Road pricing and urban freight transport: practices and developments from the BESTUFS project

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Abstract

This paper gives an overview on the situation, practices and developments relating to road pricing in Europe in an urban freight context. It is based on the outcome of the BESTUFS project (Best Urban Freight Solutions, 2000-2003, [1, 15]), a thematic network project within the 5th Framework Program of the European Commission and projects relating to freight transport and road pricing carried out by Rapp Trans AG. The main focus of the content is on practices with implemented pricing schemes in European urban areas (e.g. London) and on truck pricing (e.g. Heavy Vehicles Fee in Switzerland). Although most of the implemented schemes in urban areas are designed originally for passenger transport, the contribution will take the view from the freight transport side. Success and failure factors have been identified and finally some conclusions and recommendations for the implementation are made.
Keywords: road pricing, urban freight transport, BESTUFS, London congestion charging, Swiss Heavy Vehicles Fee.

1 Introduction

More than 80% of today's road freight trips in European conurbations are on distances below 80 km and can be defined as urban or urban-regional transport. The delivery and collection of goods within urban and metropolitan areas, especially in the core areas of cities with old and established centres has a major impact on the local community concerning the economic power, quality of life, accessibility and attractiveness of a city. This means that an efficient and environmental friendly urban transport system is essential for the economic health and the quality of life of urban areas. It is therefore important to assess the


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opportunities and chances of technical (vehicle technology, telematics applications, etc.), organisational (co-operation, time windows, weight limits, etc.), operational (route planning, etc.) and economical approaches as road pricing for improving the urban transport systems. Road Pricing is not a new issue, but its importance grew rapidly within the last years due to the fast increasing traffic problems - especially in urban areas, the technical innovations in transport telematics and the growing political willingness to accept that road pricing can be an option to reach a more sustainable transport [8].

2 The BESTUFS project

The European Commission established the thematic network on BEST Urban Freight Solutions (BESTUFS) in January 2000 with a duration of 4 years [1, 15]. BESTUFS is aiming at identifying and disseminating urban freight solutions which are considered best practice in Europe (Fig. 1). It collects and assesses innovative solutions and brings together the different views of the actors in urban freight transport.

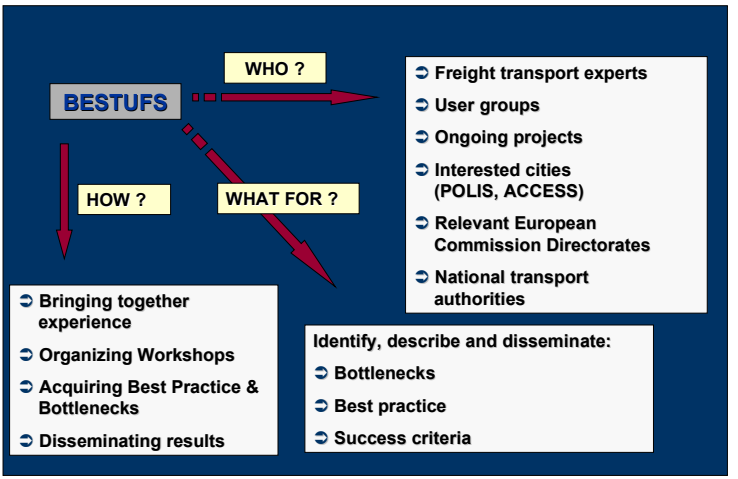

Figure 1: Approach of the BESTUFS project.

BESTUFS dealt with different topics in urban freight transport as statistical data/data acquisition, city access regulations, vehicle technology, e-commerce, road pricing, urban rail freight, urban freight platforms, night delivery, public private partnership, national research in urban freight and intelligent transport systems. The theme "Road Pricing and urban freight transport" has been treated in 2001 and 2002. A continuation of BESTUFS is foreseen for another 4 years and will start in 2004 within the 6th Framework Programme (BESTUFS II). The project is funded by the EC DG TREN and the Swiss Federal Office of Science and Education.

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3 Characteristics and key problems of urban freight transport in Europe

3.1 Characteristics of urban freight transport

Every city or urban area has its own freight transport structure depending on the economic structure, the relevant branches, the transport/logistics services and the transport network. Out of several studies and projects in European cities we can derive some average key figures for urban areas which are important for the design and implementation of a road pricing schemes [1, 5, 9]:

The share of urban freight transport is about 10 to 25% of the volumes and mileage on roads. Urban passenger and freight transport are overlapping especially in the morning peak hours.

Vans are responsible for about 60 to 70% of the urban road freight mileage and 5 to 15% of the urban road freight volumes. Trucks have a share of about 30 to 40% of the mileage and 85 to 95% of the volumes.

The Modal Split is about 85 to 100% road transport. On short distances and on the last transport leg to the consignee is often no alternative to road transport. 50 to 60% of the today's road freight trips in conurbations are below 50 km.

75 to 85% of the road freight vehicles are vans 10 to 25% trucks. Also the freight transport in cars is relevant relating to number of trips and mileage.

The most important commodities in services oriented cities are consumer goods (e. g. food, electronics), construction site related commodities (e.g. building material) and couriers/postal services. In more industrial cities als raw materials, machinery, semifinished and finished products are relevant.

Depending on commodities, branches and traffic related conditions urban freight vehicles are performing between 5 to 60 stops per day with a mileage between 50 and 200 km. The loading factor is usually between 20 and 40%.

In consumer regions – that is often true for urban areas - delivery transport chains are dominating against collection transport chains (e.g. waste transport).

The share of emissions (especially the critical ones as particles) is much higher then the share of mileage, due to the higher specific emissions of trucks compared to cars.

The share of freight transport on the whole transport sector will increase, interurban and in urban areas. Several changes in the economic structure, the demand and the logistics strategies indicate that freight transport will growing faster than passenger transport (Fig. 2). An increasing number of goods vehicles and an increasing mileage can be expected even without much higher transport volumes in tons. Freight transport growth is expected to be higher than economic growth. What is also important for designing road pricing schemes and the reaction on charges are the local framework conditions. In Europe there are many historical city centres and pedestrian areas. Access regulations are common relating to vehicle size, weight and delivery time windows. Night delivery with trucks is usually not allowed, but more and more required by the transport industry. Not widespread until now are access regulations relating to

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emission categories, preferred, loading and unloading zones/lanes, access / slot management and licensing systems.

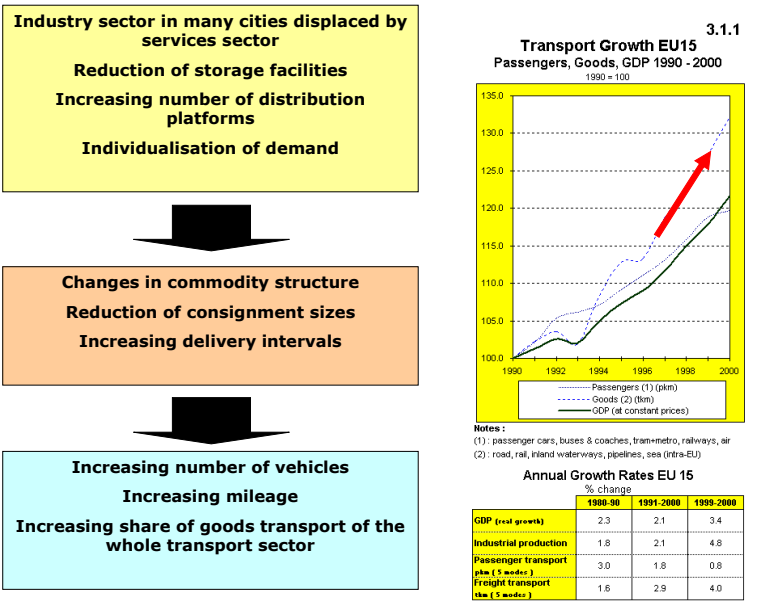

Figure 2: Development of urban freight transport.

The value of time in freight transport is about 5 to 10 times higher than in passenger transport due to the driver wages and higher vehicle costs. Charges in road pricing schemes for freight are usually the same (e.g. in London) or double (e.g. Bergen) of passenger transport, this means about 1 to 2 % of the daily transport costs. The price elasticity is very low in urban freight because of limited possibilities for changes in the transport patterns (due to access regulations, individual demand of the shipper, limited modal alternatives) and so are the direct effects of charges on urban freight limited.

For the shippers are leading times, reliability and frequency main decision factors [4]. They are heavily influenced by congestion. Therefore shippers are willing to pay for shorter leading times and increased reliability. For a 40 t truck (full load, 27 t net weight) a shipper is ready to pay about 20 Euros for 1 h lower leading time an 44 Euros for 1% more reliability [4]. The key factor in urban transport is often reliability. Leading times, flexibility and frequency are usually less important.

The infrastructure cost rates per vehicle are quite similar for cars and vans but different between cars and trucks [7]. Trucks produce about 3 to 5 times higher infrastructure cost per km than cars. This should be considered for the price level, especially when financing is an important factor for the pricing.

	Whole road network (CHF/km)	Motorways (CHF/km)
Car	0.11	0.14
Bus	0.32	0.30
Van (<3.5t)	0.13	0.17
Heavy Vehicles	0.34	0.42
Trucks (>3.5t), solo	0.25	0.29
Truck with trailer	0.54	0.64
Semi Trailer	0.52	1.30

Figure 3: Road Infrastructure costs by vehicle category (Switzerland).

3.2 Key problems in urban freight

Within the BESTUFS project a survey in more than 40 European cities was carried out to identify the problems, innovative strategies and how the cities deal with urban freight [6]. Most of the asked European cities have problems concerning urban freight transport. Other surveys and projects [5, 9] identified similar problems.

The key problems for urban authorities are the lack of suitable infrastructure for deliveries, accessibility, air pollution, congestion, noise and enforcement of regulations.

The key problems for transport operators and logistics services providers are congestion, accessibility, increased costs for the last mile delivery and the reduced reliability and predictability of deliveries.

So their views are not completely different, but the perception of effects of the problems. For authorities the relevant aspects are environment, attractivity of the city, location attractivity, safety and infrastructure. For the transport operators the main concerns are efficiency, service quality and profitability.

4 Road pricing situation in Europe concerning urban freight transport

Relating to road pricing and urban freight the situation in Europe is very heterogeneous [11]. Only about 1/3 of the European countries allow complex road pricing. The progress on national level is widespread.

A summarising overview on existing and planned road pricing schemes within Europe confirms the picture that quite a number of single roads (mostly non-urban) are charged, usually using toll booths. Charging motorway users is common in various southern countries as well as in France. For many motorway networks there are time based schemes, e.g. the “Eurovignette” for Heavy Goods Vehicles or the Swiss Motorway-Vignette for cars.

Although the implemented urban road pricing schemes are very few, there are a large number of ongoing initiatives and planned projects proving the increasing

importance of the issue. Several European research and pilot projects like PRIMA, PROGRESS, CUPID, DESIRE, IMPRINT, etc. dealt with road pricing.

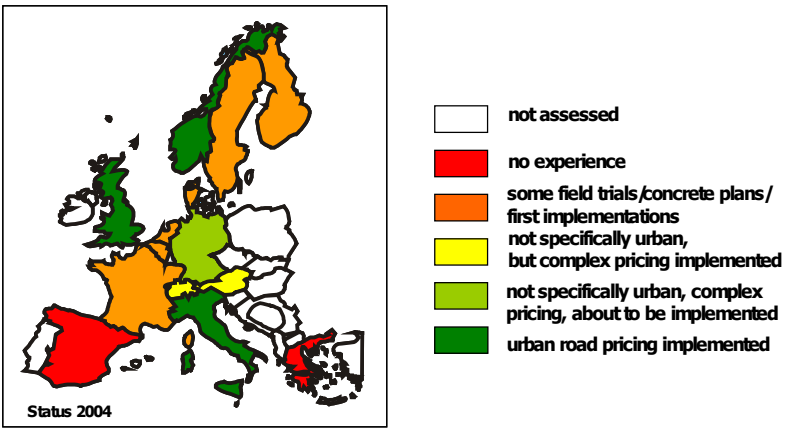

Figure 4: Urban road pricing situation in Europe.

Ahead in urban pricing are UK, Norway and Italy. Switzerland (2001) and Austria (2004) have introduced distance based heavy vehicles fees, which can also influence urban freight. Germany (2004?) plans to introduce also a distance based heavy vehicles fee in the near future. Also in the Netherlands and in Sweden this topic is on the political agenda.

Not all countries do jump on the European road pricing train. Urban road pricing, in particular for demand management, is a rather low profile issue in Finland, France and Greece. In Spain, the subject has been even abandoned.

Various schemes have been introduced: Single road pricing (e.g. Norway, France), cordon pricing (e. g. Norway, Italy), network pricing (e.g. Germany, Austria) or area pricing (UK, Switzerland). The schemes are more designed by political reality than by economic theories. There is also a strong influence by local conditions. Financing of infrastructure (e.g. Norway, France, Germany) and/or demand management (e.g. UK, Switzerland) are the main objectives. The focus is usually on passenger transport, urban freight is neglected despite its increasing share and the importance for the regional economy.

5 Experiences from two projects

5.1 London congestion charging

One actual and highly noticed urban road pricing scheme is the congestion charging in London [2, 11, 12, 13, 14]. It is also an interesting case from the urban freight point of view. The main aims of the pricing scheme are to reduce congestion, to make radical improvements in bus services, to improve journey time reliability for car users, to make the distribution of goods and services more

reliable, sustainable and efficient. So it is mainly a demand management approach with a financing element using the revenues to improve transport in London. It is an area pricing approach with a charge of £5 a day for entering the central charging zone between 07:00 and 18:30 during the week.

Figure 5: The congestion charging zone.

During the preparation phase it was planned to charge freight vehicles £15 compared to £5 for cars [2]. There is a discount on the charge if the vehicles meet certain emissions standards. £5 are about 3 to 5% of the daily costs of a truck including driver. During the consultation process the transport lobby reached a reduction from 15 to £5. Main Arguments of the transport industry against road pricing were "No alternatives to road freight", "No impact on their operation", "No congestion reduction", "worse conditions around the charging zone" and "No realisable benefits" [3].

The Monitoring of the implemented system [13, 14] showed a significant reduction of travel times (by 14%) and (by 30%). Other important effects are the 18% reduction in traffic entering the zone during charging hours and the reliability increase in public transport. The van and lorry movements have reduced by about 10%. Distribution businesses report a mixed picture: some are directly experiencing the benefits of reduced congestion; other see the charge more as additional costs. 60% of the businesses support today the London charging system. Before the implementation, the transport sector was very critical, but after the implementation the acceptance improved remarkably [12, Fig. 6].

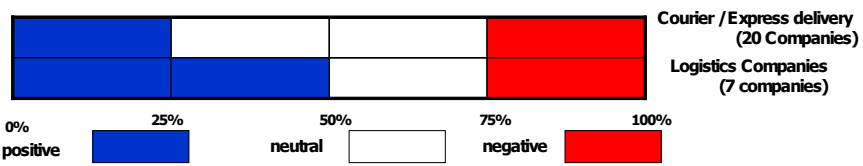

Figure 6: Acceptance of the transport industry.

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Positive arguments were “Vehicles move around quicker”, “deadlines are now more achievable” and “efficiency gains” (5 to 15% more stops per day). Negative arguments were “decreasing turnover” and “increasing costs for the client”. Overall the road pricing scheme has more positive effects on transport and logistics companies. The main reasons are the improvement of reliability, efficiency and predictability.

5.2 Swiss Heavy Vehicles Fee

The Swiss Heavy Vehicles Fee (HVF) is a successful example for the introduction of a distance based heavy vehicles area pricing [10]. The main objectives have been the internalisation of external cost and demand management. It was implemented in Switzerland for trucks > 3.5t. The main focus of the HVF is not urban transport but the approach could be extended to urban pricing solutions depending on the system requirements.

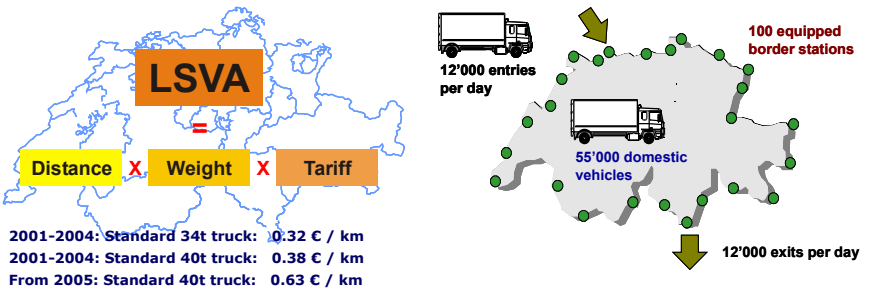

Figure 7: Calculation of HVF and system size.

The fee depends on the distance driven, the maximum gross weight and the emission category of the vehicle (Fig. 7). For a 40t truck the fee is about 0.32 Euro per km (2001-2004) and 0.63 Euro per km (after 2005). So it is about 3 to 5 times higher than the planned fee in Germany and about 2 to 3 times higher than the implemented fee in Austria.

About 70’000 vehicles are affected by the fee daily, about 57’000 vehicles are equipped with an On Board Unit (Fig. 7). There are about 100 equipped border stations to switch on/off the OBU of equipped vehicles or for declaration of entry/exit of non equipped vehicles.

A completely new type of a fee collections system was developed in Switzerland. The fee collection is based on the principle of self declaration. The distance is recorded by the tachograph and the On Board Unit records the required trip data automatic ally (Fig. 8). A GPS sensor and a movement sensor provide a second, redundant measurement in order to make sure that the tachograph signal is not intentionally interrupted or falsified.

The costs per OBU are about 800 Euro and the cost of the road side equipment and the background systems are about 100 Mio. Euro. The revenues are about 500 Mio. Euro per year. So the system has low investment and operation costs. The collection costs are about 4 to 6% of the revenues and there

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is a good balance between costs and revenues. From the revenues two third go into large scale public transportation projects and one third goes to the cantons to cover road transport costs.

Positive effects have been identified during the three first years of operation relating to fleet adaptation (replacement of high emission trucks, no significant shifts to vans), organisational changes (freight and fleet management, higher loading factors), route and mode choice and price effects [12]. The HVF System works and has a good acceptance.

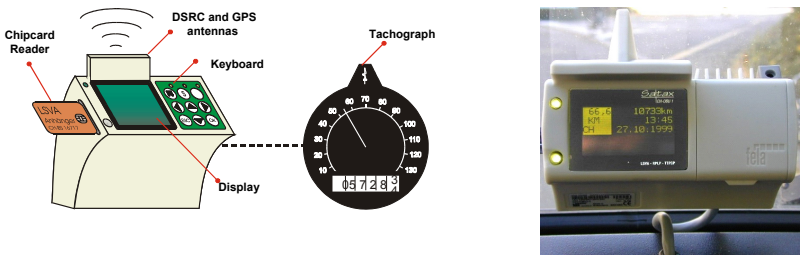

Figure 8: On board unit.

6 Conclusions and recommendations

The following conclusions and recommendations can be made:

Road Pricing can contribute to improve the efficiency of urban freight and to more sustainable logistics and distribution strategies.

With suitable pricing schemes for urban freight transport the benefits relating to reliability, leading times and predictability are higher than the costs by the charge.

A demand management approach can generate more benefits for urban freight transport than a financing approach.

Road Pricing should be a part of urban transport policy and a plan for passenger and freight.

Urban freight issues should be more considered designing road pricing schemes (area covered, pricing principles, use of revenues, supporting measures, etc.).

Road Pricing solutions in urban areas should cover trucks and vans of 3.5t and less.

Pricing should be linked with access regulations, emission categories, vehicle size/type, and eventually loading factors.

Charges for goods vehicles should be higher than for private cars (emissions, infrastructure costs, space use).

Pragmatic and simple approaches are sometimes more successful than theoretical and complex approaches. Interoperability of systems is needed to avoid incompatible solutions.

Cost / Benefit analysis are needed to identify costs and benefits for the relevant actors for different road pricing schemes.

Cities and regional authorities should road pricing take into account as an important option to optimise the use of capacity of the transport network and for financing new transport infrastructure.

References

[1] Abel, H. & Ruesch, M., BESTUFS: Final Best Practice Handbook, 5th Framework Programme, DG TREN. 2004.

[2] Baybars, M. & Browne, M., Developments in Urban Distribution in London. City Logistics III, Editors: Eiichi Taniguchi & Russel G. Thompson. 2003.

[3] BESTUFS, "City access fees and urban pricing: What are the consequences for urban freight transport?", 6th BESTUFS Workshop, 8th/9th of November 2001, Final Minutes.

[4] Bolis, S. & Maggi, R., Modelling the transport and logistics choice of a shipper, National Research Program 41 Transport and Environment. 1999.

[5] COST 321, Urban Goods Transport. Final Report. 1998.

[6] Glücker, C., & Ruesch, M., BESTUFS: Best Urban Freight Solutions, City Inquiry "European Survey on transport and delivery of goods in urban areas". 5th Framework Program, DG TREN. February 2001.

[7] INFRAS, Faire und effiziente Preise im Verkehr: Ansätze für eine verursachergerechte Verkehrspolitik der Schweiz, Bericht D3, NFP 41 "Verkehr und Umwelt". Bern, 1999.

[8] May , A. & Wachs, M., Resource papers on Road Pricing: International Symposium on Road Pricing, November 19-22, 2003. Key Biscayne, Florida.

[9] OECD, Delivering the Goods: 21st Century Challenges to Urban Goods Transport. 2003.

[10] Rapp AG, DESIRE: Designs for Interurban Road Pricing Schemes in Europe, Task 3.2: Case study Switzerland. February 2002.

[11] Ruesch, M. & Egger, D., Road Pricing and Urban Freight Transport, Best Practice Handbook Year 3 (2002), BESTUFS-Project, 5th Framework Programme. February 2003.

[12] Shepherd, N., The Impact of Congestion Charging on Specified Economic Sectors and Workers, a report prepared for the Commission for Integrated Transport. September 2003.

[13] Transport for London, Congestion Charging: Six Months on. October 2003.

[14] Transport for London, Congestion Charging: Update on scheme impacts and operations. February 2004.

[15] www.bestufs.net