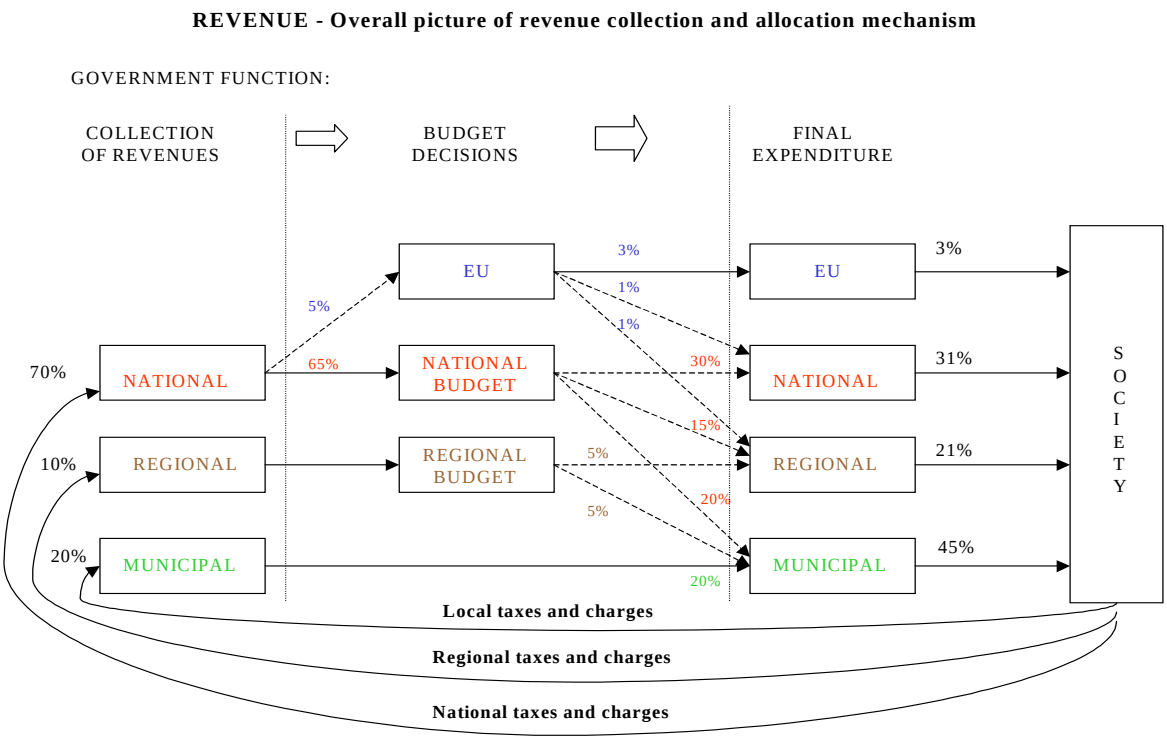


Figure 1 REVENUE – overall picture of revenue collection and allocation mechanism Ricci et al., (2006)

A key policy aspect of a change in pricing structure, and possibly price for the use of transport infrastructure, is what happens to the revenue raised through the new charges. An additional empirical question is whether the revenues raised by the new charging structure will be sufficient to cover total costs of the existing infrastructure, and importantly whether it will be sufficient to allow further development of new infrastructure. This is an important empirical question, from the perspective of government policy, given the budgetary constraints faced by national governments especially in new member states. Research questions appeared in the scientific discussions and analyses concerning revenue from transport prising are:

1. How can necessary funds be raised to finance new infrastructure?
2. What is the most efficient way to raise more revenue than implied by MSC prices?
3. How should surplus revenue be spent to promote efficiency, equity and acceptability?

Some key questions concerning the institutional arrangements regarding transport pricing and use of revenues are:

1. Who should set the charges?
2. Who should collect the revenue?
3. Who should decide how the revenue should be spent?

On the one hand, it may be argued that it is best to centralise all decisions at a high level of government – for instance at the EU as a whole – on the basis that decisions taken at this level may seek to optimise the outcome for the EU as a whole. However, this would hardly

be acceptable to the member states, and in any case lower levels of government may have better information about demand and costs and a greater ability to consult stakeholders. If decisions are taken at a lower level, then a key issue is how can efficient pricing and investment by local and regional government be encouraged? What are the prescriptions to handle the spillovers in benefits (cross border and transit traffic), and horizontal and vertical tax competition issues?

Issues like the opportunity, feasibility and efficiency of solutions whereby revenues from pricing of the use of transport infrastructure are earmarked to the transport sector itself (with implications such as cross-financing between modes of transport) are likely to swiftly reach the top of the policy agenda.

Observed transport pricing scheme in EU states

The balance of taxes and charges varies by mode and country. In this part of paper, the main findings on rising revenue schemes are discussed by mode. A concise overview of pricing schemes is given in Table 1.

Revenue from transport users is raised through a mixture of taxes and charges. The pricing strategies can be categorised as first-best, second-best and target-orientated pricing. Under first-best pricing the price paid by transport users is a reasonable reflection of short-run marginal social costs. When first-best prices cannot prevail, due to constraints or market imperfections second-best prices can be used to approximate the optimal allocation of demand between goods. Mark-ups and multi-part tariffs may be used in second-best pricing. Target-orientated pricing occurs when prices are set to meet certain targets (e.g. full cost recovery, partial cost recovery or maximum level of traffic volume). Charges and taxes are the two types of pricing instruments to be identified in the national transport pricing regimes. The corresponding concepts are explained below Ricci et al, (2006):

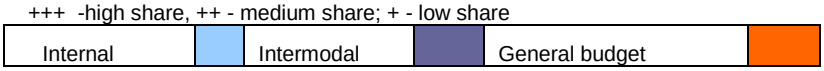
1. Charge: A levy which requires a direct and clear service in proportion to the payment from the part of the public or private provider. Some examples of charges are: infrastructure access charges (vignettes enabling use of a section of network, road tolls, bridge/tunnel charges, rail track access charges, airport landing fees, lock fees, port charges, etc.), freight tariffs, public transport fares and vehicle insurance payments.

2. Tax: A levy that must be paid with either no discernible service in exchange from the State or a service that is not in proportion to the payments. Examples of taxes are: annual vehicle registration taxes, passenger taxes, fuel duty, value added tax on fuel duty, taxes for scrapping and environment related taxes (e.g. carbon tax).

Table 1 Overview table: Revenue rising schemes

Mode	Existing taxes and charges	Tax/charge driver	Share of total taxes and charges	Destination
Road-HDV	***Infrastructure charge:*** User charge (fixed) Toll on specific parts of the network (e.g. bridges and tunnels) Toll on motorways Toll on all roads	Full internal cost recover	Depends on state	
	Fuel excise duty	Externalities and revenue generation	+++	
	Circulation tax	Revenue generation	Depends on state	
	Congestion charge	Externalities	+	
	Insurance tax		+	
	VAT	Revenue generation	++	
Road-cars	Fuel excise duty	Externalities and revenue generation	+++	
	Circulation tax	Revenue generation	Depends on state	
	Vehicle purchase tax	Externalities and revenue generation	Depends on state	
	Toll	Revenue generation	++	
	Parking fees	Revenue generation	++	
	Congestion charge		+	
	Insurance tax		+	
	VAT	Revenue generation	++	
Rail	Infrastructure charge	Marginal cost plus mark-up or full cost recovery	+++	
	Diesel excise duty	Externalities and revenue generation	+	
	Electricity tax	Externalities and revenue generation	++	
	VAT	Revenue generation	++	
Water	Harbour due	Full internal cost recover minus subsidy	+++	
	Dues for locks and bridges	Full internal cost recover minus subsidy	++	
	Fuel excise duty (in a few specific cases)	Externalities and revenue generation	+	
Aviation	LTO charge (often differentiated by noise emissions)	Externalities and revenue generation	+++	
	En-route charge (for air traffic control services)	Externalities and revenue generation	+++	
	Noise surcharge (in several Member States)	Externalities	++	
	Emission charge (at a few specific airports)	Externalities	+	
	Fuel excise duty (in a few specific cases)	Externalities and revenue generation	+	
	VAT (domestic flights)	Revenue generation	++	

+++ -high share, ++ - medium share; + - low share



A substantial amount of revenue is raised through the existing user taxation and charges system. For example, and as seen in Table 2, ECMT estimates that in the year 2000 almost €60 billion was raised from the British transport system. Furthermore across the whole transport system infrastructure cost recovery (including VAT receipts) was in the region of 266% for Britain, 136% for France, 210% for Germany, 164% for the Netherlands and 292% for Finland. The majority of this revenue is raised through taxes and charges for road transport, in particular fuel taxes. The transport sector as a whole is therefore already heavily

taxed and has also become one of the major sources of government finance in European economies ECMT, (2003).

Table 2 Revenue, infrastructure costs and cost recovery for selected countries

	Contribution to fiscal revenue incl. VAT (billion Euro per annum)		Infrastructure costs (billion Euro per annum)	Infrastructure cost recovery	
	Reference prices	Optimal prices		Reference prices	Optimal prices
UK					
Road	59,05	79,52	17,00	347%	468%
Metro	0,14	-0,05	2,00	7%	-3%
Rail	0,65	1,21	3,50	19%	35%
Total	**59,84**	**80,68**	**22,50**	**266%**	**359%**
FRANCE					
Road	48,87	65,15	26,55	184%	245%
Rail	0,2	0,59	8,83	2%	7%
Waterways	0,03	0,02	0,66	5%	3%
Total	**49,1**	**65,76**	**36,04**	**136%**	**182%**
GERMANY					
Road	54,33	90,11	19,86	274%	454%
Passenger Rail	2,35	0,56	2,72	86%	21%
Freight Rail	0,29	0,00	3,63	8%	0%
Waterways	0,00	0,15	0,89	0%	17%
Total	**56,97**	**90,82**	**27,1**	**210%**	**335%**
NETHERLANDS					
Road	12,2	15,95	4,93	247%	324%
Rail	-0,44	0,20	1,87	-24%	11%
Waterways	0,03	0,07	0,41	7%	17%
Total	**11,79**	**16,22**	**7,21**	**164%**	**225%**
FINLAND					
Road	4,38	3,39	1,18	371%	287%
Metro	-0,01	0,01	n.a.	n.a.	n.a.
Rail	0,19	0,09	0,38	50%	24%
Total	**4,56**	**3,49**	**1,56**	**292%**	**224%**

Note 1: 2000 prices and traffic demand levels

Note 2: Includes urban and inter-urban transport networks

Note 3: This only shows cost recovery for infrastructure. With respect to rail and metro there is a degree of arbitrariness regarding how costs are allocated between infrastructure costs and operating costs and to what extent each requires subsidy. It is for this reason that revenues for rail and metro can appear negative.

Source: ECMT, (2003).

OVERVIEW OF CURRENT PRACTICE IN MEMBER STATES WITH RESPECT TO THE USE OF REVENUES

Earmarking is a specific type of allocation rule where not only the beneficiary and/or purpose of the revenue is specified, but also the percentage of revenue that must be allocated. It is important to have knowledge about the rules and/or criteria that are applied to decide on investments and on fund allocation, in order to analyse the impact of the decisions in terms of efficiency. The fact sheets describe if and how transport revenue is earmarked – sometimes non-transport revenue is earmarked for transport spending, and vice versa. This is an important dimension to be considered both in the comparison of current practice to the theory. To analyse the revenue distribution and its impact to the economy and the society we have to consider such issues as:

1. Firstly, how can the necessary funds be raised to meet the need to finance new infrastructure?

2. Secondly, if a decision is taken to raise more money from users than would be implied by pure marginal social cost pricing, how may this most efficiently be done?

3. Thirdly, if marginal social cost pricing actually raises a surplus for the mode or area in question, how may this be spent to promote efficiency, equity and acceptability? Is earmarking desirable and if so should it be administered?

A review of the current practice in use of revenues from charging transport infrastructure has been presented in table 3.

Table 3 Country overview: Revenue allocation scheme

	Mode					
Country	**Road**	**Urban PT**	**Rail**	**Air**	**IWW**	**Maritime**
Austria					No allocation scheme identified	Not applicable
Belgium					No allocation scheme identified	
Finland					partly	
France						
Germany					No allocation scheme identified	
Greece			No allocation scheme identified			
Italy					No allocation scheme identified	
Netherlands						
Norway					No allocation scheme	

					identified	
Portugal					No allocation scheme identified	
Spain		No allocation scheme identified			No allocation scheme identified	
Switzerland					No allocation scheme identified	Not applicable
Sweden	No allocation scheme identified				No allocation scheme identified	
UK					No allocation scheme identified	

Internal		Intermodal		Reduction of external effects		General Budget	

Road

A road transport is the mode that generates most surplus revenue, it is not surprising that this mode has the largest number of earmarking and allocation schemes associated with it.

Road revenue, it is meant revenues from all types of road transport related taxes and charges,
is often earmarked for the improvement of existing road infrastructure and the construction of new roads and tunnels. In Austria, revenues from motorway charging (from HGV by electronic charging and LGV/cars by vignette charging) are allocated to ASFINAG, an enterprise under private law owned by the federal state. ASFINAG plans, manages and finances the Austrian motorway and highway system.

In Germany, revenues from HGV charging go to the VIFG, which is a company under private law owned by the federal state. VIFG spends the revenues on transport projects defined by the federal government, in the first instance for motorways and federal primaries. The net revenues from the heavy vehicle fee (ca. 2.4 bill. EUR) are fully earmarked to infrastructure: 50% to motorways, 38% to railways and 12% to waterways. Vehicle taxes go to the regions (Länder), parking fees to the municipalities. 3% of fuel tax is earmarked for municipal public transport.

Belgium is another example where revenue goes to the regions. Geographical equity issues are important in this country. In case of road being operated by a private concessionaire, road revenues are often internally earmarked. In this way, concessionaires can recover their investment or finance new investment. At the end of the concession period, it is common that the revenues from road charging are obtained by the state.

Intermodal fund is another option for using revenues. Intermodal funds only exist in two countries: France and Switzerland. France recently implemented the AFITF intermodal fund[1]. This fund receives motorway toll revenue as well as government subsidy, and uses the resources for the construction of new infrastructure, predominantly high-speed rail.

A special scheme exists in the United Kingdom, where revenue from road pricing schemes must be invested in the transport sector during the first ten years.

In most cases, fuel tax revenues go to the general budget without any earmarking. However, there are some earmarking schemes: In Finland and the Netherlands, a small part of the fuel tax is earmarked to cover the expenses made for guaranteeing the supply of fuel by maintaining a strategic oil reserve. In the UK, any increase in the fuel tax above inflation level must be used for transport projects. In Switzerland, 50% of the revenues from the fuel tax belong to the treasury. The other 50% are used for construction and maintenance of the national motorway network as well as the construction of the new transalpine railway tunnels.

Vehicle taxes are sometimes earmarked too. In Germany and Switzerland, these taxes are earmarked for the regions. Finally, the car scrapping tax that is used in some countries is internally earmarked.

Rail

Cost coverage for the railway infrastructure managers varies dramatically but rarely reaches 100%, and railway revenues were always observed to stay within the same mode. Some road pricing revenue is earmarked for rail infrastructure (see intermodal funds and Austrian HGV charging in the road section above). All charges paid by railway operators belong to the infrastructure managers (internal earmarking).

Urban Public Transport

Urban Public Transport is often a beneficiary of allocation schemes of other modes, and these allocation schemes sometimes even extend beyond transport. For example electricity taxes are earmarked in Austria, where 2,5% of the tax must be used for urban public transport. France also has a municipal tax scheme in which a special tax, payable by any company larger than 9 employees, is used for local public transport based in the city where the company is based.

In the Netherlands, a fund exists for the allocation of revenues from public transport ticket sales. All public transports except trains use one ticket system (the so-called “strippenkaart”). Revenues from this system are allocated to the various operators in the country in

[1] AFITF = French Agency for Transport Infrastructure

negotiations that take place in a three-year interval. This system has no incentives built into it. In Portugal, parking fees are sometimes used for the financing of urban public transport.

Aviation

Aviation-related taxes are usually earmarked. Noise charges are the most common type, which is 100% earmarked for noise abatement measures, such as insulation of houses in the vicinity of large airports. There are also security taxes that are earmarked for aviation security measures at airports. The aviation charges are usually internally earmarked for the authority that levies them. Thus, landing fees, handling fees etc. stay within the airport that supplies these services, while navigational airspaces are earmarked for the Air Traffic Control authority for every country whose airspace is used, even if the flight just crosses that airspace without landing.

Some countries have a slightly different allocation scheme. In France, there is an aviation fund (BAAC) that collects all aviation charges and redistributes them over the various airports that it operates. In practice, this means that the two Paris airports are cross-financing other, smaller airports. In the United Kingdom, all airports that fall under BAA (the British Aviation Authority) must transfer 7,5% of their profits to the BAA. Finally, another issue in airport financing is the single-till/dual-till question.

Inland waterways

Normally, the charges levied for the use of inland waterways, locks and other facilities are internally earmarked for use by the charging authority. The only country where a specific revenue allocation scheme was observed is France, where part of the hydro power tax must be spent on inland waterways.

Ports

Port dues and charges are normally earmarked internally. Some specific charges, such as the fairway charges in Sweden and Finland, are intended to be spent on that activity.

ANALYSIS OF THE IMPACT OF VARIOUS OPTIONS FOR THE USE OF REVENUES

Revenue raising and use has implications for economic efficiency, equity and acceptability. Clearly, revenue is already raised from existing transport systems, through a mixture of taxation and charges, and accrues to the state and the transport operator. National governments use this tax revenue along with other tax revenue (e.g. income tax) to fund their activities which may include further changes in the transport system.

For the assessment of revenue use impact it is necessary to mention that institutional arrangements and flow of funds have a significant influence on efficiency, equity and acceptability issues. As it has been proved in different studies (e.g. Revenue, Suter et al, (2005)), different levels of governments can take a differentiated investment decisions concerning raising revenues, what influences project efficiency, acceptability of the reform and also can reduce or enhance social inequalities.

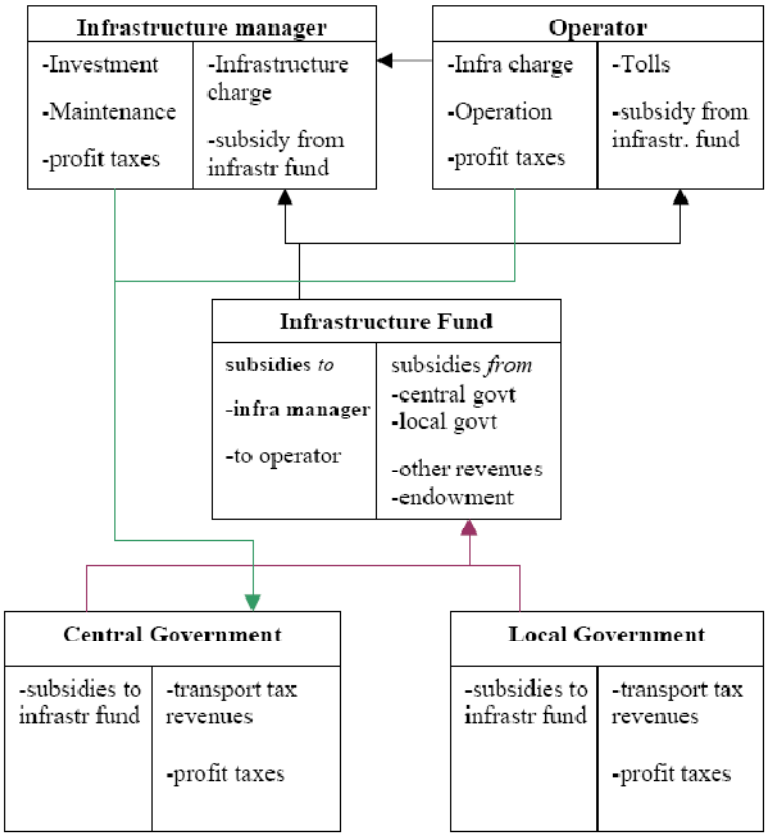


Figure 2 Flow of funds
Source: Suter et al,(2005).

The current state of knowledge on the implications of the internalisation of external costs enables to state that taxes on externalities (congestion, pollution, etc.) increase social welfare, by orienting the behaviour of producers and consumers to increase efficiency and reduce external costs (ECMT, 2003a). Most other taxes are welfare reducing to a greater or lesser degree and are usually designed to minimise changes in behaviour in order to preserve their revenue raising capacity. Taxes on externalities do raise revenues although this is not their primary purpose[2]. Generally, three broad categories of taxes can be identified:

[2] Welfare gain associated with optimal pricing would be substantial. It is confirmed by different projects: ECMT (2003a), Revenue, Proost et al. 2004.

1. efficiency and welfare enhancing taxes – charges on external costs;
2. efficiency and welfare neutral taxes – e.g. taxation of economic rents on the production of nature resources;
3. efficiency and welfare reducing taxes – most other forms of taxation.

Most EU research projects on transport pricing have concluded that governments should be free to use transport revenues in whatever way provides greater benefit. We would like to show possible options and explain advantages and disadvantages of different choices. General options to explore are:

1. earmarking 100% of revenues to transport (either as a means of reducing existing fixed charges or financing new projects e.g. TEN priority projects + ex-TINA).
2. allocating 100% of revenues to general budget without earmarking.
3. a combination of the above,
4. lowering existing taxes and charges, e.g. lowering labour taxes or social security transfers.

As it was already noticed research projects and other studies prove that taxes on externalities increase social welfare. But it is not obvious in the range of raising revenues, what will not increase efficiency automatically. Different options of revenue use also have differentiated impact on efficiency.

If revenues are totally earmarked to transport, there is no guarantee that transport projects will be the most efficient, and probably some undertaken projects will not maximise social welfare. Also budget control would not be efficient, what can reduce final efficiency of revenue use. If revenues are allocated to general budget it is a risk of political abuse of funds what influence negatively efficiency of revenue use. Moreover in a system of various levels of government the discrepancy of interests and making decisions would not increase general social welfare. In the same context the additional option of lowering taxes and charges could influence negatively general efficiency. The risk of negative impact of revenue use on inefficiency can be minimised through improving institutional arrangements, budget controls or project assessments practice.

To specify the problem, a congestion tax on work-related traffic with revenues returned lump sum can reduce labour supply and the welfare loss in the labour market can easily offset the welfare gain from internalizing the congestion externality. In contrast, the net impact of congestion taxes is to stimulate labour supply if revenues are used to reduce labour taxes (Parry and Bento, 2002).

Generally speaking, the earmarking can be distinguished between symbolic and substantive earmarking. Substantive earmarking has the earmarked revenues flow into a special fund, constituting the sole (or at least the incremental) source of funding for a particular spending program (see: Glazer and Proost, (2007)). Symbolic earmarking, though nominally tying the revenue source to a spending program, effectively makes no such link. Much of the literature on earmarking focuses on substantive earmarking. As it was analysed in Revenue, there arguments for and against earmarking are balanced.

There are many determinants (e.g. institutional arrangement) which can influence impact of revenue use in different conditions/countries/regions.

Table 4 Advantages and disadvantages of earmarking

+	–
it is consistent with the benefit theory of taxation	it creates inflexibility in the allocation of funds
it facilitates long-term planning and can reduce project costs by lowering interest rates	it hampers effective budget control
it helps to prevent political abuse of funds	it can result in shortages of revenues for some modes and excesses for others
it makes policy reforms more acceptable to voters and consequently improves the chances that reforms will actually be implemented	

Source: based on Ricci et al, (2006)

Earmarking has a different context in different transport modes. In road sector one can imagine earmarking of revenues rising from road transport taxes to other transport modes, e.g. railways, intermodal transport or public transport. Also cross financing can be a solution, e.g. by financing infrastructure investments as alternatives in different transport modes. In rail transport earmarking can potentially concern this specific transport mode. In air transport for environmental purposes, especially in the case of noise charges the revenues can be earmarked for noise insulation purposes. Also, some cross-subsidisation between airports if owned/operated by a single authority is possible. In the area of privately operated seaports or inland waterway ports, the revenues are and probably will be mainly earmarked.

Impact of revenue use on efficiency

Theoretically investment decisions base on maximizing economic efficiency – so earmarking may result in loss of efficiency what means that some projects be undertaken which does not maximize social welfare Laird et al, (2004). It depends on institutional arrangements and level of governments. Governments at the lower level may take no account of the effects of their decisions on the rest of the system outside their area, may select projects that favour local rather than transit traffic.

The question is if revenues rising from the internalisation of external costs could potentially affect positively or negatively (or neutral) economic decisions, e.g. on investment project financing.

Earmarking may increase efficiency if it deters politicians from making self-interest decisions that are socially wasteful (Ricci et al. (2006)). But can also harm by preventing money from going to the most economically worthwhile uses. Moreover the factor of budget constraints is here very important. Budget deficits and huge investment needs result in undermining even well-targeted earmarking schemes.

The efficiency of revenue use can be also analysed from political economy perspective (see e.g. Kopp (2005)). Also different options of revenue use could be taken into consideration. For example, there is no argument for earmarking, if the political process is perfect (i.e. leads to the benevolent dictator's outcome). But it is not a case in practice generally, so imperfect political process entails potential for inefficiencies in the form of coordination failures (e.g. between lobbies and lawmakers or different levels of decision makers). Then earmarking could favour avoiding these failures.

Another perspective of analysing impacts of revenue use on efficiency concerns the scope and coverage of the pricing system (see e.g. Matthews B. and Nash C. (2004)), i.e. what is priced and who is priced? Some results of modelling case-studies welfare estimate effects as a function of varying the scope or coverage as compared to the welfare levels related to the base and the first-best cases. This means that even simple pricing schemes may be worth implementing but differentiation and advanced system would improve efficiency.

Lowering existing taxes and charges could influence efficiency of revenue use in a different way. The perfect situation is if reducing labour taxes or social security transfers will lead to increase labour supply overall what will result in a further efficiency gain. But it can not be treated as a general rule and that is proved in some studies (see e.g. Parry, (2006)). The efficiency gain depends strongly on type of externality and instruments of internalisation in use. If it is possible to internalise the externalities 'perfectly' rather earmarking or allocating revenues is suggested (depending effectiveness of the institutional arrangements). Whereas the option of lowering taxes shall be chose and can bring about positive effects in the situation of imperfect internalisation strategies. Additionally some attempts at analysing the efficiency impact of earmarking transport revenues outside transport sector should be mentioned. There is evidence that, keeping equity consideration aside, a reduction of labour taxes would be a more efficient way generally of recycling revenues than social security transfers (see Mayeres and Proost, (2002)).

Impact of revenue use on equity

In modern societies, transportation influences people's opportunities to access goods, services and work or leisure activities. Transport regulation thus has a major equity dimension. In the present context, three notions of equity should be distinguished[3]:

1. horizontal equity;
2. vertical equity;
3. spatial equity;

Horizontal equity – sometimes called "fairness" – is concerned with the effects (costs and benefits) of transport regulation schemes on individuals who are comparable in wealth and ability Litman, (2002). Horizontal equity thus implies that, for example, all high-income

[3] This categorization is used by Raux and Souche, (2004), Litman, (1999) and PATS, (2001) distinguish the same concepts, but use different terms for "spatial equity" ("vertical equity with regard to mobility need and ability" and "territorial equity", respectively).

households living in the centre of a city should pay similar transport prices or taxes. Horizontal equity is sometimes interpreted to mean that consumers should 'get what they pay for and pay for what they get'. This could mean that rich people who drive very polluting cars should pay more than rich people driving clean vehicles. Note that abilities are also taken into account. Thus, horizontal equity provides arguments to subsidise transport for people with special needs or make public transport more easily accessible for them.

Vertical equity focuses on the distribution of costs and benefits between individuals of different income classes. How are rich or poor people affected by a specific regulation scheme? How are accessibility gains, the additional financial and non-monetary costs, and revenues distributed among different groups of society? Whether a specific measure or (re)distribution is justified or fair, is not a scientific judgement.

Spatial equity deals with the regional distribution of the costs and benefits of transport regulation schemes. Location is an important determinant of people's transport needs and possibilities. Inhabitants of large cities usually have access to a broad variety of transport facilities (bus, metro, taxi, car, etc.). In contrast, for people living in rural areas, private vehicles often are the only means of transport. Higher transport prices (e.g. due to an increase in gasoline taxes) thus affect people in rural areas much more, as they cannot switch to other transport facilities. Spatial equity is often meant to guarantee a basic level of access to all people, regardless of their location or abilities.

Equity effects of transport policies can be considered separately or together with the overall distribution of income. In the first case, the question is: How are different groups or households affected by a specific regulation scheme (e.g. considering different income groups). In the second case, the effect of the regulation scheme on the overall distribution of welfare or income is also important (more general macroeconomic approach)

Since the taxation and income distribution system is not ideal (all in society had an appropriate share of the benefits of economic activity), equity issues have to be taken into account as part of transport pricing decisions. For example efficiency may dictate low infrastructure charges for rail and high for bus, but an examination of the income distribution of users of the two modes may dictate that relative charges for buses should be lower. Equity issues are introduced by considering a weighted sum of utilities where the individuals with lower incomes receive a higher weight (Mayeres and Proost, (2002))[4]. So earmarking can improve equity though it is not a general rule.

The pricing reform in transport has implications on real incomes and will therefore have income inequality implications: if one concentrates on the pure efficiency point of view, society's welfare gain is maximised when revenues from pricing reform are used to reduce labour taxes. On the other hand, if one is moderately averse to income inequality the

[4] A convenient way of defining formally equity is to use weighted sums of utility functions where the weights are inversely proportional to the level of income or utility. When one is not concerned by equity at all ("not inequality averse"), one unit of income for a poor individual counts as much as one unit of income for a rich person. The other extreme is
that only the utility of the poorest individual matters (Rawlsian criterion).

optimum policy is to use revenues from pricing reforms to fund higher social security transfers (for more details see: Mayeres, I., Proost, S., K. Van Dender, (2003)). Also, well-directed use of the revenues to correct for the effects on the poorest income groups (see: Mayeres and Proost, (2005)).

It has been suggested in many studies (Ricci and Faggiani, (2001); Goodwin, (1989); Small (1992)) that at least part of the revenue generated in urban transport pricing should be earmarked for use in the same urban transport system in order to address equity issues and improve acceptability.

Impact of revenue use on acceptability

The acceptability of transport pricing strongly depends on the allocation of revenues. This depends on the expected outcomes of the measure. Kahneman , Knetsch, and Thaler (1986) demonstrated that people evaluate outcomes of situations in terms of gains and losses relative to their current situation. Most car users would probably consider the effects of transport pricing policies as a loss (i.e., their costs for car use increase). Cost increases can be compensated by returning the revenues to car users. It is expected that the more certain it is that car users are compensated, the more acceptable a transport pricing policy will be. People will feel more compensated when they perceive a direct link between their increasing costs on the one hand, and the compensation for these costs on the other Geller, (1989), which is particularly the case when revenues of transport policies are allocated to benefit car users.

Acceptability is promoted by:

1. Clear objectives to solve recognized problems
2. Transparency in setting price and use of revenue
3. Simplicity in pricing structure
4. Perceived fairness across social groups and locations.

The use of revenues is decisive for the perception of fairness and for the distributional effects resulting from a regulation scheme and therefore a key acceptability issue.

> London Congestion Charge is a good real example which proves the role of the use of revenues in acceptability. In London according to introductory legal regulations the net revenues of the congestion charge was guarantee for London transport facilities. From the beginning of the system operation the full transparency in the use of revenues was assumed. Afterwards the effects on transport modal structure and many other effects have been systematically assessed. In spite of high operating costs the new scheme was generally accepted by the people. The acceptance was supported by the lowering congestion trend but also by the provision of extra public transport capacity and improvements in public

transport (many London citizens had used public transport for commuting also before the scheme implementation).

A number of studies on acceptability of transport pricing have concluded that earmarking of revenues for transport-sector-related purposes is a key requirement to achieve public acceptance. The theoretical work conducted within the REVENUE project proved that voters can consider earmarking as an instrument to prevent politicians from using revenues from transport pricing as another element of general taxation.

Though it seems to be clear that earmarking matters, case studies are needed to make clear which type of earmarking is more or less accepted to the different stakeholder groups. It is, for example, clear that the acceptability of a regulation scheme proposing that revenues from road transport pricing flow back into the road transport sector will strongly differ between the different stakeholder groups. It may be more accepted if the revenues are used to offer real alternatives to those transport services that are most affected by the change in pricing. The spatial scope seems to be crucial.

Revenues collected in a certain area should not be used elsewhere. Acceptability of a regulation scheme may increase if the revenues from transport pricing are used to reduce specific impacts and outcomes of the pricing part of the scheme (e.g. correction of the regressive effect of the charges). The perceived fairness will change.

Public acceptability is closely linked to the use of revenues. Acceptance increases if the revenues are spent on projects that people support. EU projects (PRIMA, (2000) or PATS, (2001), also Nash et al, (2003)) prove that people would be willing to pay higher charges if revenues is used in transport sector and moreover if the revenues are used to reduce pollution or to improve public transport through cross-subsidisation. So far, the role of revenue allocation in acceptability judgements of transport pricing has not been examined systematically.

Some attempts to systematize the knowledge in this area can be found in the study of Schuitema and Steg, (2008). According to this study a survey in Great Britain revealed that charges on driving in city centres and motorways were more acceptable if revenues were invested in public transport or used to reduce car-related taxes (Commission for Integrated Transport, 2001). In line with this, other British surveys concluded that investing revenues in public transport is the most acceptable revenue allocation, in particular when these investments were made in the area in which transport pricing was introduced Ison, (2000) and Jones, (1991). It is already proved through many studies that transport pricing is more acceptable if revenues are allocated to the transport system instead of to general public funds (see e.g. Schuitema and Steg, 2008). So generally, earmarking increases acceptability.

J Schade and B. Schlag examined acceptability ratings of three packages of pricing policies in four European cities. The revenue allocation was described in the policy packages, linking the revenues to a specific transport policy. Their results showed that these policy packages

were acceptable if their revenues were allocated to public transport, conditions for pedestrians and cyclists, or used to lower car-related taxes Schade and Schlag, (2000a), Schade and Schlag, (2000b).

Public acceptability is also closely related to equity. If a reform is considered inequitable or unfair it may well be perceived as unacceptable. Ultimately, whilst efficiency can be improved by a pricing reform, evidence and research suggest some elements of efficiency will need to be sacrificed in order to achieve an acceptable and equitable reform that is understandable to transport users and can be sold to the public (see: de Palma et al, (2007)).

Impact of revenue use - synthetic assessment

Since the impact is not modelled, only qualitative assessment is presented in tables below. The impact of revenue use on transport can be treated as creating new incentives for the industry (e.g. to use modern technologies), transport enterprises (e.g. to modernise fleet), or transport users (e.g. to buy fuel efficient cars or to change driving style).

Though different European models can be used to model impact of internalisation measures in the future, it is difficult or even impossible at present to use them to model impact of revenue use for welfare, equity or also transport sectors[5]. So this analysis is based on expert's assessment supported by literature review. In the following tables the impact concerning revenues from internalising different cost categories is presented. Additionally, it is also mentioned what kind of instrument in specific transport mode is used because type of instrument influences also the scope and the level of impacts of revenues.

Table 5 Climate change

Revenues use / earmarking issue	Transport mode / type of instrument used	Options/ comments	Impact of revenues on:			Revenue impact on transport
			efficiency	equity	acceptability	
General budget (possible tax labelling), possible earmarking to transport	Road / minimum fuel excise duties	Good proxy for greenhouse gas emissions	positive, reduced if imperfect institutional arrangements	neutral or positive	neutral	incentive for buying fuel efficient cars and for fuel efficient driving style, increase of biofuels share
	Road, railway, inland shipping and maritime / CO_2 taxation	Abolishment of purchase tax and differentiation of circulation taxes, possible lowering fuel excise duties, threat of fuelling up outside EU in maritime shipping				
Emission trade market	Rail and air transport	Risk of high transaction costs, problem of additional emissions of NO_x, level of incentive could be below or above external costs of CO_2 emissions	neutral	neutral	neutral or positive (possible in air sector)	neutral

[5] Among others the MOLINO model should be mentioned. It is a tool developed within REVENUE project in the context of an attempt to devise a more general and systematic theoretical framework to the question of the use of revenues (Proost et al (2004) and Suter et al. (2005)).

Use of revenues from fuel charges would generate mainly positive impacts on efficiency objectives. One can not expect any significant impact on equity or acceptability. In the range of emission trade systems, due to possible distortions of the market and transactions costs, efficiency effects are not obvious.

Table 6 Air pollution

Revenues use / earmarking issue	Transport mode / type of instrument used	Options/ comments	Impact of revenues on:			Revenue impact on transport
			efficiency	equity	acceptability	
Earmarking to public transport or rail alternatives in sensitive areas ir to regions (e.g. sensitive areas)	Road / petrol and Diesel: fuel tax, charge per km, mark-up on circulation taxes	Possible lowering fuel excise duties, lowering labour taxes and rewarding the best companies	positive (but risk of inefficient inflexibility in the allocation of funds)	positive	positive or neutral	incentive to introduce new / cleaner cars Incentive to use new technologies in sensitive areas
General budget or earmarking to rail transport	Rail / Diesel: fuel tax (based on average external cost of diesel trains), electric: energy tax based on average external cost	Possible lowering fuel excise duties	positive (but risk of shortages of revenues in other modes)	positive or neutral	positive or neutral	subsidising fleet or engine renewal
Earmarking to rail transport or regions / local areas	Rail / Charge per km differentiated to urban/interurban	Investments in sensitive areas	positive (but risk of inefficient self-interest decisions)	positive or neutral	positive or neutral	Incentive to modernise fleet and supporting railway investments
General budget or earmarking to inland waterways	Inland shipping / fuel tax based on average external costs	Possible lowering fuel excise duties	positive	neutral	neutral	Subsidising fleet or engine renewal
Earmarking to inland waterways	Inland shipping / charge per km	Investments in inland waterways	neutral (or other depending earmarking scheme)	neutral	neutral	Incentive to modernise fleet
General budget or earmarking to maritime transport	Maritime shipping /Fuel tax based on average external costs	Possible lowering fuel excise duties	positive	neutral	neutral	Subsidising fleet or engine renewal
Earmarking to maritime transport	Maritime shipping / Charge per harbour visit	Investments in maritime transport	positive (but risk of shortages of revenues in other modes)	neutral	rather positive	Incentive to modernise fleet
General budget or earmarking to air transport	Aviation / fuel tax based on average external costs	Possible lowering fuel excise duties	positive	neutral	neutral	Subsidising fleet or engine renewal
Earmarking to air transport	Aviation / Charge per LTO	Investments in air transport	positive (but risk of shortages of revenues in other modes)	neutral	Rather positive	Incentive to modernise fleet

Revenues from fuel taxes or distance related charges would have positive impact on efficiency objectives. Positive impacts on equity and acceptability issues can be expected especially if earmarking is introduced to public transport or for investment programmes in the regional / local level.

Table 7 Noise

Revenues use / earmarking issue	Transport mode / type of instrument used	Options/ comments	Impact of revenues on:			Revenue impact on transport
			efficiency	equity	acceptability	
General budget or earmarking to local areas	Road / fuel tax based on average noise cost, charge per km differentiated to urban/interurban, mark-up on circulation taxes	Possible lowering fuel excise duties Use of revenues for noise screens and insulations	positive	neutral	neutral or positive	minimal
	Rail / fuel tax based on average noise cost, charge per km differentiated to urban/interurban	Use of revenues for noise screens and insulations, possible noise bonus for silent brake systems	positive	neutral	rather positive	minimal
	Aviation / fuel tax based on average noise cost, charge per LTO	Possible lowering fuel excise duties Possible noise insulations	positive	neutral	neutral	minimal

Earmarking of revenues to local areas and regions, and use of revenues for noise insulation would influence positively efficiency and also could be well accepted. It is not predicted any important impact on equity issues.

Table 8 Accidents

Revenues use / earmarking issue	Transport mode / type of instrument used	Options/ comments	Impact of revenues on:			Revenue impact on transport
			efficiency	equity	acceptability	
General budget, tax labelling	Road / fuel tax based on average accidents costs	Special fund for compensation and safety of infrastructure use	positive (but risk of political abuse of funds)	neutral	neutral	Incentive to reduce accident risk
Internalisa-tion via insurance companies, partly redistribution to the	Road, rail / charge per km differentiated to type of road, mark-up on	Very low correlation with marginal accident costs	positive	positive	neutral or positive	Incentive to reduce accident risk

insurance holders per capita	circulation taxes					
General budget, tax labelling or earmarking to rail transport	Rail / fuel tax based on average accidents costs	Possible fund for compensation	positive (but risk of shortages of revenues in other modes)	neutral	neutral or positive	Incentive to reduce accident risk
General budget, tax labelling or earmarking to air transport	Aviation /Fuel tax based on average accidents costs	Possible fund for compensation	positive	neutral	neutral or positive	Incentive to reduce accident risk
Earmarking to air transport	Aviation / charge per LTO	Very low correlation with marginal accident costs	positive	positive	neutral or positive	Incentive to reduce accident risk

Mainly positive impacts on efficiency can be achieved. Also for the equity it is expected that internalisation via insurance companies can improve social inequalities. It can be neutral or positively from acceptability point of view.

Table 9 Congestion and scarcity

Revenues use / earmarking issue	Transport mode / type of instrument used	Options/ comments	Impact of revenues on:			Revenue impact on transport
			efficiency	equity	acceptability	
Earmarking to investments in transport (possible non-road modes)	Road / cordon charges in congested urban areas, congestion charge at bottlenecks	Possible public transport support, lowering labour taxes, fund for infrastructure investments, cross financing possible	positive	positive	rather positive	Incentive to reduce congestion, public transport support, incentives to increase load factors or increase capacity, support to intermodal transport

As it is argued in some studies (e.g. Parry and Bento, (2001)), sometimes congestion charge can raise the overall costs of commuting to work and discourage labour force participation to the extent that welfare loss in the labour market can exceed the welfare gain from internalization. Then, it is reasonable to use revenues to reduce labour taxes.

CONCLUSIONS AND POLICY RECOMMENDATIONS ON USE OF REVENUES

Most EU researches on the economics of transport pricing have concluded that the most efficient use of revenue requires that governments be free to use the revenue in whatever way provides the greatest benefit. By contrast, research on acceptability tends to suggest

that earmarking this income for specific uses (usually within the transport sector) would make pricing reform more acceptable, as those paying the charges would know how the income was to be used, and how it would benefit them.

Generally, governments are responsible for setting the policy and regulatory framework within which infrastructure managers set prices, whilst service providers and ultimately users are affected by pricing decisions. However there are interactions and conflicts between each set of actors as each may pursue a different set of objectives. Individuals and service providers impose costs on one another (e.g. congestion costs and pollution costs), whilst service providers compete with each other for business. Governments local or national tend to pursue goals that maximise the benefit that their populace will receive, potentially to the cost of people living in other regions or countries.

Current EU policy does allow revenue raised from one mode to be spent on infrastructure associated with another mode and also for revenue raised in one region to be spent in another region. Such policy, however, is only one option regarding the use of revenue. Other options would include using revenue for general taxation purposes (e.g. reducing labour taxes or social transfers) or more restrictive options such as directing revenue towards projects within the region or the mode from which it was raised. Each type of revenue use has important implications for efficiency, equity and acceptability.

While analysing impact of different options of revenue use it should be remembered that effects on transport sector could be very important. New incentives for the industry (e.g. to use modern technologies), transport enterprises (e.g. to modernise fleet), or transport users (e.g. to buy fuel efficient cars or to change driving style) can emerge. Also, the analyses of different options of revenue use on efficiency, equity, acceptability and transport sector should not disregard the applied type of instrument in specific transport mode. These origins of internalisation instruments influence the scope and the level of impacts of revenue use.

REFERENCES:

1. Commission for Integrated Transport, (2001), The CfIT report 2001: Public attitudes to transport in England. Available on http://www.cfit.gov.uk/ (10.03.2010)
2. De Palma et al, (2007), De Palma A., Lindsey, R. and Proo st, S. (Eds), Investment and the use of tax and toll revenues in transport infrastructure, Elsevier, Amsterdam.
3. ECMT, (2003), Optimal Transport Pricing: Final Report of the ECMT/EC DG-TREN research project comparing current transport taxes and charges with an optimal pricing benchmark. Paris, 2003.
4. ECMT, (2003a), Reforming transport taxes. European Conference of Ministers of Transport, Paris 2003.
5. Geller, (1989), E. S. Geller: Applied behavior analysis and social marketing: An integration for environmental preservation. “Journal of Social Issues”, 45,
6. Glazer and Proost, (2007), Glazer A., Proost S., Earmarking: Bundling to Signal Quality, http://www.kulueven.be/ete

7. Goodwin, (1989), Goodwin, PB, The Rule of Three: A Possible Solution to the Problem of Competing Objectives for Road Pricing, "Traffic Engineering and Control", 30 (10).
8. IMPACT D4 (2008), van Essen H.P. et al, Internalisation Measures and Policies for All external Costs of Transport (IMPACT), Deliverable 4 - Draft report on internalisation strategies, Delft, CE, 2008
9. IMPRINT-NET (2005), D1 Pricing for (sustainable transport policy – A state of the art, IMPRINT-NET, Implementing pricing reforms in Transport – Networking Coordination Action.
10. IMPRINT-NET, (2007), J. Laird, C. Nash, IMPRINT-NET expert group on implementing pricing reforms: revenue raising and use. Overview of existing practice and research – briefing note 1, Implementing pricing reforms in Transport – Networking, Coordination Action, 2007.
11. Ison, (2000), S. Ison: Local authority and academic attitudes to urban road pricing: A UK perspective. "Transportation Policy", vol. 7,
12. Jones, (1991),P. M. Jones: Gaining public support for road pricing through a package approach. "Traffic Engineering and Control", 32,
13. Kahneman , Knetsch, and Thaler (1986), D. Kahneman, J. L. Knetsch, R Thaler: Fairness as a constraint on profit seeking: Entitlements in the market. The American, "Economic Review", 76,
14. Kopp, A. (2005), Revenue use and infrastructure funds, Presentation on the REVENUE conference, Revenue use from transport pricing, November 2005.
15. Laird et al, (2004), Laird, J.J., Nash, C.A. and Nellthorp, J. , Macário, R., Van der Hoofd, M., Carmona, M., Proost, S., Suter, S., Lieb, C., Deliverable 1 State of the Art and Conceptual Background, REVENUE Project, ITS, Leeds.
16. Litman T., (2002), Evaluating Transportation Equity. "World Transport Policy & Practice", Vol. 8 (2).
17. Matthews B. and Nash C. (2004), IMPRINT-EUROPE Final Report, Implementing Pricing Reform in Transport – Effective Use of Research on Pricing in Europe, University of Leeds
18. Mayeres and Proost, (2005), Mayeres, I., Proost, S., Towards better transport pricing and taxation in Belgium, Working Papers Series no2005-04, http://www.kulueven.be/ete
19. Mayeres and Proost (2002), Mayeres, I., and Proost S., Reforming Transport Pricing: an economic perspective on equity and acceptability. Available at: http://www.kuleuven.be/etenrWP2002-12
20. Mayeres., Proost, Van Dender, (2003), Mayeres, I., Proost, S., K, Van Dender, The Impacts of Marginal Social Cost Pricing, in Nash, C. & B. Matthews, Measuring the Marginal Social Cost of Transport, Elsevier Science.
21. Nash et al., (2003), Nash, C.A., Niskanen, E. and Verhoef, E. (2003). Policy conclusions from MC-ICAM. Paper presented at the fourth IMPRINT-EUROPE seminar "Implementing Pricing Policies in Transport: Phasing and Packaging", 13-14 May 2003, Leuven. http://www.imprinteu.org/seminars
22. Parry and Bento, (2002), Parry I., Bento A., Revenue recycling and the welfare effects of road pricing, "Scandinavian Journal of Economics", 103 (4),
23. Parry I. (2006), Are the costs of reducing greenhouse gases from passenger vehicles negative?, Discussion Paper, "Resources for the Future", Washington, RFF DP 06-14 REV
24. PATS (2001). Recommendations on transport Pricing Strategies, Final Report. TIS.pt,Portugal.
25. PRIMA, (2000), Pricing Measures Acceptance (2000), Final Report, Inregia, Sweden.

26. Proost at el, (2004), Proost S., de Palma A., Lindsey R., Balasko Y., Meunier D., Quinet E., Doll C., van der Hoofd M., Pires E., Deliverable 2, Theoretical framework, REVENUE Project, ISIS, Rome.
27. Raux and Souche, (2004), Raux Ch., Souche St. (2004), The acceptability of urban road pricing. A theoretical analysis applied to Experience in Lyon. “Journal of Transport Economics and Policy”, Vol. 38 (2).
28. Ricci and Fagiani, (2001), Ricci, A, and Fagiani, P., Reforming prices in urban transport, a review of research findings. Paper presented at the first Imprint-Europe seminar, "Key Requirements for Implementing Pricing Reform in Transport" 21, 22 and 23 November 2001, Brussels. http://www.imprinteu.org/seminars.htm#sched
29. Ricci et al. (2006), A. Ricci, C. Sessa, C.A. Nash, R.Macario, M. Van der Hoofd, M.Carmona, S. Proost, A. De Palma: D 6: Synthesis and Policy Conclusions, REVENUE project, Rome.
30. Schade & Schlag, (2000a), J. Schade, B. Schlag: Acceptability of urban transport pricing. Helsinki: VATT.
31. Schade & Schlag, (2000b), J. Schade, B. Schlag, Public acceptability of traffic demand management in Europe. “Traffic Engineering and Control”,vol 41,
32. Schuitema & Steg, (2008), G. Schuitema , L. Steg, The role of revenue use in the acceptability of transport pricing policies, “Transportation Research” Part F 11,
33. Small (1992), Small K., Urban Transportation Economics. Reading, Harwood Academic Publishers, Chur. Switzerland.
34. Suter at el, (2005), S. Suter, U. Springer, A. de Palma, R. Lindsey, S. van der Loo , A. Ricci, P. Fagiani, P. Moilanen, M. van der Hoofd, M. Carmona, J. Baker: Deliverable 3,Case Studies Specification, REVENUE project.