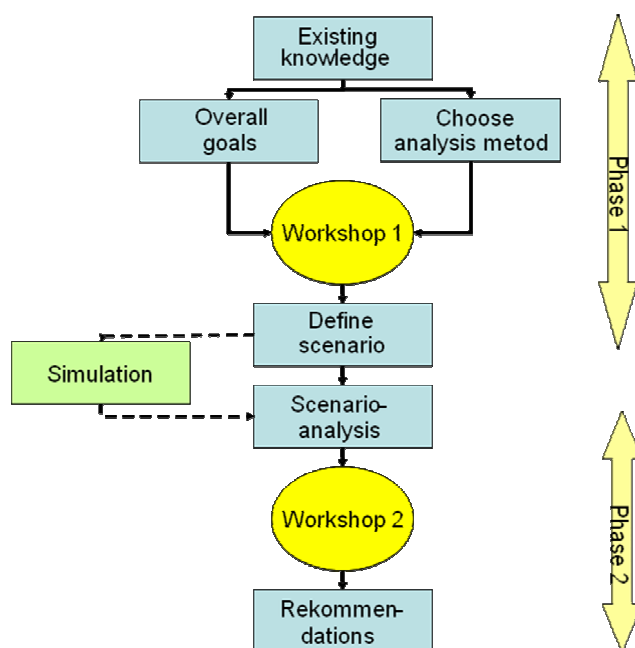


## Distance based electronic fee collection for heavy vehicles in a regional context



**October 2007**

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Title: Distance based electronic fee collection for heavy vehicles in a regional context

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Publication 2007: WP2\_REPORT

Publishing date: October 2007

Publisher: Region Blekinge

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Layout: East West TC Secretariat

ISSN:

Distributor: Region Blekinge, Ronnebygatan 2, 371 32, KARLSKRONA, Sweden

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1	Summary.....	4
2	EWTC WP 2 – Objective and scope .....	5
3	Methodology .....	5
4	Impact of road user charging for heavy vehicles (RUC-HGV) .....	6
4.1	Structuring the effects .....	6
4.2	Principal objectives.....	6
4.3	Vehicle impact .....	7
4.4	Routing impact.....	8
	Problems with deviations in Germany and Austria .....	9
4.5	Market impact.....	11
4.6	Environmental impact.....	113
5	Value Added Services.....	14
5.1	Technical considerations .....	14
5.2	Public and commercial objectives.....	15
5.3	Design considerations.....	15
6	The East West Demonstrator .....	17
7	Conclusions and further work .....	18
8	Annex – WP 2 reports.....	20

## 1 Summary

This report from work package 2 of the East West Transport Corridor project (EWTC) focuses on if/how distance based road user charging of heavy vehicles (RUC-HGV) may contribute to a more efficient and less polluting road transport sector. The work in this subproject is also aimed at providing additional knowledge about the regional impacts of road user charging of heavy vehicles.

The EWTC concludes that a km-based tax for heavy vehicles differentiated per vehicle type (emission level) and road type could be an efficient tool to improve efficiency and reduce emissions, but it could also provide a means for regional traffic management. The results of a review of international experiences and evaluation of different implementation scenarios could be summarised as follows.

A distance based tax for heavy vehicles:

- Improves the load factor
- Reduces emissions
- Increases the use of roads better adapted to HGV traffic
- Provides options for further (regional) differentiation
- Contributes to equal operational conditions for domestic and foreign truckers
- Enables an efficient internalisation of the marginal costs, but can also be used for the present tax levels

It is important that the system is seen as fair and that it does not allow systematic fraud by certain user-categories. However, the cost of setting up and operating a RUC-HGV is very dependent on the control system used. It is a major task to develop a control strategy which is not too costly and which is secure enough against fraud and which also meets European demands.

The EWTC considers that the combination of RUC-HGV and value added services is complicated. There are definitely applications which could be seen as add-ons to a km-tax system from a technical point of view. However, different business models, and national and European legal demands complicate the issue. Presently it looks as if it is difficult to develop a more general strategy for integration.

Work package 2 of the EWTC has focused on the regional aspects of RUC-HGV, while simultaneously national and above all European concept development has taken place. It seems feasible to continue activities with a regional focus in order to be able to validate emerging European concepts and systems together with regional authorities and with regard to their transport and traffic policy objectives. Work could include:

- The use of the pricing instrument in a regional context.
- Understanding the reactions of presumptive users to different technical and organizational concepts
- Developing and evaluating the feasibility of combinations with other services

A close relation to the users with a good understanding of their business together with a well defined policy and traffic environment in a regional setting make it easier to illustrate a full scenario in which users and other stakeholders can recognise themselves.

## 2 EWTC WP 2 – Objective and scope

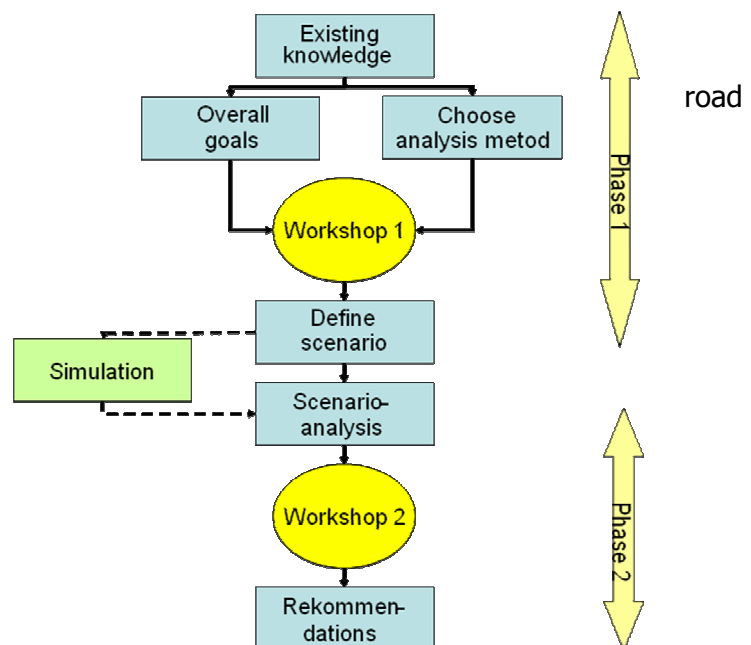
WP 2 of the East West Transport Corridor project (EWTC) aims at showing how the use of ICT can improve the efficiency and mitigate the disturbances of transport in the corridor. This report focuses on if/how distance base road user charging of heavy vehicles (RUC-HGV) may contribute to these objectives. More specifically, the work in this subproject aims to:

- Provide additional knowledge about the regional impacts of road user charging for heavy vehicles and from there derive demands on the design of such a system
- Provide input for the design of such a system, explore the potential for added value services and outline their impact on the design of the charging system

## 3 Methodology

The conclusions presented in this report are experiences gained in user charging systems for heavy vehicles already in operation in combination with interviews with representatives of the Swedish trucking industry and an analysis of scenarios simulating different charging strategies.

Work was divided in two phases where the first focused on understanding state-of-the-art and provide a basis for the following scenarios. Interviews and discussions with road hauliers and network operators gave a good understanding of impacts on business and many of the practical considerations.



The main effort of the second phase was the simulation of the transport behaviour and the following analysis of traffic distribution and modal split given different types of charging strategies. The results have been further enhanced by cooperation with the Swedish Research Intermodal Centre (SIR-C) which has produced a study of the effects of road user charges for heavy vehicles and the potential to influence modal split. A list of reports produced is appended.

## 4 Impact of road user charging for heavy vehicles (RUC-HGV)

### 4.1 Structuring the effects

From the perspective of the East West Corridor Transport project, regional impacts of RUC-HGV are in focus. When reviewing a number of existing systems it was interesting to understand which were the principal objectives for introducing the system and more specifically, if regional objectives had been influencing charging strategy and systems design. Secondly, which other effects had been noted and how could they be related to regional, mainly traffic management goals?

The effects discussed are listed in the table below.

<b>Vehicle impact</b>	<b>Routing impact</b>	<b>Market impact</b>	<b>Environmental impact</b>
Engine type Vehicle size Support for in-vehicle added value services	Route choice Detours/short cuts	Transport efficiency Accessibility Market distortion Modal split	Emissions Noise Traffic safety

The reports listed in the appendix have delivered knowledge on most of these effects. However, regional consequences are seldom explicitly indicated in the background information and have been deduced for the purpose of this report. The findings are summarised below.

### 4.2 Principal objectives

Experiences from large scale RUC-HGV schemes from Germany, Austria and Switzerland were been reviewed. Since then a RUC-HGV system, similar to the Austrian one, has also been introduced in the Czech Republic. There are also a number of road tolling systems for all types of vehicles around the world, but they are not considered here. Neither are the city tolling systems in e.g. several Norwegian cities, London or Stockholm.

Distance based road user charging for heavy goods vehicles is on the political agenda in Sweden as well as elsewhere in Europe. Charging for the use of infrastructure is not a new concept. New however, is the increased technical ability to reflect the socio-economic marginal costs and the deployment of technology to support national transport policy objectives. A certain level of European harmonisation is ensured by the requirements for non-discrimination and free trade. These requirements have shown to have quite an impact on network design and charging strategy.

A review of the principal objectives behind the RUC-HGV schemes as they are introduced in Europe indicates that fiscal and environmental goals are the most prominent. Road user

charging is seen as a means to internalise the external costs incurred by the heavy goods traffic in combination with creating financial support for improving road and rail infrastructure. However, the three distance based road user charging systems studied emphasise these objectives differently:

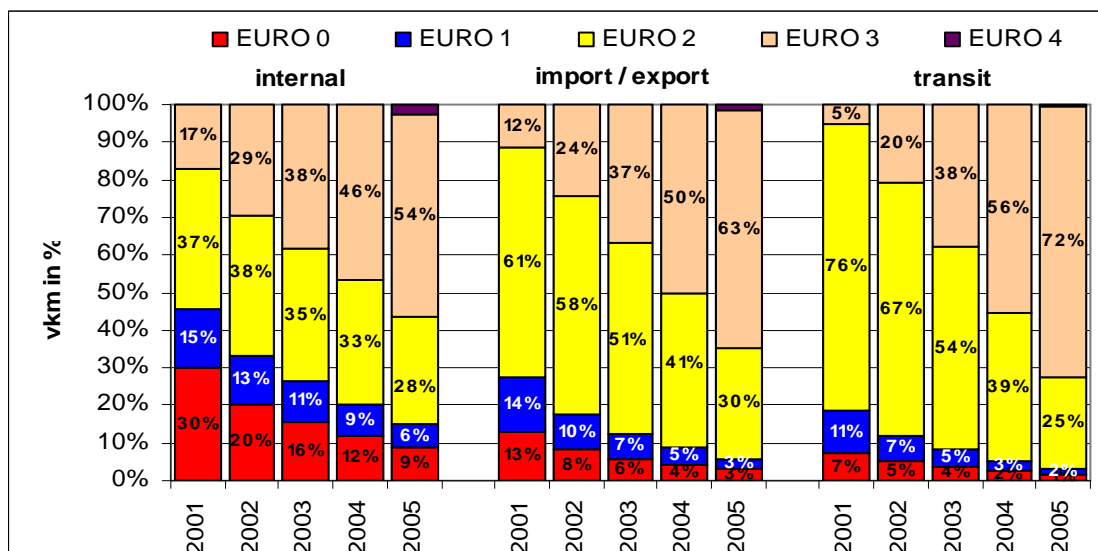
- The Austrian system is mainly focused on road infrastructure financing.
- The Swiss system has a clear focus on applying the “user pays” principle, protecting the environment and increasing the rail share.
- The German system has a strong focus on the infrastructure financing but there is also a focus on applying the “user pays” principle, more efficient use of transport capacities and emission-related tolls as well as providing fairer conditions for rail transport.

The principle for the system design is fairly simple: the more you drive the more you pay. But, you will pay less if you use vehicles generating less emissions. A km-based fee or tax also means that you pay for using the road you are driving on; irrespective of where your vehicle is registered or where you bought the fuel.

National, not regional objectives, provide the basis for the introduction of the RUC-HGV.

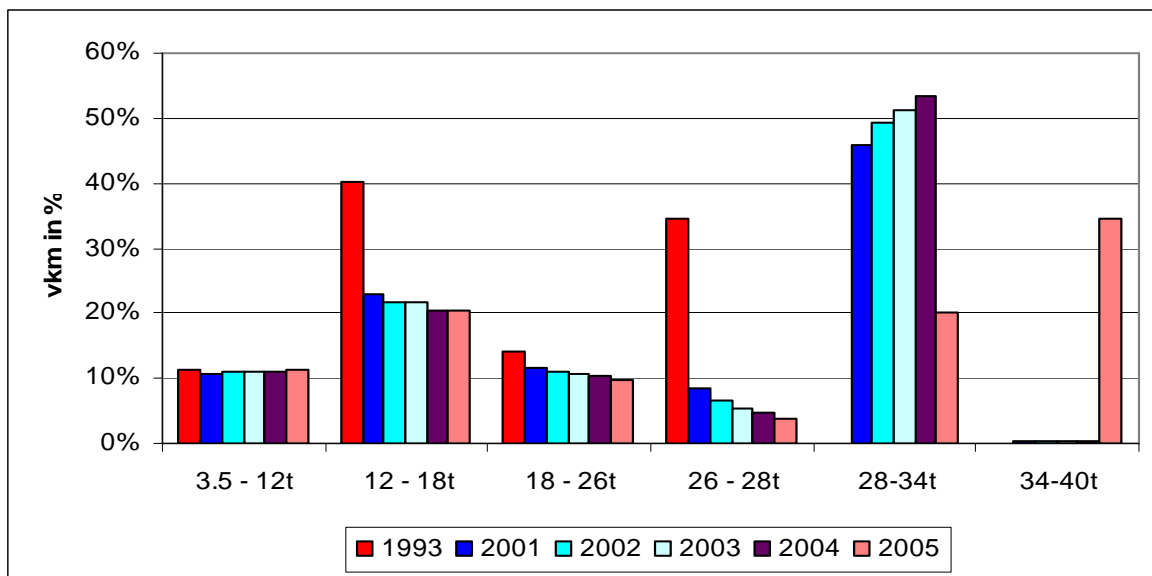
### 4.3 Vehicle impact

There is a tendency towards an increasing share of vehicles with reduced emissions (EURO 4 and 5 class vehicles) in Germany and Switzerland. The following diagram indicates the development in Switzerland.

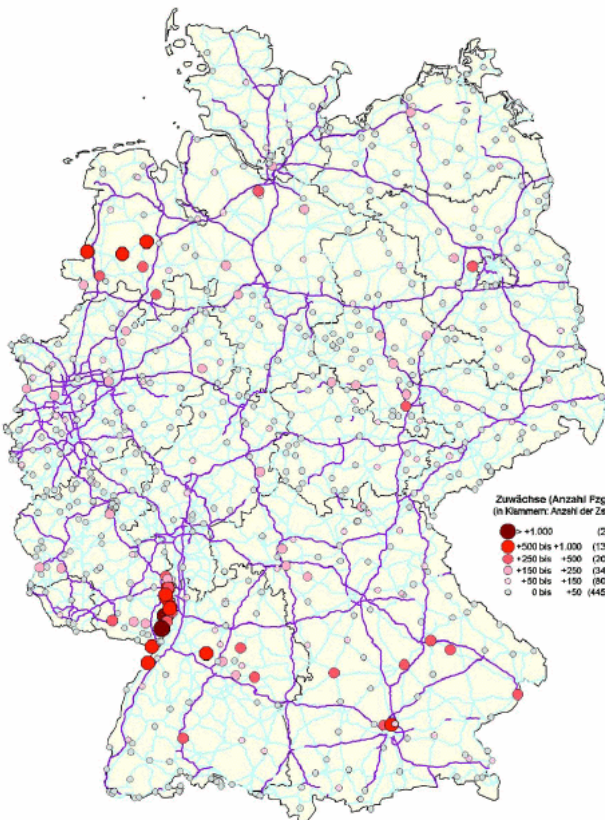


Vehicle kilometres per vehicle emission categories (source: ECOPLAN 2007)

There is also a tendency in all countries towards adjustments of the fleet composition as a response to the charging criteria. This development is especially evident in Switzerland which introduced an increase of the maximum vehicle gross weight to 40 tonnes at the same time as the km tax was introduced for vehicles above 3,5 tonnes.



Vehicle kilometres per weight class in internal road transport (source: ECOPLAN 2007)



In Switzerland there is little or no indication that the number of trucks below the 3,5 tonne limit would increase disproportionately to avoid the road tax. There is an increase, but it is due to the general change in the transported goods (just-in-time, smaller transport units ...).

#### 4.4 Routing impact

##### Problems with deviations in Germany and Austria

Germany and Austria have introduced road user charging for heavy vehicles only on the motorway network, while in Switzerland the system covers the whole road network.



In the two first countries mentioned, this has led to drivers trying to use alternatives outside the RUC-network, also in neighbouring countries. The red dots on the map to the left indicate an increase of more than 500 trucks per day due to the "Maut" on roads outside the motorway network in Germany.

*Increased average daily HGV traffic (DTV, > 3,5 ton) caused by introduction of the Maut. Comparison of traffic development 2004/2005 (2nd quarter)*

Of all the cases in Germany where the Maut caused an increase of HGV traffic, only one led to an extension of the RUC-network. In the other cases conventional traffic regulatory measures were chosen. The main reasons for this were regional resistance to a limitation of accessibility and restrictions due to EU regulations.

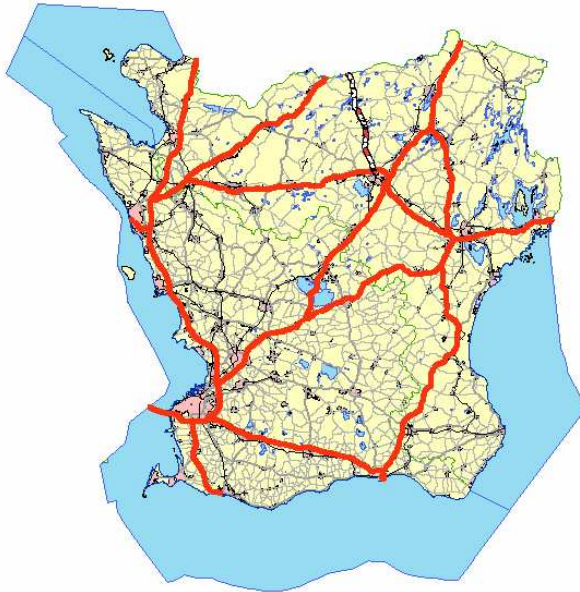
Rerouting has also been found in Austria. Sources mention an increase of heavy goods transports on parts of the secondary road network of 2-3%. However, it might be discussed how much of the effects are specifically due to the road user charges. A general cost increase might have made the drivers more sensitive to distance and time on the road.

The situation in Switzerland is simpler, as they have a flat fee for the whole network. This has led to a scheme where 1/3 of the income from the system is distributed to the regions/cantons as a compensation for e.g. long driving distances, smaller productivity gains from the increase of the gross weight limit etc. Estimates made (ECOPLAN) indicate that the compensation received by far exceeds the negative impact.

### **RUC-HGV for regional traffic management**

The scenarios for the Swedish RUC-HGV assume that the complete road network might be included in the km-tax system, i.e. a national coverage as in Switzerland, but with the possibility of differentiation of the tax levels for different road types. The East West Transport Corridor project has simulated the impact of such strategies in Skåne-Blekinge.

The results indicate that heavy vehicles can be concentrated to a HGV-network, which is specially designed to limit the negative impact of heavy truck traffic, but which still provides good accessibility and direct routing. The Road Administration in Skåne and Blekinge has appointed such a network, and a differentiation of road user charging would provide an interesting tool to make the investments in improving road standards and protective measures more feasible.



*The dedicated HGV-network for Skåne*

The concept seems to correspond to the route choice of Swedish truckers. In an interview (6) a majority declared that time is the principal criterion for route selection when the transport schedule is tight (which is the normal case).

The model calculations further indicate that the concentration to a HGV-network will increase traffic work (vehicle kilometres) marginally in comparison to the present situation and thereby there is a risk that - at least theoretically - the emissions will increase. However, the model does not fully cater for differences in driving patterns on a small road with several stops in comparison with a primary road designed for long distance traffic. A careful design of the HGV-network will also reduce the necessary deviations respecting the trade-off between traffic safety, noise and other disturbances on the one hand and the vehicle kilometres saved on the other.

The introduction of a vehicle tax in Sweden might also have an impact on long distance traffic in the East West Transport Corridor and make trucks deviate to routes through northern Poland and Germany. A simulation of the distribution of the flows in the case of a vehicle tax in Skåne-Blekinge indicates that 1-2 % might choose to use routes south of the Baltic and that the same number could be diverted to direct sea transport. A more significant impact however, is the 5 % increase of train transport in Skåne –Blekinge. This is further discussed in chapter 3.5 below.

## 4.5 *Market impact*

### **Increase road transport efficiency**

The impact of the Maut (the German RUC-HGV scheme) on the general price level is on average +0.15%. It is estimated that the Maut has increased the costs of road haulage by 5-7% and it has had a variable impact on profitability across the haulage sector<sup>1</sup>. While the increased freight rates for full truck loads (FTL) were paid by the cargo owners, the empty runs have to be paid by the hauliers themselves. In groupage transport (LTL) however, most companies have managed to increase their rates to cover both the full and the empty kilometres, so that they seem to suffer less from the increased costs. An indication of increased efficiency in the road transport sector is the fact that the empty runs have decreased by 15%<sup>2</sup>.

The Swiss note a consolidation among road transport companies which is thought to be influenced by the need to make better use of the available transport capacity and a better adaptation of the vehicle fleet. Indications from Austria also point at reorganisation of transport logistics and intensified co-operation with other logistics provides as the most relevant strategies. Hence, in general a rather clear message that road user charges contribute to more efficient road transport.

A survey among Swedish road hauliers (6) indicates that the transport industry in Sweden expects that there is a potential for reducing empty runs and increasing the load factor perhaps in cooperation with the customer and through intercompany coordination. However, most of the interviewees expect a price increase which has to be compensated by the customer.

### **Impact on peripheral regions**

It is expected that the Maut in Germany will have a negative effect on already economically weak regions. Companies situated in such regions are likely to have to cover the costs for a higher share of empty runs which will worsen their competitive position. The disadvantage of peripheral regions is also corroborated by Swiss studies. It is estimated that average cost per employee in transport related business in such regions is 50% higher than in the other regions. But in Switzerland there is compensation through a regional distribution of a share of the tax revenues. A km-tax which allows for differentiation according to road type and region would be a means to avoid such distortions.

### **A level playing field**

Interviews with Swedish road hauliers (6) highlight the need for a "fair" taxation which requires that it applies to domestic and foreign trucks alike and that the system is fraud-proof and controlled to a level which prevents certain categories to systematically avoid taxation.

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<sup>1</sup> McKinnon, Alan, A review of European truck tolling schemes and assessments of their possible impact on logistical systems, International journal of logistics, Edinburgh, 2006

<sup>2</sup> Press release from Bundesverkehrsministerium für verkehr, Bau und Stadtentwicklung. BVBS, Maut ist umweltpolitisches und wirtschaftliches Steuerungsinstrument, 11. November 2005, Nr.: 453/2005

A calculation (6) of the costs for different categories of truckers also highlights the different conditions under which the companies operate. A Swedish trucker in long distant traffic has approximately twice the costs compared to a Polish trucker operating in Sweden. Given the same distance driven in Sweden, a km-tax<sup>3</sup> would increase the costs for both parties with the same amount but relatively the advantage of foreign trucker would be reduced.

### **Modal split**

One of the major arguments for the introduction of road user charging for heavy vehicles is the possibility to influence modal split away from road transport. However, there is little evidence that this has happened so far. In Germany a survey indicates that 3,1% of the larger shippers are using rail transports as an effect of the Maut. However, it is difficult to distinguish the effect of the Maut from other effects, primarily the increase of fuel prices.

There are almost no effects on modal split in Switzerland, since the costs for the km-tax were almost fully compensated by efficiency gains through higher permitted gross weights for trucks.

The East West Transport Corridor project has cooperated with the Swedish Intermodal Research Centre (SIR-C) on a study "Effects of road user charges for heavy vehicles and the potential to influence modal split" (10). As in other model calculations prior to the introduction of road user charging in Germany and Austria, this study also indicates a clear impact on modal split.

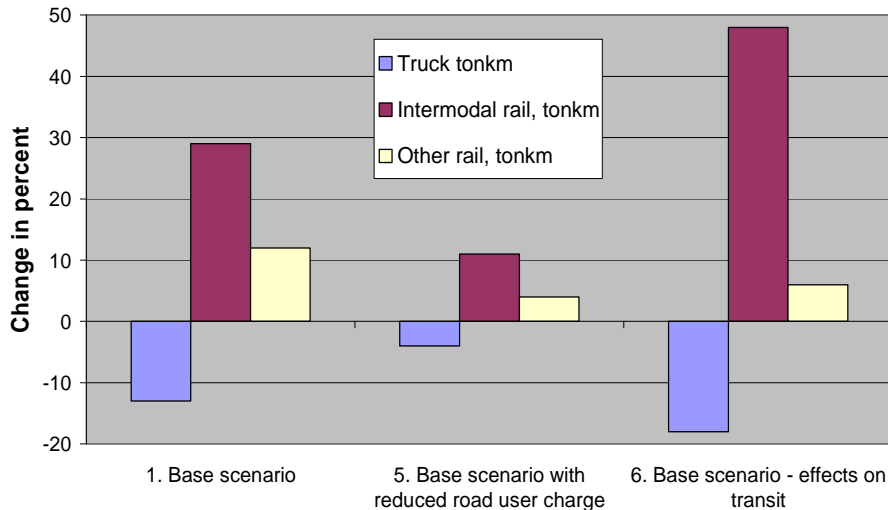
The simulation method used in the study is based on the same tool as the one used in regional study for Skåne Blekinge (8) with the difference that the demand for truck transport in the latter was assumed to be fixed. The starting point of report no 10 was to assume a constant demand for freight transport in Sweden, for transit as well as for export and import, but to calculate modal split (road, rail, intermodal) based on the total generalised cost for transport between origin and destination.

The simulation indicates that increasing the costs for road transport has substantial impact on modal split, especially favouring intermodal rail.

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<sup>3</sup> According to the level used by SIKa

### Potential impact of road user charges - A comparison with existing situation



Scenario 1 with road user charges as proposed by the parliamentary road tax committee reduces truck transport by 10-15 % and increases intermodal transport by almost 30% (cf. diagram above). The impact on transit is even more drastic (cf. scenario 6), however these volumes are fairly small. When the tax in scenario 1 is reduced to 1/3 the impact on rail and intermodal is reduced to the same extent. But the impact is still considerable.

The results are fairly sensitive to e.g.:

- increasing fuel prices (more intermodal and rail),
- decreasing prices for intermodal and rail transport (more intermodal and rail),
- lower tax on the network of E-roads (results in more traffic on this road network and less intermodal and rail).

The simulation attempts to model rather complicated commercial relationships and decisions. In a situation (as the present) when rail and intermodal capacity often is scarce, the corresponding prices will go up. Track, traction, wagon and terminal capacity will only slowly increase. The model also has difficulties in mirroring the inertia on the market. It will take time before the players commit to any drastic changes of their behaviour. As a consequence, it can be assumed that truck transport will continue to be a serious competitor to other modes due to its high flexibility and good quality, in spite of the increasing costs. Changes in modal split will only gradually occur as rail alternatives become more competitive.

#### 4.6 Environmental impact

As illustrated in the previous chapters, road user charging has proven to have direct and indirect impacts on emissions from heavy vehicles. The trend to a renewal of the fleet towards vehicles with less polluting engines can be accelerated by price differentiation of the km-tax. In the long term perspective, higher costs for trucking promotes the use of alternative transport modes, but in the short term perspective it can be expected that the hauliers focus on means to increase the efficiency of their current operations. The charging systems in operation have been proven to result in a reduction of the share of empty runs and an

increase of the load factor. This means that the same payload can be transported by fewer vehicles, which reduces emissions, but also other disturbances created by heavy goods vehicles.

The simulations undertaken in the EWTC indicate that price differentiation of the road user charge affect the routing of the heavy vehicles. Theoretically this could result in more traffic work, for example in a case where the heavy vehicles are encouraged to use a road network with bigger grids than the normal national and municipal network.

More vehicle kilometres result in more emissions, but the following aspects have to be considered:

- Driving at a constant speed generates less emissions than start, stop and accelerations. However, a positive or negative emission balance also depends on the difference in speed.
- Heavy vehicles which are encouraged to use a dedicated HGV-network will not be directly affecting so many people as when using roads in more densely populated areas. Less people will be exposed to the immediate emissions (including noise) and traffic safety is improved.
- The HGV-network can be technically designed to cope with heavy loads and a large number of trucks.

## **5 Value Added Services**

It is an assumption that a combination of a service for distance based road user charging with other added value services (AVS) could contribute to an increased acceptance of the charging system, improve the cost efficiency of all the services implemented and thus support the introduction of the charging system. On the other hand one might envisage the situation where "standardised" functionalities of the charging application could provide a platform for a number of other applications and thus contribute to interoperability.

The East West Transport Corridor project has considered the feasibility and the practicability of such combinations (5) and also produced a simple demonstrator (11).

### **5.1 Technical considerations**

It is assumed that the RUC-HGV includes vehicle equipment that registers the vehicle route (continuous time and place) and is able to transfer this information to the road side. This vehicle equipment, the On Board Unit (OBU), consists of a positioning device (e.g. GPS), processor capacity, memory and a communication channel. The OBU-type may differ with regard to its capacity to contain road network characteristics. A so called "thin client OBU" does not contain such information, which implies that ITS applications requiring on board road maps (e.g. Intelligent Speed Adaption -ISA) are less viable than in a combination with a RUC-HGV based on the "thick client OBU", which contain such maps.

The basic idea is that the on-board equipment eventually in cooperation with some central system(s) provides the basic technology necessary for service. However, some additional hardware might be needed as for example in cases like the e-Call, where a crash sensor is required. The tachograph needs a device for input of driver information and an alco-lock requires a sensor for breath analysis.

## 5.2 *Public and commercial objectives*

The considerations made by the EWTC indicate that an integration of charging and value added services has to be developed within the framework of an agreed system context governed by:

- Safety and security requirements
- Legal demands
- National and international requirements for interoperability
- Integration with legacy systems

Different stakeholders have different perspectives. The authorities for example must consider how to improve the overall goals they want to achieve, which could be of a general nature as reduced environmental impact from road transport, improved road safety, more efficient use of the road transport system and eventually also regional development goals. But there could also be more immediate objectives related to the public authority as an operator of the charging system e.g. maximising revenues or minimising costs or safety risks. The user/trucker wants to achieve the best cost/benefit ratio and the technology provider has to decide how to build applications which are attractive to the market and possible to produce at a competitive price.

Given the different views of the public and commercial stakeholders the value added services could be structured into two groups. The following table indicate applications which could be of interest to combine with a distance based road user charging system.

Public services	Commercial services
Intelligent Speed Adaptation (Speed Alert) Alcolock Data collection for traffic management (road status monitoring) Hazardous Goods Monitoring e-call Traffic Information Services Preferred network guidance	Vehicle and cargo information (for the haulier and consigner) Driver support systems Fleet management system Payment of transport services

## 5.3 *Design considerations*

A designer and producer of added value services has to focus on systems and services which:

- ... are of interest for key stakeholders
- ...are based on more or less the same technical components
- ...may share a part of EFC investment costs
- ...will increase support for EFC application
- ...will support public transport policies
- ...provide commercial value



The services may more or less contribute to the overall objectives of improving the environment, increasing road safety and transport efficiency as well as regional development. The following table illustrates a classification made of some of the services identified (1= high contribution; 3=small contribution).

	Env.	Safety	Effic.	Region
ISA		1		
Alco-lock		1		
Road Status Monitoring		2	1	
Traffic Information and guidance	3	2	1	
Hazardous Goods tracking	1	2		
E-call		1		
Use of Priority Road Network	2		1	1
(Digital tachograph)		1		
Fleet management systems			1	
Vehicle- and cargo information			1	2
Driver support			1	
Transport service payment	1	3		2

The EWTC concludes, that presently decisions on integration between RUC-HGV and value added services require a per case analysis of a complex mix of technological, legal, organisational and commercial requirements. Major obstacles (e.g. legal) and driving forces have to be analysed, the relevant stakeholders identified and their objectives clarified. Costs for the additional service(s) must be calculated and an analysis made of how they impact on the total costs for the system. A careful and realistic analysis has to be done of the business models which are to drive the systems, the distribution of costs being one of the important issues. If one or more value added services are integrated with the road user charging system, consideration must be given to how marketing and competing services are to be handled.

Decisions on national and European levels are required to create the necessary degree of consensus. It is to be expected that the Communication from the Commission "Freight Transport Logistics Action Plan" COM(2007) 607 will promote a more holistic view on Intelligent Transport Systems, which also could benefit the integration of distance based road user charging and added value services.



## 6 The East West Demonstrator

A demonstrator combining road user charging with road status monitoring was developed within the East West Transport Corridor project as part of a master's thesis. The demonstrator was designed to show the charging process together with an application which sends information on traffic density, vehicle speed and road conditions to the road side. The prerequisites were:

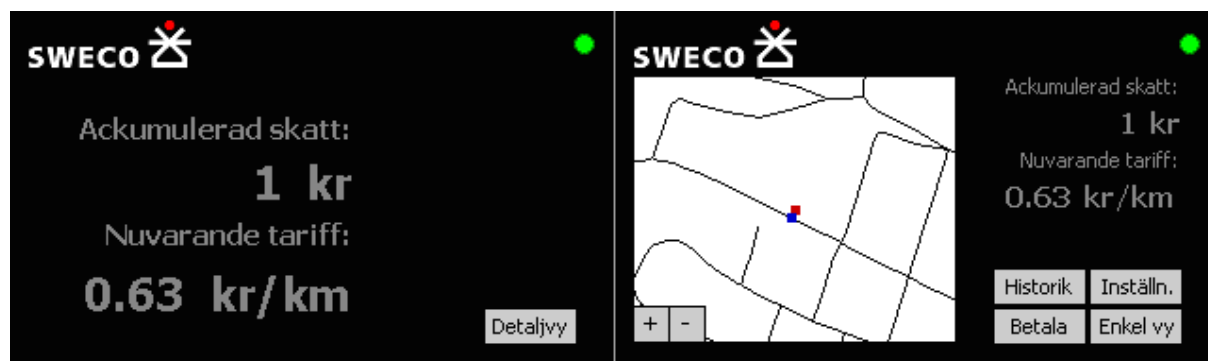
- The added value service should use the same technology as described in the EFC directive 2004/52 (DSRC, GSM, GNSS).
- The added value service should use similar functionality as is used in a distance based charging system.
- Due to time and economic restraints, the added value service should not require any additional technology or include any new payment services.
- The OBU used in the demonstrator should be equipped with display for HMI flexibility.

A screening of a number of potential candidates (cf. the previous chapter) resulted in the selection of an application for road status monitoring, which primarily helps the road operator to understand the traffic conditions during different times of the day (the floating car concept). The application provides the driver sending the information and fellow drivers on the road with better information on the immediate risk for queues etc.

The demonstrator is logging vehicle positions from a GPS receiver and matches these positions to a road segment on a map. The tax is then calculated using the information from this map and the weight and pollution class of the vehicle. This information is then sent to a server with GPRS. The added value service "road status monitoring" uses the same functionality as for calculating the road charge, i.e. information on speed and position on the specific road link.

Program development was done in .Net with an additional library from Franson GpsTools.

The demonstrator shows, despite flaws in reliability, how a distance based road charging system can function and the possibility of combining additional services with such a system.



*User interface*

## 7 Conclusions and further work

The Swedish Parliament has declared that road user charging should be explored as a means to internalise the external costs of road transport. A correct pricing mechanism would contribute to the development of a sustainable and energy-efficient transport system. Road user charging might also improve the financing of the infrastructure.

As indicated in this report, these are also the major arguments for the RUC-HGV systems presently in operation, albeit with slightly differing priorities. The experiences so far also show that the immediate impact is a higher load factor and a transition towards a less polluting vehicle fleet, which are results supporting the environmental objectives. The systems also generate a substantial surplus which is mainly dedicated to infrastructure development, although the revenues collected often are accompanied by a more or less corresponding reduction of the conventional financing via the state budget.

In the long term perspective it is also to be expected that higher costs for using the roads will contribute to an increasing market share for conventional and intermodal rail services. However, the inertia of the business together with lack of capacity in the rail sector will make this development rather slow.

Experiences indicate that pricing also has an impact on the truckers' route choice as road haulage is a very cost sensitive business, but on the other hand it is also very time sensitive, which substantially reduces the use of alternative and less costly routes.

The Swedish approach to a charging strategy is to introduce a tax level which corresponds to the marginal cost for using the road, which in fact would increase the total tax level. With the same average tax increase per km of the entire road system, it is not to be expected that such an approach would have any impact on the distribution of traffic on the network. If, on the other hand, the tax would be differentiated based on the marginal cost for different road categories, the tax would have a traffic management impact.

Simulations done in the EWTC show that HGV traffic in such a case would use the less costly and better adapted route alternatives. However, it remains to be analysed if the differences in marginal cost for different routes are big enough to induce the desired behavior from a traffic management point of view. The EWTC has taken the view that as long as the total tax sum corresponds to the amount an average km-tax would generate, then the differentiation between road categories could be based on traffic management considerations.

The EWTC concludes that a km based tax for heavy vehicles differentiated per vehicle type (emission level) and road type:

- improves the load factor
- reduces emissions
- increases the use of roads better adapted to HGV traffic
- provides options for further (regional) differentiation
- contributes to equal operational conditions for domestic and foreign truckers

- enables an efficient internalisation of the marginal costs, but can also be designed for the present tax levels.

It is important that the system is seen as fair and that it does not allow systematic fraud by certain user-categories. However, the cost of setting up and operating a RUC-HGV is very dependent on the control system used. It is a major task to develop a control strategy which is not too costly and which is secure enough against fraud and which also meets European demands. The fact that the RUC-HGV involves companies and not individuals opens possibilities which the conventional motorway tolling systems do not have.

The EWTC considers that the combination of RUC-HGV and added value services is complicated. There are definitely applications which could be seen as add-ons to a km-tax system from a technical point of view. However, different business models, national and European legal demands complicate the issue. Presently it looks as if it is difficult to develop a more general strategy for integration. The most feasible approach seems to be to continue to develop the applications individually and let the market demands govern the integration.

Work package 2 of the EWTC has focused on the regional aspects of RUC-HGV, while simultaneously national and above all European concept development has taken place. It seems feasible to continue activities with a regional focus in order to be able to validate emerging European concepts and systems together with regional authorities and with regard to their transport and traffic policy objectives.

The use of the pricing instrument to improve the efficiency of the road transport sector and reduce its environmental impacts should be further explored from a regional perspective. Differentiation of price levels with regard to road type (and later perhaps time) is interesting as a traffic management tool especially on the regional level. The technology to be used for RUC-HGV is still not defined, but understanding the reactions of the presumptive users to different concepts can also be done in the regional context where it is easier to illustrate a full scenario, in which the users can recognise themselves. A close relation to the users with a good understanding of their business together with a well defined policy and traffic environment is also a good basis for developing and evaluating the feasibility of combinations with other services.

## **8 Annex – WP 2 reports**

1. Road User Charging for Heavy Goods Vehicles - Overview of Regional Impact (Jan 2007). Desk research on the impacts of heavy vehicle road user charging systems on route choice, modal choice, choice of vehicles and logistics and a survey of if/how regional impacts were considered when the road user charging systems were designed.
2. Road User Charges for Heavy Goods vehicles - impacts and possibilities. Documentation from an expert seminar in Sept 2006
3. Report from an expert seminar in Vilnius in June 2007
4. Regional experiences of Electronic Fee Collection for Heavy Vehicles - report from a study tour in May 2007. The aim of the tour was to study regional experiences in Switzerland and Germany of the introduction of RUC for HGVs.
5. Integration of added value services with distance based road user charges (Dec 2006). This report address the prospect for using ITS as a tool for innovative actions in the corridor, by using a foreseen kilometre tax system as a platform for added value ITS services (AVS).
6. A kilometre tax for HGVs – possible impact on Swedish hauliers. Desk research and interviews for assessment of how Swedish hauliers will react to a kilometre taxation for HGVs.
7. Overview of scenario activities (Feb 2007). This short report outlines the three scenarios used for the assessment of RUC for HGVs: "The Eagle", the "Frog" and the "Extended Frog".
8. Impact of kilometre based charging for heavy vehicles in Skåne Blekinge (Kilometerskatt som styrmedel för tung trafik i Skåne- Blekinge) (April 2007). A simulation of the impact on route choice of tax levels and their differentiation over the networks.
9. Structuring and Analysis of the East-West-Corridor via Skåne-Blekinge (Aug 2007). Simulation of the impact of RUC on east-west transit traffic through Skåne-Blekinge.
10. Effects of road user charges for heavy vehicles and the potential to influence modal split (June 2007). A simulation of the impacts on the national networks. This study was financed by the national Swedish rail and road administrations.
11. Utveckling av demonstrator för ITS-tjänster I fordon. Berg, P., April 2007. Development of a demonstrator combining road user charging with road status monitoring.



## Partners of East West TC

AAK	Municipality of Sölvesborgs
Aerotech Telub	Municipality of Ronneby
Baltic State Fishing Fleet Academy	Port of Esbjerg
Blekinge Institute of Technology	Port of Karlshamn
Coordinating Council on Transsiberian Transportation	Railon
County Administrative Board of Blekinge	Railog
DFDS Tor Line	Region Blekinge
DFDS Lisco	Region Skåne
EC Gruppen	Region Sealand
Esbjerg Business Center	SC Lithuanian Rail Administration
IKEA Sweden	South West Business Development
ITS Sweden	Swedish National Maritime Administration
Kaliningrad Branch of North West Academy	Swedish National Rail Administration
Kaliningrad Oblast	Swedish Road Administration Skåne
Kaliningrad State University	Swedish Road Administration South East
Karlshamns Expressbyrå	University of Southern Denmark
Klaipeda County Coordination	Vilnius Gediminas Technical University
Klaipeda County Governors Administration	Vinnova
Klaipeda State Seaport Authority	
Klaipeda University	
Klaipedos Smelte	
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