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PLanning and Urban Mobility in Europe

Synthesis Report: Economic Problems

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1 OVERVIEW OF KEY FINDINGS FOR POLITICIANS

Economic problems in the transport field can be identified in the following areas:

- Real and perceived connections between economic growth and transport.
- Internal costs (and resulting financial / fiscal barriers to transport strategy implementation).
- External costs (those not inherently borne by the user):
  - environmental & noise impacts (see Section 3.2 of the SoAR and SR)
  - accident impacts
  - loss of time
  - land consumption

Current economic trends generally lead towards an increase in demand for both freight transport and personal business travel (both mostly on the roads, the second also by air). However, the negative side-effects of current mobility patterns create both considerable costs to society and negative effects on the quality of life, especially in urban areas. Therefore it is becoming increasingly important to work towards **a decoupling of mobility and economic development**. Stricter environmental legislation and rising congestion make many companies consider usage of modalities other than road transport. Government authorities generally view this development as very positive but it is often politically difficult to actively encourage modal change through measures, which increase the direct costs of the undesired modes (such as road taxes or fuel prices). An alternative is to decrease the relative (financial or time) costs of other modes by increasing their speed or frequency, and also by focusing on access rather than mobility – generally through integrating land use and transport policies. Common measures, which help to use transport infrastructure more efficiently – and therefore overall more cheaply are, parking place management, the enhancement of public transport services or congestion pricing (as has recently happened in London, UK but is also practiced in many other places) The biggest general problem with road user charging is that while it generally functions as a source of revenue, it does not *necessarily* result in more sustainable transport patterns, depending who has to pay, how much, where and when.

However, the improvements achieved through the measures listed above (e.g. better air quality, noise reduction, time savings, new uses of urban open space) can in turn positively influence economic development. Therefore extending the notion of quality - which is already familiar to the business world – to the whole urban economy and society management – which includes transport and all its effects - is the best strategy to sustain economic development in the future.

Internal costs in the transport sector arise largely during the planning, implementation, maintenance and monitoring of transport measures (both infrastructure and services). A survey for PROSPECTS (Deliverable 15) found, that *road building* and *public transport infrastructure* are the two transport policy areas most commonly subject to financial constraints (in 80 % of cities surveyed) with *bus and rail operation* following in third place. However, increasing – though still insufficient - consideration is nowadays given to the **external costs** of current mobility patterns those costs, which are *caused* by satisfying the mobility needs of goods and people but which are not actually paid for within the transport system. Such costs include environmental impacts (pollution, noise), accident and other

health costs, land use and loss of time through congestion. The biggest question concerning external costs – and ultimately also any instruments aimed at internalising them – is how to calculate their true value and how to predict the effect different policy instruments or combination of such instruments will have in the short, medium and long term on such costs.

But if current social, economic, population and political trends are continued, the costs of transport on both levels will rise further – and they are by and large already at a level, which cannot sustainably be met. Also, the relative costs of mobility compared to available household income have been rising in most EU countries with the exception of Denmark – in other words, people have to spend increasing proportions of their income on satisfying their mobility needs. But projects within the PLUME network[1] are showing through both case studies and the development and application of models, that the problem of financial barriers in providing for mobility needs as well as the problem of external costs can both be tackled – often simultaneously – with some success if the right combination of instruments is chosen.

Within this synthesis report information from the following EU-funded research projects were used: ARTISTS, CITY FREIGHT, IMPRINT, ISHTAR, MCICAM, PROPOLIS, PROSPECTS, SPECTRUM, and TRANSPLUS.

[1] see e.g. TRANSPLUS Deliverable 4.1

2 KEY THEORETICAL POINTS

This section will serve to highlight the main issues relating to urban transport and economic considerations. A distinction is made between economic issues relating directly to transport (i.e. internal and external costs – and benefits – of different transport modes and policies) and the connection between economic development and transport in general.

2.1 Economic Growth **(see TRANSPLUS Del. 1.1)**

Economic efficiency involves maximising the benefits which users can gain from the transport system, after taking account of the resource costs of provision and operation of the transport system. Thus the system must be efficient to be attractive for the users. At the same time, land use and transport policies should support economic growth. A more competitive and dynamic knowledge-based economy capable of sustainable economic growth with more and better jobs and greater social cohesion is expected (new strategic goal of the EU Social Policy Agenda adopted by the Lisbon European Council in June 2000). On average economies have grown by about 2.2% per year in the last two decades (9.4% from 1995 to 1999) but the annual growth rate of EU member countries was generally higher in the period 1975-90 than in the '90s. In 1998 the gross domestic product per capita was on average 22.5 k$ (for EU 15 and Norway) with only 3 countries (Spain, Portugal and Greece) at about half the average. Increasing overall prosperity has been experienced by all member states of the EU and Norway in the most recent years although this long term trend includes shorter time periods with cycles of higher and lower growth.

The continuation of this long term trend would mean a continued increase in demand for mobility. On the other hand, it is relatively likely, that the current long term expansion will be followed by a slowdown (that is on a larger time scale than the ups and downs of economic cycles observed every few years). This downturn could take place with a soft landing or with a sudden deflation leading to deep depression. A sudden slump would certainly dampen the demand for mobility, while a gradual cooling down of the economy would limit said demand more slowly. At the same time, transport measures which improve access or enhance the environment can lead to increased economic activity and possibly to sustained economic growth – thus mobility measures might also influence economic developments.

However, economic growth and coinciding transport activities imply use of energy and other natural resources, as well as pollutant discharges and waste production and possibly increasing congestion and accident risks. The environmental effects depend on production and consumption patterns, and are influenced by the behaviour of firms' and the public, and by government's interventions. Other factors such as technology also play an important role. Economic growth also provides opportunities to finance environmental protection expenditure with potential benefits in the form of cleaner and less resource-intensive technologies and the production of environmentally friendly goods.

Table 2.1: Links between Policy Instruments and Economy

	in city centres	in inner suburbs
Land use	●●●	●●●●
Infrastructure	●●●	●●●●
Management	●	●●
Information		
Attitudes		
Pricing	●●	●
Key: ● *weak link* ●●●●● *strong link*		

Source: PROSPECTS Del 15

A key message for the City of Tomorrow is that included in the new Social Policy Agenda of the European Union: growth is not an end in itself but essentially a means to achieving a better standard of living for all. The overall focus will be the promotion of quality as the driving force for a thriving economy, more and better jobs and an inclusive society: strong partnership, dialogue and participation at all levels, access to good services and care, social protection adapted to a changing economy and society. Extending the notion of quality - which is already familiar to the business world – to the whole urban economy and society management is the better strategy to sustain economic development in the future.

2.2 Internal Costs (see PROSPECTS Del 15)

In urban transport, the principal types of costs are capital costs of new infrastructure, operating and administration costs, and costs of maintenance and replacement. These will be offset to some extent by income from users and from taxes. Such costs and revenues are generally much easier to determine than external costs and changes in these two factors are crucial in determining whether an individual policy instrument, or an overall strategy, is affordable. It is often the case that low cost instruments will offer greater value for money than major infrastructure projects.

2.3 External costs (see PROPOLIS Del 3.1)

Externalities are changes of welfare which are caused by economic activities without being reflected in market prices. A negative externality is a cost to society and should be reduced, a positive externality entails a benefit for the actors affected (and is not considered in the context of economic problems). The negative externalities of transport are:

- *Environmental impacts* of gaseous emissions (both in terms of air pollution and in terms of global climate change): sulphur dioxide (SO_2), nitrous oxides (NO_x), particulates (PM), carbon monoxide (CO), volatile organic compounds (VOC) and carbon dioxide (CO_2).
- *Noise impacts (see synthesis on environmental problems for the above two issues).*
- *Accidents impacts*: road traffic accidents can cause high levels of death and injury as well as material loss. Beyond the cost of medical care relating to these deaths and injuries there is a wide range of social costs in terms of loss and suffering to the victims and their families and also to the economy in general in terms of e.g. policing and administrative costs and loss of production. (ISHTAR, Del. 9.1).
- *The use of valuable urban land* this is the cost to the economy of land used – largely – by motorists to drive and park their cars at a price lower than its market value.

- *Loss of time*: as more vehicles enter the transport network, capacity constraints lead to delays to all the vehicles in the system. The major cost component of this delay is the road users' value of time lost – though this is of course only partly an external cost since it is also borne by those, who cause it. Congestion situations will further lead to an increase in other environmental impacts, notably air pollution and noise. It should be noted that measurement of traffic/transport effects in ISHTAR should not be limited to private road vehicles but should also consider public transport of all types and the non-motorised modes. (ISHTAR, Del. 9.1).

There has been some debate firstly about whether the external costs of transport should be measured in terms of willingness to pay (WTP) of users, costs of replacement of the depleted resources or costs of prevention and secondly about the economic values that should be attributed to these factors. The estimates of the net total costs (taking into account the costs already internalised by transport users through fuel taxes, insurance etc, which vary from country to country) attributable to external effects would allow to assess the difference between the external costs in the different policies and the external costs in the reference solution. This difference should represent the net benefits produced by a measure or instrument – if the externalities are forecast to rise; the policy approach should be re-examined.

Estimate of accident costs by mode *(SEE PROPOLIS, DEL. 3.1)*
Quantifying the cost of accidents is often difficult because of the lack of data recording the responsibility of accidents as well as the consequences of the accidents, both as health damages and as social costs. The other key issue is to establish not only the overall costs of accident but also to assess how much is already paid by transport users through the insurance policies and through the payment to the health national services. In general the whole cost of accidents includes:

- the risk value or human value
- the human capital losses
- the medical care
- administrative costs
- the damage to property

The five components have different weights, which also change with the gravity of the accidents. The assessment of the human value is usually carried out by means of Stated Preference procedures, that lead to the definition of the willingness to pay for the reduction of the number of accidents, measure of the statistical value attributed to the human life from the community. As expected and as well confirmed by the reviewed studies, this represents the high majority of the total cost, and it is obviously far higher in the case of fatalities.

The other estimates are carried out in a simpler way as they are quantifiable in money terms. As a matter of fact, the losses in human capital refer to the loss of production, either temporary or perpetual. The other costs listed above are, though with some difficulty for the computation of specific costs, represented by monetary expenses and are therefore easily assessable. The external accident costs are obtained by deducting the transfers from liability insurance systems and gratification payments, they are therefore net externalities.

The most recent publication on this issue is the 2000 report from INFRAS-IWW, in their "External Effects of Transport" carried out for UIC. The assessment of accident costs in

PROPOLIS will be conducted with the help of values estimated for the year 2010, on the basis of trends of accidents, traffic and growth of GDP per capita. The improvement of the procedure and the consequent methodology of assessment of the economic impact of accidents should take into account other variables. In principle the cost of accidents, both for the external and the internal quote, is highly dependent on the severity of the single accidents which is a random variable on the one hand, but could on the other hand be significantly dependent on other variables such as the speed of flow, the level of congestion and so on. The probability of accidents is in many ways difficult to model as it depends on factors such as the geometry of roads and junctions, the composition of traffic (trucks, cars, bicycles etc.), the speed limits, the individual drivers etc. All these factors influence the probability of accidents and some policies, as for instance policies of speed reduction, could in principle lower the frequency and the severity of accidents.

The reference values in the table below, taken from the INFRAS/IWW study, as well as values calculated by other studies, take into account an average severity of the accidents. The input values are the number of accidents and the consequences of accidents. The average that is therefore calculated does not consider how accidents are distributed across the different types of roads or the specific severity of accidents occurring in different areas and under different traffic conditions.

The estimate of accident costs presented below attempts to take account of the total costs of accidents by country. The cost of an accident is attributed to the (type of) vehicle that is responsible for the accident and an average economic value is attributed to each accident according to the severity of injuries and/or to the number of victims. Therefore, the results that are presented are average costs, obtained by taking into account the entire traffic of a country and the combined costs of all accidents. The values reported from INFRAS-IWW are summarised in the following table.

Table 2.2: Average External Accident Costs by Country and Type of Vehicle for 1995

	Passenger (Euro/1000 pkm)				Freight (Euro/1000 tkm)
Country	**Car**	**Motorcycle**	**Bus**	**Railways**	**Trucks**
Austria	51	293	2.1	1.4	5.6
Belgium	46	262	5.0	0.8	12.4
Denmark	25	178	2.0	1.6	4.8
Finland	26	163	2.4	1.3	6.2
France	32	245	2.7	0.9	18.6
Germany	48	305	3.2	0.8	11.9
Greece	33	282	5.1	2.1	12.3
Ireland	30	209	5.2	0.7	6.1
Italy	32	206	3.0	0.4	10.7
Luxembourg	47	315	3.6	7.1	8.7
Netherlands	34	245	2.1	0.2	4.6
Norway	20	132	2.8	1.9	7.8
Portugal	35	281	2.7	4.3	20.6
Spain	27	185	1.8	0.3	16.0
Sweden	19	142	2.0	0.3	8.5
Switzerland	37	244	2.8	1.4	13.2
United Kingdom	33	241	5.4	0.9	9.0
Average EUR17	**36**	**250**	**3.1**	**0.9**	**11.5**

Source: INFRAS-IWW, *External Effects of Transport*

The problems that arise concern the validity of data for specific applications as for example for urban traffic modelling and appraisal. Accidents in urban areas are often less severe, but on the other hand they are also more frequent. Also, forecasting of accident costs in the year 2010 should estimate a lower average cost due to several effects - above all the expected reduction of numbers of accidents and the improved safety of vehicles circulating.

The following table presents the results of a study reported in "I costi ambientali e sociali della mobilità in Italia", which takes into account firstly the results produced by CENSIS (Censis, 1997) regarding the costs of accidents in Italy, and secondly the risk value from ExternE (EC, 1997) as a homogeneous value considered for other external cost estimates.

Table 2.3: Average Costs of Accidents in Italy, 1995

	Total cost (million Euro)	**Average cost (Euro/1000 pkm)**	**Average cost (Euro/1000 tkm)**
Road			
Cars	19.7	31.9	-
Motorcycles	5.4	110.6	-
Bus	0.2	2.1	-
Freight	1.7	-	6.3
Rail			
Passengers	1.0	1.6	-

Source: report by "Amici della Terra", *I costi ambientali e sociali della mobilità in Italia.*

The values obtained are quite similar to the results provided by INFRAS-IWW, and in a sense they therefore validate each other. It must be remarked, however, that the largest fraction of these costs is attributable to the value of life and that the main source for quantifying this value is in both cases the EC project ExternE. In addition to this, the highest differences are regarding modes of transport that are either less important in terms of volume (the case of motorcycles) or not represented in the urban models (trucks[2]).

The project ISHTAR (Del. 9.1) presented an estimate of accident cost components according to severity.

[2] [author's comment: Is it true, that models of urban traffic do not take into account trucks and if so, what is the justification?]

Table 2.4: Monetary Values for Accident Cost Components

Monetary values for accident cost components

€/case	Willingness-to-pay component (a)			Costs for rest of society component (c)		
Country	Fatality	Severe Injury	Light Injury	Fatality	Severe Injury	Slight Injury
Austria	1,367,000	177,700	13,700	136,700	27,800	2,610
Croatia	299,000	38,900	3,000	29,900	2,700	120
Denmark	1,395,000	181,300	13,900	139,500	11,000	1,130
France	1,172,000	152,400	11,700	117,200	30,400	1,980
Germany	1,380,000	179,400	13,800	138,000	28,500	2,960
Greece	837,000	108,800	8,400	83,700	9,900	730
Hungary	567,000	73,800	5,700	56,700	5,400	240
Italy	1,147,000	149,200	11,500	114,700	12,300	900
Netherlands	1,400,000	182,000	14,000	140,000	21,200	2,350
Poland	460,000	59,900	4,600	46,000	4,100	180
Slovakia	568,000	73,900	5,700	56,800	5,100	220
Slovenia	864,000	112,300	8,600	86,400	7,800	340
Spain	1,061,000	137,900	10,600	106,100	5,400	270
Sweden	1,235,000	160,500	12,300	123,500	43,800	2,230
Switzerland	1,769,000	230,000	17,700	176,900	41,300	3,150
United Kingdom	1,251,000	162,600	12,500	125,100	17,700	1,880

Journey Time Valuation (from ISHTAR, Del. 9.1)

Congestion can be defined as a situation in which transport participants cannot move in a usual or desirable manner. Journey times increase in congested streets. From an economic point of view, these time losses can be expressed in money terms; they constitute any increase in vehicle operating costs and the value (WTP) that travellers place on extra time spent on a journey.

As recommended by the Commission's High Level Group on Infrastructure Charging (WG2) (Nash et al., 1999) the external congestion costs are estimated by modelling the interaction of demand and supply on the road network under consideration. Time losses are quantified by the use of speed-flow curves, which demonstrate the impact of an extra vehicle on overall speeds (and hence the extra delay caused).

The values of time used to value delay are derived from four state-of-the-art studies: two Dutch values of time (VOT) studies [no reference provided, ed.], a Swedish VOT study by Algers, the Wardman review, 1998 and DeJong's Dutch study on freight [no reference provided, ed.]. The values are transferred to other countries by factors derived from "real per

capita income at purchasing power parity exchange rates for each country"[3] using the Netherlands/Sweden/UK average as the base.

Table 2.5: Monetary Valuation of Travel Time (€/person hour)

Monetary valuation of travel time (∈ /person hour)

Country	Business	Commuting / private	Leisure/holiday	Freight
Austria	22.66	5.26	3.51	46.4
Croatia	4.94	1.18	0.78	10.1
Denmark	24.13	5.37	3.58	49.4
France	20.03	4.51	3.01	41.0
Germany	21.82	5.31	3.54	44.7
Greece	13.44	3.22	2.15	27.5
Hungary	9.93	2.19	1.46	20.3
Italy	20.41	4.42	2.95	41.8
Netherlands	22.89	5.39	3.59	46.9
Poland	7.60	1.81	1.21	15.6
Slovakia	9.38	2.23	1.49	19.2
Slovenia	14.25	3.39	2.26	29.2
Spain	16.34	4.09	2.73	33.5
Sweden	20.66	4.75	3.17	42.3
Switzerland	25.68	6.81	4.54	52.6
United Kingdom	20.56	4.90	3.26	42.1

Source: EUNET; Based on Nellthorp (2001)

Costs of Land Use

The World Resources Institute (WRI 1992) estimates the cost of driving not borne by drivers at 300 billion US$ per year (year 1989) or about 1.000 $ per US citizen. Of this amount, land taken up for roads and parking amounts to 160 billion US$, according to their estimation. If this estimation is transposed to Europe (or Japan) the figure should be much higher since - as a result of higher population density - the value of land is higher. The WRI analysis does however only include land permanently frozen for other uses. It does not include the time dimension. However, the motorist not only uses about 20 times more urban space than the pedestrian but also has to find space for the car every time it is not in use, i.e. some 95% of the cars total life cycle. The area/time consumption of land (or dynamic consumption of land) by the motorist is therefore many times more than 20 times the space consumption of the pedestrian. A ratio of one to hundred in dynamic space consumption for the motorist leaving his car for the whole day at his workplace seems a reasonable estimation. In comparison to cyclists, motorists use about 8 times as much space when parking (much more when in motion due to greater safety zones) and also considerably more than public transport

[3] The purchasing power parity exchange rates convert national currency values to a hypothetical euro value relating to the real value of each national currency. These were calculated before the introduction of the single European currency.

users, though this of course depends on the mode of transport (bus, tram, light rail) and its level of use.

2.4 Financial/fiscal barriers (see TRANSPLUS Del 4.1)

These are barriers with a financial/ fiscal dimension that cause hindrance, delays or obstacles in the process of design/ planning and implementation of an integrated land-use and transport policy package or measure. In discussing the financial dimension of barriers, in all cases of infrastructure provision, it is important to overcome the low profit nature of most infrastructure projects. Therefore, value capture has been seriously considered as a financing mechanism in many countries – and mostly outside Europe.

Financial barriers include:

- barriers caused by inter-territorial conflicts, relating to the competence and power of different levels of government in relation to taxation of both land use and transport assets and activities, on the one hand, and financing of current and capital expenditures for the provision of public services and infrastructures, on the other. They include problems raised by financing infrastructures as well as public services specifically related to land use development and transport: planning departments, traffic management, parking management, subsidies for public transport, etc.;
- barriers caused by inter-organisational conflicts, relating to the competency and financial capability of organisations, which are more or less within the same territory and thus do not experience, at least in principle, inter-territorial conflicts in relation to financing of transport and land use integrated projects within the same area of competence;
- barriers to the adoption of value capture and innovative finance, stemming from a specific inter-professional conflict, which especially affects project finance, i.e. the lack of communication between international project finance and local property development. The necessary exchange between international and local communities hardly exists, or it is limited only to some renowned places. Economic planners and property advisors are not yet able to assess impacts on land and property values in such a precise way that they can be fitted into the rules of international project finance. While the latter is increasingly a global profession, property markets and their advisors are mostly acting at a local level;
- barriers caused by risky land use and property markets, relating to the specific features of land and property markets, which tend to be vulnerable and cyclical, causing substantial extra risks when expected revenues from these markets are used to co-finance infrastructure projects, and especially those on a large scale. This is a kind of intrinsic barrier, linked to the functioning of the real estate markets, and must be treated mainly with the enhancement of project ex-ante evaluation methods and procedures and better risk allocation between public and private sectors.

2.5 Freight and City Logistics (see CITY FREIGHT Final Report WP1)

The relative performance of different modes of transport over time includes changes in the cost of production factors and improvements in technology. All modes of transport have enjoyed reductions in unit cost due to improvements in vehicle design, vehicle production processes, lower maintenance requirements and better fuel consumption. On balance those improvements have favoured road transport, which is reflected in its increasing share of the freight market.

While the overall level of transport grew, the market share of each transport mode developed in a different way. This change of modal split was induced by economic and technological but also socio-political and organisational trends. Besides the general growth of traffic business and outsourcing, trends have lead to a higher traffic volume since more goods have to be transported. On the household level mass customisation has also increased the transport demand. Customers expect a flexible delivering system and products focused on their demands. A higher number of consignments and, consequently, of transports are the results of increasing individualisation in a society that can only be served by road based deliveries. On the other hand the introduction of the 24 hours economy could be seen as a chance to even out peaks in daily traffic levels especially in urban areas.

Only trucks are able to adapt quickly to new market demands. Tougher competition due to trucking deregulation and new technological developments changed the cost structure and lowered fares. Consumers also enjoyed a greater selection of companies because of new market entries. However, stricter environmental legislation and rising congestion makes many companies consider usage of modalities other than road transport. Government authorities view this development as very positive. The development and building of intermodal sites (both terminals and industrial estates) is strongly stimulated by governments of most of the European countries (these policies to be discussed further on).

At present times rail transport cannot compete with road transport. The railway sector is being deregulated as it is often considered that the monopolistic situation of most suppliers eliminate tendencies towards innovation and engagement in a customer-oriented service. However, it must be noted, that very different experiences exist in this sector and deregulation is not a guarantee for a better service (see for example the British experience).

Furthermore, railway system characteristics and the different technical equipment of European railways cause difficulties in accommodating market needs. However, the Second Railway Package, COM (2002)18 final, introduced by the European Commission in January 2002 proposes a set of measures to improve safety, interoperability and opening of the freight transport market.

The biggest impacts on city distribution will be generated by business to consumer trade (B2C). The increase of B2C e-trade requires new logistics arrangements also in the city centres, such as space for reception boxes, terminals concentrated on providing logistics operations tailored to the needs of e-trade as well as new traffic arrangements and information services. New arrangements will be a relevant problem especially in the old city centres with narrow streets.

In the future, shopping centres and supermarkets will increasingly be established in the outskirts of towns and cities. This will decrease cargo traffic in the centre but, on the other hand, increase passenger car traffic and deliveries alongside city centres. Shopping centres with many different shops will also increase the number of deliveries due to lack of logistics co-operation between retailers. The trend towards more centralised distribution at the European level will increase the distances driven.

3 MODEL RESULTS

In recognition of the strong links between transport and a wide variety of economic factors, increasing attempts are made to account for these connections in modelling. The models can be used to forecast the impact certain transport policies or measures have on economic indicators.

3.1 Economic Indicators

As part of the PROPOLIS project, a set of economic indicators was developed to help in the economic evaluation of transport policies (Del. 3.1) through models. These indicators were classified in 3 main categories:

- the indicators derived from direct impacts from the transport sector,
- the indicators derived from the impacts observed on the land-use side,
- the indicators relating to overall impacts on the economy.

The indicators will be calculated for various case studies through the Economic Indicator Module (EIM) described in PROPOLIS Deliverable 3.2. They are summed up in the following table, together with the indication of the level of disaggregation obtainable according to the methods of calculation.

Table 3.1: List of the Economic Indicators Produced by the Propolis Methodology

Acronym	Title	Level of Disaggregation
ETIC	Transport Investment Costs	None
ETUB	Transport User Benefits	None
ETOB	Transport Operator Benefits	by mode of transport
ETGB	Government Benefits from Transport	by mode of transport
ETAC	Transport External Accident Costs	by mode of transport
ETEC	Transport External Emissions Costs	by zone type
ETGG	Transport External Greenhouse Gases	None
ETNC	Transport External Noise Costs	by zone type
EEEI	Economic Evaluation – Economic Index	None
ETGC	Transport Generalised Costs variation	by SEG
ELFP	Change of Floor Prices	by land use zone
ELPG	Productivity Gain from Land Use	None

The first group of indicators represents the result of a complete Cost Benefit Analysis where benefits are subdivided in different indicators. In particular, the ETIC (Transport Investment Costs) indicator refers to the flow of cost of investment, management and maintenance of the infrastructures expected in the policy.

The social surplus, which is usually accounted as a whole, is split in 3 different indicators (ETUB Transport User Benefits, ETOB Transport Operator Benefits and ETGB Government Benefits from Transport). In brief, the three indicators aim to distinguish how benefits are subdivided among different actors: a positive value would be a benefit while negative values for these indicators represent a cost for the given subject (users, operators or government). It is likely that in the application of the PROPOLIS analytical framework the 3 indicators will show different signs.

Four indicators (ETAC Transport External Accident Costs, ETEC Transport External Emissions Costs, ETGG Transport External Greenhouse Gases and ETNC Transport External Noise Costs) aim to distinguish the main components of external costs. They could also show either positive or negative signs: for example the construction of a new ring road around the urban centre could at the same time cause an increase of greenhouse gas emissions (ETGG<0), a reduction of noise (ETNC>0), an increase in accident severity (ETAC<0) and a reduction of local pollution damages (ETEC>0).

All these indicators can be summed up in a synthetic Economic Index that would show the overall economic impact as measured by means of a good cost benefit analysis. Since all the indicators are calculated as actual benefits per inhabitant, the economic index thus defined would represent the impact of the policies on every resident, while the single indicators show how the overall impact can be shared between different actors and between different effects. The Economic Index will be calculated by EIM with the acronym EEEI (Economic Evaluation – Economic Index).

The three indicators in the second group are different:

- The ETGC (Transport Generalised Costs variation) indicator, which provides an indication of who benefits more or who is more affected from the changes in mobility. In brief, on the basis of the SE group defined in the harmonisation of the city models, the indicator tries to establish the distribution of the costs and benefits of a given policy among the different users group.
- The ELFP (Change of Floor Prices) indicator, which assesses the amount of benefits that are transferred in the land use market. The change of floor prices is indeed a proxy for the analysis of the indirect impacts of transport policies. As could be the case for instance of new infrastructure (a road, a rail line) which improves the accessibility of a particular area: that area will presumably show an increase in floor space values as a result of its accessibility increase. This change in floor space values is basically dependent on reduced travel times and/or costs to all or specific destinations, i.e. the standard transport benefits. Whether the benefit will remain internal to the land market or will be transferred to other users, for instance services located in the area, is out of the scope of the evaluation model. The indicator is therefore only a first measure of the process of transferring benefits from transport to other markets. The harmonisation of the models led to the definition of 3 main floor destinations: industry, offices/commercial, and residential. The indicators show how prices of the three floor space types change in different policy alternatives.
- The indicator ELPG

Wherever possible, benefits can thus be calculated separately by mode of transport or by zone. However, the aggregation/comparison of benefits can be conducted only for the whole of each indicator; the more detailed subdivisions that have been implemented would help in checking results and understanding how policies work but would not help for the overall evaluation. The list of the indicators shown above was slightly updated from the one included in Deliverable 3.1.

Further tests with the EIM input/output software component have been performed including a full test with the Helsinki model. Minor errors were reported and are currently studied before the release of the final revised software for all partners. The contribution made through the EIM tool will also be useful in the light of findings from the MC ICAM[4] project, which aims

[4] Marginal Cost Pricing in Transport - Integrated Conceptual and Applied Model Analysis

to develop principles and guidelines for implementation pricing policies that in turn aim at internalising the marginal costs of transport to the user.

3.2 Policy Interactions

Ultimately, it will not be sufficient to model separately the impacts of individual policies and instruments since the urban transport situation generally demands a package of measures in order to solve existing problems. However, in such cases it will be important to understand in which way different policy measures and instruments affect each other. In this context it will be interesting to consider the results of the project SPECTRUM (not yet available), which aims to 'to develop a theoretically sound framework for defining combinations of economic instruments, regulatory and physical measures in reaching the broad aims set by transport and other relevant policies'.

4 EMPIRICAL EVIDENCE, CASE STUDIES AND TRANSFERABILITY

4.1 Artists

The project ARTISTS, which aims at producing an holistic analyses of problems and methods for improving the environmental and living conditions on and along the arterial streets in European cities intends to quantify the connections between types of arterial streets and;

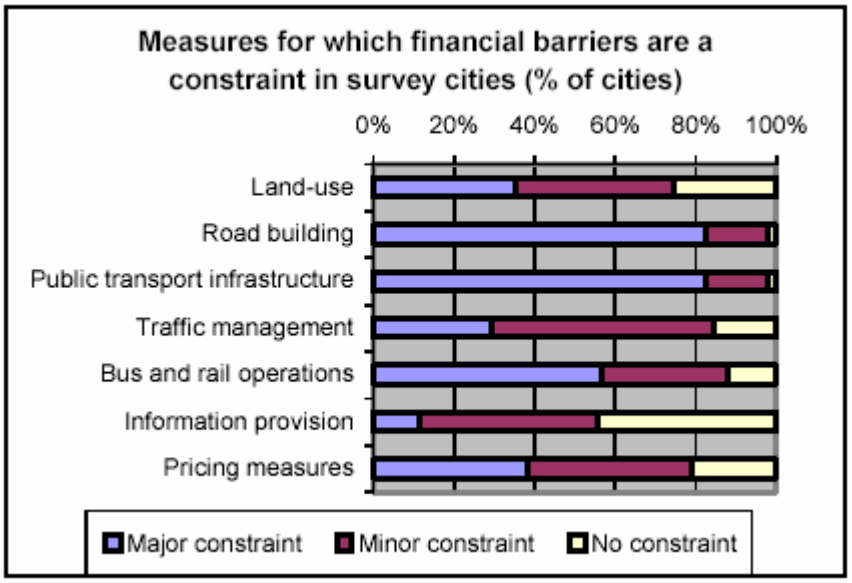
- The type of land use (activities in the buildings surrounding the arterial streets like share of residents, shops, offices, etc) as well as
- The attractiveness of the location (rents for the premises, share of un-let square meters, etc).

Results are expected in early 2004.

4.2 Assessment of Financial Barriers

Financial barriers include budget restrictions limiting the overall expenditure on the strategy, financial restrictions on specific instruments, and limitations on the flexibility with which revenues can be used to finance the full range of instruments. Road building and public transport infrastructure are the two transport policy areas which are most commonly subject to financial constraints, with 80% of European cities stating that finance was a major barrier. Information provision is the least affected.

Figure 4.1: Financial Barriers to Implementation of Transport Measures



(Source: PROSPECTS, Del. 15)

Initial evidence of financial barriers produced by the first stage of TRANSPLUS case study analysis failed to show cases of value capturing and conscious recourse to innovative forms of land management and revenue raising. This evidence was too fragmented to allow the full assessment of barriers within specific cases, although it provided the needed hints to select those case studies where a further assessment of financial barriers has been done in the second stage of case study analysis, including Bilbao, Lisbon, Croydon, Nantes, and Rome. Not surprisingly, the level of policy integration needed for a widespread diffusion of value capture practices is far from being achieved, at least in Europe, where there are no robust examples to be reported.

The evidence suggested the following categories of barriers (which have been described above)

- barriers caused by inter-territorial conflicts
- barriers caused by inter-organisational conflicts
- barriers caused by risky land use and property markets
- barriers to the adoption of value capture raising from inter-professional conflicts

Although a rigid hierarchy between the financial barriers mentioned above cannot be established, it is useful to think in terms of more or less fundamental barriers that should be addressed activating a logical sequence of steps, to solve first the more fundamental barriers and then the less important.

A second round of analysis confirmed the presence of inter-territorial and inter-organisational conflicts and the absence of significant evidence of problems associated with land use and property market dynamics, as well as of value capture practices. Due to the differing nature of the identified financial barriers the assessment was done on a case-by-case basis. The following table provides an overview of the case studies selected for this further assessment, and its main results.

Table 4.1: Overview of Results of Assessment

CITY	CONFLICTING SITUATION	BARRIERS	Solutions
Bilbao	Inter-organisational conflict between local governments	No barriers to report	Financial: Public-Private Partnership (PPP)
Lisbon	Inter-organisational conflict between municipalities	Financial: lack of resources	Organisational: co-ordinating agency (Parque Expo'98)
London	Inter-organisational complexity	Financial: complicated funding co-ordination	Institutional: Greater London Authority
Rome	Inter-territorial conflict between the national and local governments. Inter-organisational conflict between the municipality of Rome and the surrounding municipalities.	Barriers with financial implications: Legal: contrasting legislation Organisational: lack of co-operation Institutional: political opportunism	Institutional: Metropolitan Authority Legal: legislation for Rome Financial: PPP and Transfer of Development Rights (TDR)

Source: TRANSPLUS, Del 4.1

4.3 City Freight (Final Report WP 1)

The type and detail level of information about urban freight distribution volumes and structure vary substantially from city to city. Similarly, the views as to which traffic elements should be included in urban freight transport also vary. Since the availability and comparability of information concerning urban freight flows is poor, it is not reasonable to delimit the concept of urban goods transport here. However, knowledge on freight activities is essential in public and private decision making and its unavailability is one of the main problems in improving urban logistics. Information is lacking on **daily freight traffic** on different street and road segments in cities.

Although the data available for each city varies considerably, a summary table of different types of data and key figures was collected, presented in Annex 3. Even though it is not possible here to make comparisons of these variables in different cities, the example figures give an overview of city freight distribution indicators and driving factors.

Summary of national and local policies and strategies on urban freight transportation:

- Only 2 City Freight countries have explicit urban freight policy documents: the French national program Goods in the City from 1993 and the British Sustainable Distribution: A Strategy from 1999.
- The other countries only have general traffic/transport/freight policies and strategies, parts of which may concern urban freight issues.
- At the local level, freight transport issues are more commonly included in traffic policies or research and development activities.
- Traffic and freight policies and strategies discuss and set objectives for the following themes: environmental effects of traffic (emissions, noise and accidents), congestion, efficiency of transport, dialogue between private and public actors, land and infrastructure use, accessibility, information and communications technology, research and development, databases and dissemination of innovations, and restrictions of urban freight traffic.

Table 4.2: Problems and Development Needs in City Freight Distribution

	Operations	Market	Land use / infrastructure	Environment and safety	Policies, planning and regulations
Congestion (town centres and access roads), often made worse by transit traffic and passenger traffic	•		•	•	
Lack of unloading and parking places for delivery vehicles	•		•		•
Fragmented and frequent deliveries generating more traffic	•	•		•	
Co-operation and exchange of information between private and public actors in urban traffic planning	•	•	•	•	•
(Historical) town centres with narrow streets and other obstacles	•		•		
Urban freight transportation absent in local town and traffic planning			•		•
Environmental impacts (emissions, noise, safety risks, etc)				•	•
Lack of off-street (un)loading places	•		•		
Poor unloading conditions	•			•	
Viability of town centres vs. congestion/heavy traffic		•		•	
Signage	•				
Fragmented transport industry		•			
Time windows	•		•	•	
Wider planning needed (logistics chains, freight and passenger traffic)					•
Differentiated regulations					•
Profit margins in transportation sector		•			
Working time directive	•	•			•
Transport of dangerous goods in town centres				•	
Drivers (high turnover, lack of skills)		•		•	
Deteriorated transport infrastructure			•	•	
Violations of access and parking restrictions					•
Data transfer	•				
Driving behaviours	•	•			
Connections to port or airports			•		
Lack of information on urban freight transport			•		•
Land use / location of activities	•		•		•
Lack of co-operation in distribution	•	•			
Inefficiency of distribution	•	•			
E-Distribution	•	•	•		

5 TECHNICAL SUMMARY HIGHLIGHTING CONFLICTS, ASSESSMENT OF LIKELY IMPLICATIONS

The key economic problems in transport are created firstly by the internal costs (capital costs of new infrastructure, operating and administration costs, and costs of maintenance and replacement), which are to some extent offset by income from users and taxes but often act as barriers to policy implementation. The second problem is the external cost caused by pollution, noise, accidents and loss of time (mostly through congestion).

Finding a reliable way to estimate *net total costs* attributable to external effects under specific conditions (taking into account the costs already internalised by transport users through fuel taxes, insurance etc. - these vary from country to country) would enable the assessment of the difference between the external costs of using different policy instruments and the external costs in the reference scenario. This difference should represent the *net benefits* produced by a measure or set of measures – if the externalities are forecast to rise; the policy approach should be re-examined.

One strategy for overcoming firstly the financial barriers, which cause hindrance or delay to the design, planning and implementation of integrated land-use and transport policy packages and secondly for reducing the negative externalities is to introduce some form of pricing mechanism. Such mechanisms function firstly as measures which help to solve congestion problems by steering users towards more sustainable transport choices. They can additionally be a source of additional revenue that can be reinvested in transport measures.

There has been – and still is - a debate among experts about whether the external costs of transport should be measured in terms of willingness to pay (WTP) of users, costs of replacement of the depleted resources or costs of prevention and also about the economic values that should be attributed to these factors. However, the European Commission favours marginal cost pricing according to the "polluter/user pays principle":

The key message of the Commission's infrastructure charging policy is that transport taxes and charges, in every mode of transport, should be varied to reflect the cost of different pollution levels, travelling times and damage costs as well as infrastructure costs - to apply the polluter pays principle and provide clear fiscal incentives to help achieve our goals of reducing transport's congestion, pollution, re-balancing the modal split and decoupling transport growth from economic growth. Getting transport operators to pay is fair, and helps make better use of the existing infrastructure capacity.[…] and applying the user pays principle is fundamental to commercial practices and liberalised markets. (source: http://europa.eu.int/comm/transport/infr-charging/charging_en.html, accessed 26.8.2003)

To be able to attach an actual price to different modes and travel choices as well as to allow the economic evaluation of transport policies, the PROPOLIS project developed a set of economic indicators (Del. 3.1) through models. These indicators include both internal and external costs and are summed up in a synthetic Economic Index that should show an overall economic impact as measured by means of a cost benefit analysis. Once the economic impacts of existing measures have been assessed, pricing policies can in theory be developed to help internalise the marginal costs of transport to the user.

However, some projects have identified problems in existing models and also in the debate on how to evaluate transport externalities. The MC ICAM[5] project, which aimed to develop principles and guidelines for implementation pricing policies pointed out in its Deliverable 3 (Modelling and Cost Benefit Framework) that there is an ongoing debate in the profession for example about how much of the costs of accidents are internal to travellers rather than being borne as externalities by the rest of society.

Consequently, the project also identified a lack of consistency in the treatment of accident costs across different models currently available. This inconsistency compromises the goal of maintaining, to the greatest extent possible, comparability of results across different cases of application. Due to potential interaction effects between accidents and other externalities, as well as the effect of accident costs on trip frequency and mode choice, the treatment of accidents can affect estimates of the efficiency gains from internalising other externalities, too.

In terms of predicting changes in internal transport costs though, the PROPOLIS project showed that current modelling packages are well able to predict changes in capacity, congestion and user costs (in terms of time and money). The main exception to this observation was that (as shown in Table 5.2) travel costs to road and rail freight companies were not included in the models (although a number of the models take into account changes in costs to road freight companies simply due to route switching).

This could partly be due to the fact that the actual availability and comparability of information concerning urban freight flows is poor (cp. project CITY FREIGHT). Knowledge on freight activities is essential in public and private decision making, though – as well as for modelling the potential impact of such decisions - and its unavailability is one of the main problems in improving urban logistics.

The projects reviewed have tested and compared many of the modelling instruments currently available for assessing the overall economic implications of current transport situations and the potential impacts of various policy instruments or packages of instruments. The projects have attempted to fill some of the gaps identified but also found, that there is still a lack of consistency in the treatment of different economic factors in different policy and modelling approaches. Secondly, there is a lack of information on especially urban freight (but other factors as well) which makes it difficult to operate even the tools currently available with a satisfactory degree of accuracy.

[5] Marginal Cost Pricing in Transport - Integrated Conceptual and Applied Model Analysis

6 LIST OF MOST USEFUL REFERENCES AND WEBSITES

6.1 References

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6.2 Weblinks for Projects Mentioned in this Synthesis

http://www.tft.lth.se/**artists**/ (includes deliverables)
http://www.**ishtar**-fp5-eu.com/ (includes deliverables)
http://www.**mcicam**.net/ (includes deliverables)
see also: http://www.imprint-eu.org/public/list%20of%20authors4.htm for papers presented at the Fourth IMPRINT-EUROPE Seminar, which focussed on the MC-ICAM project

http://www.ltcon.fi/**propolis**/index.htm (does not include deliverables)
http://www-ivv.tuwien.ac.at/projects/**prospects**.html (includes deliverables)
http://www.its.leeds.ac.uk/projects/**spectrum**/ (will include deliverables)
http://www.**transplus**.net/ (includes deliverables)

6.3 Project Deliverables Quoted

- CITY FREIGHT - Final Report WP1 – September 2002
- MC-ICAM - Deliverable 3 *Modelling and Cost Benefit Framework* - March 2003
- PROPOLIS - Deliverable 3.1 *Literature review and theoretical analysis for the economic evaluation* - June 2001
- PROPOLIS - Deliverable 3.2: *Economic evaluation - Harmonisation of the implementation in the different models - The EIM (Economic Indicator Module) software tool* - 'November 2001
- PROSPECTS - Deliverable 3 *Key Modelling Issues* – August 2001
- PROSPECTS - Deliverable 15 *Decision Makers Guidebook* – January 2003
- TRANSPLUS - Deliverable 1.1 *Impacts of Megatrends on Transport and Land Use in Europe Final Version* – October 2000
- TRANSPLUS - Deliverable 4.1 *Assessment of Barriers and Solutions* – April 2002