Ministry of Transport and Communications

Fair and Intelligent Transport

Working Group Final Report

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Ministry of Transport and Communications

Vision

Well-being and competitiveness through high-quality transport and communications connections.

Mission

The Finnish Ministry of Transport and Communications seeks to promote the well-being of our people and the competitiveness of our businesses. Our mission is to ensure that people have access to well-functioning, safe and reasonably priced transport and communications connections.

Values

Courage
Equity
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Ministry of Transport and Communications

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Abstract

This report investigates the impacts that would result from an overhaul of passenger car taxation so that taxes would be based exclusively on car use. In practice this would mean substituting fixed taxes (the motor car tax and annual vehicle tax) with taxes based on kilometres driven.

The kilometre tax would be a more flexible transport policy tool than the current tax system. It would also better serve the achievement of transport and environmental policy objectives than the existing tax regime. On the other hand the kilometre-based system would be less cost effective. The estimated impact of taxing motorists based on kilometres driven lends support to a possible move towards the introduction of a kilometre tax in Finland.

Before any final decisions are taken it is crucial to ensure that the necessary technology works as intended and that it is suited to taxation purposes; that the cost estimates are accurate; and that privacy protection is maintained. The Working Group recommends a step-by-step approach through trials and experiments. The first stage should involve extensive testing of technical systems, information security and monitoring methods.

To the Ministry of Transport and Communications

The Ministry of Transport and Communications appointed on 3 February 2012 a Working Group to explore ways of moving towards a fairer and smarter transport system and to study different long-term strategies for the introduction of road pricing systems. The Working Group's mandate is based on the Government Programme which says that the Government will assess the feasibility of introducing GPS-based road pricing systems in Finland.

The Working Group has considered the motives, international experiences, legislative issues, technical solutions and the impacts of road pricing. It has focused primarily on the effects of a kilometre-based tax on passenger cars.

Digitalisation is eventually and inevitably going to make a major impact on transport. Advancing technology and the growth of smart transport provide an opportunity to move towards a fairer system of road transport taxation that is based on vehicle use. In this situation it is advisable to align and integrate transport policy objectives with the objectives of road taxation.

A kilometre tax would better serve the achievement of transport and environmental policy objectives than the existing tax regime. The kilometre-based system would be less cost effective than the current method, but the annual savings in reduced accident and emission costs to society would be equal to the costs of collecting the kilometre tax.

Legislative considerations pose no obstacles to the development of a comprehensive national road pricing system. There are, however, several significant legislative boundary conditions for the implementation of such a system. Privacy protection is just one of the considerations that must be resolved from the very outset in developing a kilometre-based tax system.

The estimated impacts of taxing motorists based on kilometres driven lends support to a possible move in motoring taxation towards the introduction of a kilometre tax in Finland. Overhauling the road tax system to make the amount of tax payable entirely dependent on car use is a major public issue that involves a number of challenges and uncertainties.

Before any final decisions are taken on the adoption of a kilometre tax it is crucial to ensure that the necessary technology works as intended and that it is suited to taxation purposes; that the cost estimates are accurate; and that privacy protection is maintained. It is advisable to proceed through trials and

experiments. The first stage should involve extensive testing of technical systems, information security and monitoring methods. The early introduction of a kilometre-based tax might contribute to create new business opportunities and jobs in Finnish industry.

The Working Group hereby submits its unanimous Final Report to the Ministry of Transport and Communications. A statement is attached to the Final Report (Annex 1).

Helsinki, 16 December 2013

Jorma Ollila

Chairman of the Working Group

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1. Introduction

1.1 Working Group's mandate

Minister of Transport, Ms Merja Kyllönen appointed on 3 February 2012 a Working Group tasked with exploring how Finland could move towards a fairer and smarter transport system and with studying different long-term strategies for the introduction of road pricing systems. The Working Group's mandate is based on the Government Programme, which says that the Government will assess the feasibility of introducing GPS-based road pricing systems in Finland.

The Working Group's aim was to provide an overview of how Finland should proceed with the introduction of road pricing in the long term, addressing the technical, transport, economic and legislative issues. Specifically, the Working Group's mandate was to provide an assessment of

1. International experiences of road pricing and current trends
2. What kinds of road pricing objectives should be adopted in Finland
3. What kinds of technical solutions would be viable in Finland
4. The impacts of road pricing
5. In what way and over what sort of time scale would Finland be able to adopt a GPS-based road pricing system
6. What effects would a road pricing system have on road users' privacy protection and what kind of legislative changes would be needed
7. What other electronic services could be provided based on the GPS-based road pricing system
8. What are the key areas of development and export prospects for Finnish GPS technology and services based on GPS applications

The current Final Report summarises the discussions and work of the Working Group. Separate reports are published on technical and legislative issues as well as on the impacts of introducing a road pricing system.

Chapter 2 of this report discusses the background and reasons why an overhaul of the current tax system is being considered. Chapter 3 describes the existing system. Chapters 4 and 5 report on international experiences of road pricing and discuss the objectives and motives for road pricing/taxes in Finland. Chapter 6 deals with legislative issues. The specific options considered and impact assessments are introduced in Chapter 7. The Working Group's conclusions are presented in Chapter 8.

1.2 Notes on terminology

Road pricing is traditionally used to refer to a toll collected for the use of a specific road or part of a road network. Motorway tolls in many European countries are an example of road pricing where motorists pay extra in addition to existing taxes.

Road pricing is also an integral part of so-called transport pricing, which comprises the entire system of road-related taxes and charges. In Finland, the Constitutional Law Committee has previously taken the view that any road pricing collected in Finland would constitutionally be a tax payment, which is why in the Finnish context it is more appropriate to refer not to congestion charges or other similar fees or tolls, but to road taxes. Nonetheless the report frequently refers to the well-established concepts of congestion charges and tolls, although in the Finnish context they always mean taxes.

This report is mainly interested to assess the effects of introducing a national kilometre tax levied on passenger cars. In order to properly quantify these effects, the calculations proceed from the premise that existing fixed taxes on passenger cars, the amount of which is not dependent on distances driven, would be replaced by kilometre taxes. Fixed taxes, in this connection, refer to the car tax, the base component of the annual vehicle

tax, and the vehicle motive force tax. Therefore a national kilometre tax would not be a traditional road pricing scheme comparable to a congestion charge that is levied in addition to existing taxes. In practice the tax reform would mean changing the existing system of passenger car taxation with a new tax system that is based entirely on taxing motorists based on vehicle use (fuel tax + kilometre tax). For this reason it is more accurate to refer not to road pricing, but rather to the taxation of car use. The Working Group is keen to stress that no decisions have been made on discontinuing or changing existing taxes, but all the figures presented are based on theoretical calculations made for the purposes of this report.

2. Why consider changing the existing tax system?

2.1 Need for more effective transport policy

The existing road tax regime was not originally intended as a transport policy tool, but rather as a means of generating tax revenue for the government. However road taxation could also serve as an effective transport policy tool that could help to direct the use of the transport system for greater efficiency, to reduce the negative externalities of traffic, and to finance the development and maintenance of the transport system. In other words it might be possible by means of economic regulation to influence the volume and quality of road traffic.

Economists have long advocated the introduction of transport pricing. The thinking in economics is that users should pay for all the costs incurred to themselves and to others from the use of the transport infrastructure (road network wear and tear, time costs, environmental costs, or the so-called socio-economic marginal costs). This will have the effect of increasing the efficiency of road network use, reducing the costs of transport and maximising the benefits to society. In practice, then, it is thought that transport pricing makes for greater transparency in decision-making on the demand side of transport infrastructure capacity: users will have greater influence over their own transport costs by adjusting their behaviour. At the same time there would be a real incentive for users to take account of the negative externalities of transport in their own decision-making. Overall the system would work more effectively than it does at the moment, and it would have a greater guidance effect on people's behaviour.

A good example is provided by congestion. Traditionally, congestion is viewed as an infrastructure issue, i.e. as a problem on the supply side. The solution is thought to lie in increasing the road network capacity. Economics, however, views this as a pricing issue, as a problem on the demand side. The solution, accordingly, lies in pricing. Congestion can be resolved by imposing a charge on the use of congested roads during rush hours. This will reduce transport flows enough to get the traffic going again, because some drivers will decide to take public transport, some will choose a different route or make their journey at a different time.

The negative externalities of transport (congestion, emissions, etc.) have increased. In Finland, for instance, the transport sector looks set to achieve its 2020 emission reduction targets, but not in the longer term. Transport service requirements are becoming increasingly rigorous, and the targets for mitigating the negative effects of transport are getting ever tougher. If the transport system is to meet the complex mix of objectives that include delivering 24/7 reliability and satisfying a broad spectrum of user needs in absolute safety and at once in a cost efficient and environmentally friendly manner, then it must also have access to a more diverse selection of tools.

The growth of transport also calls for more effective means to influence people's transport choices and behaviour. Finland's road network is by and large sufficient to meet current and future transport needs, but there are some issues with regard to directing transport flows so that the existing network can be used more effectively. It is necessary to shift the focus of transport policy so that capacity problems are resolved primarily by means of controlling transport flows and demand rather than building new infrastructure. These means are often much more cost effective than traditional means of infrastructure management, and therefore contribute to easing the pressure on state finances, a key consideration in present-day decision-making on infrastructure management.

Transport pricing is an integral part of EU transport policy. In 2011 the European Commission published the EU Transport White Paper in which it proposed that the structure of transport fees and taxes should move towards the full application of the "polluter pays" and "user pays" principles. The EU's long-term goal is to apply user fees to all vehicles and on the whole network to reflect at least the maintenance cost of infrastructure, congestion, air and noise pollution.

Several countries are currently in the process of rethinking the taxation of road transport. There are several reasons for this, and they tend to be very similar in every case.

The key motive for taxing road transport has always been to raise tax revenue for the government. Collecting taxes from transport has been a relatively simple and straightforward task for administration, and the continued growth of road transport has brought a steady growth of tax revenues. In recent years, however, this trend has changed with significant improvements in fuel efficiency, for instance, chiefly as a result of increasing environmental concerns. In the longer term, the growth of transport can no longer guarantee the current level of revenues from fuel taxes. There are two alternatives: either to continue to put up taxes, or to overhaul the tax system.

The discussion has revolved around two principal options, viz. collecting separate road charges or introducing a kilometre-based tax system where drivers are taxed based on kilometres driven. There is very little annual variation in the total number of kilometres driven on the road, and therefore it is easy to predict the amount of annual tax revenue. The interest in the kilometre system has been strongest in countries where revenue from the fuel tax goes directly back into road network maintenance. The United States is a case in point. The continued improvement in car fuel efficiency has meant that despite the growth of transport, revenue from fuel taxes has fallen clearly and consequently less money has been available for road maintenance. Several states in the US are therefore discussing plans to replace the fuel tax with a mileage tax.

In Europe, too, there has been growing interest in the kilometre tax. Several European countries have now introduced a kilometre tax on heavy goods traffic. However in Europe the kilometre tax is not seen as a replacement of fuel tax, but rather as a complement. This is because raising fuel taxes is politically less contentious in Europe than in the United States. Furthermore in the EU, abandoning the fuel tax would require a unanimous decision by all Member States, and such a decision is not forthcoming at this time.

The European discussion is framed by the premise that the kilometre tax would be introduced in replacement of fixed taxes on road transport, i.e. the annual vehicle tax or taxes associated with purchasing a new car. This is based on the recognition that variable taxes, i.e. taxes dependent on the amount driven, have a much greater influence on people's transport behaviour than fixed taxes. Therefore a key reason for overhauling the road tax system is firmly grounded in transport policy.

2.2 Digitalisation and technology are changing transport

Several sectors of society have seen a rising wave of digitalisation in recent years that has led to increasing productivity and brought new products and services into the marketplace. The same trend of digitalisation is inevitably going to make a major impact on the transport sector as well. Intelligent transport systems and services (ITS) is one way of addressing the problems created by the growing volume of road transport. Significant improvements have been achieved in traffic flows and traffic safety by means of traffic management and particularly variable traffic controls (traffic lights, variable speed limits, etc.). Ongoing advances in ICTs are creating whole new vistas for the entertainment and benefit of road users. Among these technological advances, special mention must be made of the development of a "transport internet", which is based on the proliferation of mobile broadband, mobile terminals and GPS and navigation services. The private sector has also invested heavily in developing smart on-board systems and in intelligent traffic and transport systems. These technological innovations are also paving the way to a rethinking of transport pricing systems.

The most useful services with respect to traffic fluency and safety are so-called collaborative services in which vehicles, road users and the transport infrastructure are engaged in mutual dialogue to prevent accidents from happening by means of warnings,

emergency brake systems and other mechanisms. In the haulage industry, key services include those designed to increase the efficiency of rolling stock use and order-delivery chain management in general, starting from vehicle and cargo monitoring services to various control books and electronic transport documents.

Another significant technological development is the evolution of more advanced driver assistance systems, which are bring us ever closer to automatic driving cars. Anti-lock braking systems, active lane assistance, variable cruise control and electronic stability control are all in existing use in cars today. Autonomous cars will be in the marketplace by 2020, and fully automatic, self-driving cars will be on the road after 2025. It is expected that the latter will bring significant relief to congestion problems by allowing larger numbers of vehicles to occupy the same road space and at the same time by providing revolutionary new opportunities for the ”transport as service” concept. It is clear then that transport will become increasingly pervaded by information technology. At the same time it is logical that transport pricing (taxation) will become an integral part of this modern system. Furthermore, ongoing advances in technology will continue to open up new ways of levying transport taxes. So sophisticated is today’s positioning technology that it is already possible to levy taxes based on time and place.

In the long term the advanced technologies and solutions discussed above will indeed allow for the ”traffic as a service” concept to materialise. The core of this traffic-as-a-service thinking[1] lies in the effective and user-friendly coordination and integration of intelligent transport infrastructure, transport services and transport-related information and other services. The vision might be one of a system where users get the transport services they need by building a package that meets their specific transport needs: this might include using their own car, using taxi and public transport services, parking services as well as other additional services. This requires that boundaries between different transport modes are lowered, that transport pricing is further developed and that information services are put to more effective use.

[1] Traffic as a Service, TaaS; or Mobility as a Service, MaaS.

3. Finland's existing road tax system

3.1 Different types of taxes

Finland's existing road tax system is based on three different taxes. First, a *car tax* is levied on all new cars purchased as well as on second-hand cars imported into Finland. Second, an annual *vehicle tax* is levied on all vehicles in current use. And third, a *fuel tax* is levied based on the amount of fuel consumption.

Car tax

Car tax is a one-off tax levied in connection with the first registration for road use of a new car or motorcycle purchased in Finland or a second-hand car or motorcycle imported into Finland.[2] The amount of tax is based on the value of the car: it is determined according to the consumer price of the car in Finland. In connection with the 2008 tax reform the flat tax rate was replaced by a tiered system to reflect the car's carbon dioxide emission performance. The emissions-based tax regime was further tightened in 2012. Average emission levels of new cars have fallen by more than one-third since the introduction of the new tax rules.

Car tax is levied on newly registered passenger cars and vans as a percentage of their value for tax purposes. The tax rate varies according to the vehicle's carbon dioxide emission performance. The lowest rate is 5% for zero emissions (0g CO_2/km), rising progressively in one gram increments to 360g CO_2/km, which attracts a tax rate of 50%.[3] Vans used for goods transport and distribution attract a reduced tax rate. For motorcycles, the car tax is levied based on the engine's cubic capacity: the minimum tax rate is 9.8% and the maximum rate 24.4% of the motorcycle's taxable value. Taxable value, then, is determined based on the domestic retail value of the vehicle in question. Second-hand cars, vans and motorcycles imported into Finland and registered for road use are taxed on the same basis as new cars: their taxable value is determined based on their domestic retail value.

Vehicle tax and vehicle motive force tax

Vehicle tax and *vehicle motive force tax* are taxes related to the availability of the vehicle for road use. The base tax component of the vehicle tax is levied on all passenger cars and vans in regular road use in Finland; in addition the motive force tax is levied on passenger cars, vans and lorries that are powered by other than petrol engines. Both these taxes are levied for each day that the vehicles are registered for regular road use. As it stands the base tax component of the vehicle tax has some incentive effect for consumers to shift to lower emissions vehicles through the tiered emissions regulations. The incentive effect of the base tax complements the corresponding mechanism built into the car tax.

Vehicle tax was originally a flat rate tax applied to all passenger cars and vans irrespective of their size and performance. From the beginning of 2010 the base tax component of the vehicle tax has been based on the carbon dioxide emissions of cars and vans. For cars whose specific emissions are not indicated in the type-approval information for the vehicle in question, the base tax is determined according to the vehicle's total mass. In 2013 the minimum emissions-based vehicle tax was 43.07€ / 365 days (11.8 cents/day at 0 g/km emissions; in practice this is for electric cars) and the maximum 606.27€/ 365 days (166.1 cents/day). The lowest vehicle tax calculated on the basis of total mass is 125.93€ / 365 days (34.5 cents/day; total mass up to 1,300 kg) and the highest 535.46 €/365 days (146.7 cents/day; total mass 3,401–3,500 kg).

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[2] Car tax is not levied on heavy goods vehicles or on buses or coaches; nor on taxis, caravans and motor homes, emergency vehicles, ambulances, hearses and veterinary vehicles; nor on mopeds and lightweight ATVs.

[3] Specific emission is indicated in the vehicle's type-approval information. In cases where emission data are missing, the figure is derived based on the vehicle's total mass.

Motive force tax is levied on passenger cars on fiscal grounds to even out the differences between the lower-taxed diesel fuel and higher-taxed petrol based on the annual total of kilometres driven. The tax therefore has the role of balancing out the fuel tax. In connection with the fuel tax reform the motive force tax levied on passenger cars was graded by type of motive force to add to its environmental regulation effect: the tax now takes account of the energy and carbon content and the local emissions of each energy source. The motive force tax levied on HGVs is not a ”balancing tax”, but intended to meet the requirements of the Euro-vignette directive for a minimum time-based tax on HGVs. The motive force tax charged on HGVs is 0.6–2.2 cents/day for every 100 kilogrammes depending on whether the truck is used for drawing a trailer as well as on the type of trailer (full trailer or semi-trailer). The tax can be determined on a daily basis in cases where a vehicle is temporarily withdrawn from road use or if its status as a drawing/non-drawing truck changes.

Fuel tax

Based on the idea of directly taxing vehicle use, *fuel tax* has a long history of fiscal motivation, but in recent years energy and environmental regulation have come to figure ever more prominently. Fuel tax is based on the energy content of each fuel and its lifetime carbon dioxide emissions and local emissions, which is why the per-litre taxes on biofuels and biogas are lower than those levied on fossil fuels. Fuels that work in diesel engines attract a lower tax than petrol products. This has been in order to prevent the costs of diesel-powered goods transport from escalating.

3.2 Government tax revenue from transport

Tax	2006	2007	2008	2009	2010	2011	2012
Car tax	1 304	1 217	1 016	687	941	1 068	1 007
Annual vehicle tax	567	612	637	654	691	759	758
base tax				*327*	*347*	*456*	*434*
tax on driving power				*327*	*344*	*303*	*324*
Fuel tax for fuel consumed in road transport:							
petrol	1 424	1 443	1 453	1 435	1 408	1 334	1 311
diesel	768	833	943	929	1 007	1 038	1 260
VAT on fuel *	994	996	1 122	1 008	1 191	1 400	1 508
Totall	5 057	5 101	5 171	4 713	5 238	5 599	5 844

* Around 40-50% of estimated VAT sum is deductible
SOURCE: Ministry of Finance

Table 1. Total annual revenue from road taxes (EUR million)

Road transport and passenger car transport in particular has long been a very significant source of tax revenue for the Finnish government. Road taxes have accounted for some 15% of total government tax revenue. It is extremely difficult to replace these taxes from any other sources. It is clear then that any undertaking to overhaul the road tax system must closely consider the effects of such a reform on government tax revenue.

4. Road pricing schemes around the world

4.1 Historical motives: funding and transit

Road pricing mechanisms are often called tolls. This is understandable from an historical point of view, as tolls have always been collected on different parts of transport networks. Tolls were charged to people and goods transiting a certain area. However this is not entirely the same as the modern understanding of road pricing in that early tolls were not charged to the vehicle used, nor was the revenue from tolls used to fund road and infrastructure maintenance or to try and influence transport volumes. The key motive was simply to collect money from transit. Even today this remains one of the most important motives behind road pricing.

Road pricing charges have always been integrally related to financing the building and maintenance of roads. Modern practice whereby governments assume the costs of road maintenance is, historically speaking, a rather recent innovation that only began to gain ground from the mid-1850s. Prior to this the building and maintenance of roads was usually down to local residents and towns that benefited from their existence. However practices varied widely from country to country.

In the 18th and 19th centuries, the UK and the United States had several turnpike toll roads.[4] These toll roads were intended to ensure that monies were available to build and maintain new roads. However they were not particularly profitable and were gradually abandoned by the early 20th century.

The second wave of toll roads came after the Second World War when France, Spain and Italy set about building an extensive network of toll motorways. Building was usually based on the concession principle. The motive was fundamentally the same as with the early turnpike toll roads: to collect the money needed to build and maintain roads without having to resort to public funds. In France, for instance, the government gave private companies or public-private partnerships the right to build, finance and operate motorways and to charge tolls for the use of these roads. Even today, new toll roads are being built and opened in different parts of the world. In Europe alone, there are currently some 45,000 kilometres of tolled roads.

4.2 Collecting transit charges

The two principal motives for road pricing, funding and transit, have continued to gain in prominence since the mid-1990s. Several European countries have introduced road pricing for HGVs. However these schemes have been motivated by other goals as well, such as exercising a positive environmental impact, influencing the division of labour between different transport modes, improving transport efficiency and ensuring equitable treatment of domestic and foreign HGV transport. One of the reasons behind the growth of HGV road pricing in Europe has been the introduction of relevant legislation: the Euro-vignette directive took effect in 1999. Currently the only EU countries that do not have HGV road pricing schemes in place are Finland, Estonia and Cyprus.

The most common HGV road pricing system in use in the vignette, which is a time-based charge. Vignettes can be purchased for a day, week, month or year. The so-called Euro-vignette was introduced in 1995 in Belgium, Denmark, the Netherlands, Luxembourg, Sweden and Germany. Several other countries also have national vignettes.

The vignette system is gradually giving way to an HGV kilometre charge. This trend is mainly being driven by Central European countries, which have high volumes of HGV transit. The view taken in these countries is that foreign HGV traffic should also contribute towards the costs of maintaining the road network. Switzerland introduced an

[4] The “turnpike” was a pole that barred movement along a road. When the traveller paid the required fee, the pike was moved out of the way.

HGV kilometre fee in 2001, and Austria, Germany, Slovakia and the Czech Republic have introduced a corresponding fee that is mainly applicable to motorways. France will be introducing an HGV kilometre fee in 2014. These moves are motivated not only by funding, but also environmental considerations. Therefore the fees are called eco-taxes. In addition to the countries just listed, a number of EU Member States have plans in place to introduce an HGV kilometre fee.

The impacts of these HGV road pricing schemes have been in line with the objectives set. They have influenced both the volume of transport and the quality of HGVs on the road. However the division of labour between different transport modes has remained unaffected: there has been no modal shift from road to rail transport. The kilometre fees have generated additional revenues for the governments concerned. In Germany, annual revenues from HGV kilometre fees come to around EUR 3.5 billion, 10 times more than it collected in Euro-vignette fees. The costs of running the road pricing system in Germany have been around 15% of gross revenue.

4.3 Controlling transport demand

Apart from the funding motive, another justification for transport pricing that has recently gained increasing prominence is the need to control transport demand. In urban areas one way of controlling transport demand is through the introduction of congestion charges. By charging a fee for driving a car at a certain time in a certain place it is possible to reduce the volume of traffic. The purpose is to create enough space to get the traffic moving again. Some drivers will decide to take public transport, some will choose a different route or make their journey at a different time. There are different types of congestion charges, including toll rings (payable upon entering and/or leaving a certain zone), area tolls (payable for driving within a certain area) and kilometres charges, which are payable in certain areas or on certain roads. The latter system has not yet been put into practice anywhere.

Congestion pricing is not in fact an accurate concept inasmuch as drivers are not paying for the congestion, but for the fluency of traffic. Indeed it has often been suggested that the term congestion charge should be revised accordingly.

Congestion pricing is not usually intended simply to make the transport system more efficient and to make the traffic flow better, but also to reduce the adverse environmental impacts of transport (e.g. curbing CO_2 emissions) and to gain additional financing for the transport system.

The increased use of congestion pricing is in part attributable to advances in technology. Modern technology makes it possible for traffic to flow readily without the need to stop at toll collection points. At the same time this technology means the actual charge can be varied at different times or in different places.

The best-known examples of congestion pricing are Singapore, London and Stockholm. All these cities have used congestion charges in order to reduce volumes of car traffic during rush hours. The results have been largely consistent: there have been fewer gridlocks and overall traffic has flowed more easily. These successes have attracted growing interest in the use of road pricing as a means of transport control, and many cities have looked into the possibility of introducing such schemes. Gothenburg in Sweden introduced congestion pricing from the beginning of 2013. Again the impact has been similar to that seen elsewhere.

The effects of congestion charges on transport have been quite clear and in line with the targets set. In this context of congestion pricing there has been much talk about the fairness of these schemes, particularly about whether low income groups are at a disadvantage.

Research results have shown that the perceived fairness of congestion pricing depends on how the charges are compensated and on how revenues from congestion schemes are

spent. The effect of congestion pricing and any associated compensation system may be either regressive or progressive. A tax is regressive if people with a low income pay a larger share of their income in taxes than people with a high income. In other words the amount of tax as a proportion of income grows smaller with rising income. A tax is progressive, on the other hand, if the tax rate increases with rising income. Progressive taxation is generally considered fair, regressive taxation unfair.

London and Stockholm have used revenues from congestion pricing to increase and improve public transport. Evidence from opinion surveys suggests that the overall impact of congestion charges and compensation systems in both these cities is generally considered progressive rather than regressive. This is because low income groups use public transport more than high income groups. A survey in Sweden found that if revenue from congestion pricing is used to improve public transport, women and lower income groups stand to benefit the most (progressive effect). If, on the other hand, the revenue were used to reduce taxes, high income groups would be the main beneficiaries (regressive effect).[5] In Singapore, too, the overall impact of congestion pricing is considered progressive because there the revenue has been spent on improving public transport and on building affordable housing particularly along public transport corridors. In Norway, revenue from road tolls goes towards both road infrastructure investment and improving public transport.

Another comment often made about congestion charging is that it has an adverse effect on local business among other things by discouraging people from driving into city centres. However there is no evidence to support this in any of the cities that have congestion charges in place. On the contrary figures from London indicate that the number of trips made into the congestion charge area has increased every year since the system was introduced.[6]

4.4 National kilometre charge

Road pricing systems in different countries have so far been limited to specific areas. Universal or near-universal charges or taxes applicable to the whole or the major part of the road network are only used for HGV traffic. There are no such tolls or taxes anywhere for passenger cars (excluding the time-based vignette payment). Nevertheless it seems that this is now the prevailing trend: we are headed towards road pricing charges or taxes that apply to the whole road network. There are several reasons for this.

One key reason is the development of technology, which has become so sophisticated that it is possible to have different tax rates for car use at different times or in different places. As was discussed earlier, the EU's long-term transport policy objective is to have road pricing charges that are applicable to all vehicles across the road network. The existing road tax system does not yet allow for any significant regional differentiation. The kilometre tax is considered one of the possible ways of influencing transport costs in different areas, because it is technically possible to have different kilometre tax rates in different areas.

In 2013 the US state of Oregon adopted a law that paves the way to the introduction of a state-wide mileage tax system for passenger cars. The system will be put in place from the beginning of 2015, when 5,000 voluntary motorists will start paying the mileage tax. In return, they will be exempted from fuel tax (i.e. the tax will be paid back to them). State officials in Oregon are keen to stress that this is no longer just a trial, but the beginning of an alternative way to paying taxes for driving. The plan is to gradually replace the fuel tax with the mileage tax.

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[5] Eliasson, Jonas, Mattsson, Lars-Göran, (2006). Equity Effects of Congestion Pricing: Quantitative Methodology and a Case Study for Stockholm. Transportation Research Part A: Policy and Practice, Volume 40, Issue 7, pp 602-620.

[6] http://www.tfl.gov.uk/assets/downloads/corporate/travel-in-london-report-4.pdf

In autumn 2013, in connection with discussions on the formation of a new German government, the decision was taken to introduce a national autobahn charge for passenger cars. At least initially the charge will be collected in the form of an annual vignette. Authorities in Germany have already looked into the possibility of extending the current HGV kilometre charge to apply to passenger cars as well.

The spread of road pricing has also been taken into account in European legislation. Under the unifying European Electronic Toll Services (EETS) system, road users need only one on-board unit and one contract with a service provider to be able to pay all road tolls in the countries joining the system. Supplied by the EETS service provider, the necessary on-board unit collects information on the vehicle's movements in EETS domains. Users can pay the service provider for their road tolls on a single invoice. The toll can be collected in the form of a fee, tax or other dues. The service provider will be responsible for making payment on behalf of the EETS user to all road toll operators in whose domains the vehicle has been used. The service provider can use the same on-board unit to deliver other services needed by road users, such as real-time information on traffic and road conditions.

EETS is designed to facilitate travel across the European road network, to promote the development of EU-wide ICT transport service markets, and to provide new tools for the implementation of EU transport policy.

EETS will complement electronic road toll systems that are operated nationally or locally in Member States. Member States are to decide independently on the introduction of road tolls as well as on the structure and amount of the tolls. There are currently some 200 electronic road toll systems in use across the European Union, and only some of them are interoperable. As yet there is not a single EETS service provider in Europe. Work has now started in France and Germany to develop the first electronic road toll systems that support EETS.

Implementation of EETS has fallen behind schedule and the European Commission has suggested a stepwise approach to achieving Europe-wide interoperability via regional systems. However those regional systems must be compliant with EETS definitions.

EETS introduces satellite positioning systems alongside existing systems that are based on shortwave communications. In practice interoperability will be achieved by on-board EETS units that support both satellite technology and shortwave communications, while the roadside equipment will be dependent on the road toll operators. EU regulations state that EETS units must have the ability to download other applications as well.

5. Road pricing in Finland

What might be the motives for the introduction of road pricing in Finland?

5.1 Integrating transport policy objectives with taxation

Transport policy ties in closely with public policy more generally. The purpose of the transport system is to enable society to function, to create the necessary conditions for growth and to boost Finland's competitiveness. Transport policy is not just about the building and maintenance of transport infrastructure, but more broadly about resolving problems of movement and transport through the application of public policy tools, regardless of administrative boundaries and jurisdictions.

The current system of road taxation is the outcome of a long chain of historical development. The prime motive for taxing road users has always been to raise tax revenue for the government. During the current decade the taxation of road transport has increasingly moved to incorporate energy and environmental policy objectives. Today, the amount of car tax and the base component of the annual vehicle tax depend upon the vehicle's carbon dioxide emissions. The fuel tax and motive force tax, then, take account of the energy and carbon content of the fuel as well as local emissions. Although most of the revenue from the taxation of road transport already comes through taxes on vehicle use, i.e. the fuel tax, and although public transport benefits from various tax subsidies, the link between taxation and transport policy objects is still rather weak and tenuous.

In any event the taxation of motoring needs to be reviewed and rethought in Finland because increasing fuel efficiency and the growing number of electric cars mean that long-term tax revenue is inevitably going to be affected.

The taxation of motoring could be a highly effective tool of transport policy. For this reason it makes sense to explore the possibilities of overhauling the existing tax system so that it could support not only government finances and environmental objectives, but also transport policy objectives. It is a waste of society's resources to try and resolve transport policy problems by ineffective means if there is an effective option as well. Needless to say, an overhaul of the tax system that at once makes it a transport policy tool must be justified in terms of socio-economic effects, that is the benefits to public finances must outweigh the costs to public finances.

5.2 Economic regulation

The aim and purpose of transport policy is to ensure that traffic moves smoothly and safely and causes minimum environmental harm. One of the key factors with respect to achieving these goals is the volume of traffic. Economic regulation can contribute to influencing transport performance, i.e. to increasing the efficiency of the transport system, reducing environmental harm, improving safety and securing government tax revenue.

The existing system of road taxation consists of taxes levied on the purchase of new cars, the availability of the vehicle for road use, and the de facto use of the vehicle (car tax, base tax component of the annual vehicle tax, motive force tax and fuel tax). The most significant tax item, the amount of fuel tax paid by the motorist in the price of fuel, is directly dependent on the distance driven and driving style (variable tax). By contrast the amount of tax payable in the form of car tax, base tax in vehicle tax, and motive force tax is not dependent on kilometres driven; in this sense they are fixed. In other words motorists cannot decide to drive less, for instance, in order to reduce their tax bill. They can, on the other hand, influence the amount they have to pay in car tax, the base amount of the vehicle tax and motive force tax through the choice of vehicle, because these taxes are determined based on the car's retail price, age, carbon dioxide emissions and type of fuel. Furthermore by temporarily decommissioning a vehicle from road use it

is possible to reduce the amount of vehicle tax payable because that tax is calculated on a daily basis.

Fixed taxes have a much lesser effect on people's driving behaviour than direct taxes on consumption. At worst, the steering effect of fixed taxes may be exactly opposite to that intended. For instance, the motive force tax levied on diesel cars may encourage people to drive as much as possible in order to justify their driving such a vehicle rather than a petrol-driven car. Fixed taxes also mean that motorists who drive less than average pay more tax per kilometre driven than those who drive more than average.

The tax bases for motoring are currently the same throughout the country. The only tax in the existing regime that would lend itself to regional modulation would be the vehicle tax. Currently some one-third of all taxes paid by motorists are fixed taxes (car, vehicle and motive force tax) and two-thirds are variable taxes (fuel tax). One way of moving towards a road tax system that places greater weight on vehicle use would be to substitute fixed motoring taxes with variables ones. The replacement of the car and vehicle tax with a kilometre tax based on time, place and type of vehicle would lend stronger support to transport policy objectives than the current system.

A kilometre tax would have a greater effect on driving or overall traffic volumes than fixed taxes because it would be levied on the actual use of cars. The amount of tax payable can also be adjusted according to the car's environmental performance, so that each kilometre driven affects the amount of emissions coming from the car's exhausts. It is also easier to predict the level of tax revenues because there is very little annual variation in the number of kilometres driven, whereas purchases of new cars can and do fluctuate. A kilometre tax would also provide a way of taxing electric cars other than through taxing the car itself or electricity.

Couldn't all these same effects be achieved by incorporating fixed motoring taxes into the fuel tax? There is a clear connection between the fuel tax and car use: the more people drive and the fuel-thirstier their driving style, the more tax they have to pay. Fuel tax can internalise the costs of CO_2 emissions. Fuel tax also internalises the costs from local emissions at the national level. However fuel tax cannot be used to reduce local emissions, for instance in city centres. Fuel tax does not require tracking the location of vehicles, it is a simple and straightforward administrative task and highly cost effective.

However increasing the fuel tax involves some obvious problems. A fuel tax hike could not be restricted to passenger cars except by creating an extremely laborious refund mechanism to compensate professional road hauliers. Fuel tax can be used to influence traffic volumes, but not to increase the efficiency of the transport network because it cannot be regionally differentiated; it has to be the same throughout the country. It follows that a fuel tax hike would have the greatest effect on motorists who have to drive the longest distances and who have no option but to use their car.

Fuel tax cannot be used to internalise congestion costs. Driving in heavy traffic increases fuel consumption, but these costs are internal to the motorist and do not cover the external costs caused by the motorist, i.e. the extra amount of time that other road users have to spend getting to their destination. It is true that the problem of congestion in the metropolitan Helsinki region could be resolved by effecting a sharp hike in fuel tax, but this would mean that all motorists around the country would have to pay for resolving the congestion problems in Helsinki.

If Finland had a significantly higher fuel tax and therefore a higher price level than its neighbouring countries, this would certainly encourage some fuel tourism into those countries.

5.3 Funding

The single most important motive for the introduction of road pricing has always been to secure funding. Revenue from road pricing has been used to finance either specific road

projects or the building of larger road networks. In Finland the building and maintenance of public roads is financed from the State Budget. In recent years the overall quality of the road network has deteriorated as the appropriations available for road maintenance have fallen short of needs. It might be suggested that securing funding for road maintenance might be one motive for the introduction of road pricing/taxes in Finland.

However things are not as simple and straightforward as that. The Government taxes road transport to the tune of almost six billion euros a year. Appropriations allocated for purposes of road maintenance have been in the region of EUR 750 million a year. In other words the amount of taxes collected from road transport exceed the amount of money spent on road maintenance some seven times over. Revenue from road transport taxes would be more than enough to cover the costs of road maintenance. Why the need to collect even more taxes?

Taxes levied on road transport are part and parcel of the general taxation system that is designed to cover all government expenditure. In Finland tax revenues cannot be earmarked for any specific purpose. Parliament decides each year in the State Budget how government funds are to be allocated for different purposes. In other words the amount of tax revenue received from road transport and the amount of money made available for purposes of road maintenance have nothing to do with each other. These are political decisions.

Collecting more taxes from road transport (especially if the new taxes replace existing ones) would therefore not automatically increase the amount of money available for road maintenance. For this reason collecting funding for road maintenance cannot be a motive for the introduction of road pricing or taxing in Finland. Road pricing can of course be used to collect more tax revenue for government. However it would be more effective to generate additional revenue by some other means, such as by increasing fuel tax, than by introducing a road pricing scheme.

Regional or local road pricing/taxing constitutes an exception, however. Congestion charging is one example of a local or regional tax that is considered in terms of an extension or addition to existing taxes. Like other taxes, it would have universal coverage. Revenue from congestion charging could be allocated to the appropriate State Budget expenditure item in order make the funds available for the development of the transport system in that area or region where the congestion charges have been collected – otherwise it is not worthwhile for the region in question to introduce congestion pricing in the first place. It is hardly conceivable, for instance, that congestion charges collected in the Helsinki area are spent on developing transport systems in other parts of the country, or on meeting other central government expenditure.

Toll roads

Conditions in Finland do not lend themselves very well to toll roads. This is because transport volumes in Finland are fairly low in comparison with Central Europe, for instance, and therefore it would be difficult to make them economically viable. One of the key ideas of toll motorways is that they provide shorter and faster routes to the intended destination than non-toll roads. In Finland this would be much harder to achieve because distances between motorway junctions are very short. For this reason it would be difficult to create attractive toll roads in Finland, especially as the old, non-toll roads usually run alongside the motorway. Accordingly if road pricing were applied to motorways only, larger volumes of traffic would move back to the lower road network, which is not desirable. In other words the application of instruments of economic regulation would be counterproductive.

Taxing transit traffic

Finland, too, is a transit country. Large volumes of transit traffic pass through the country from and into Russia. In practice foreign registered HGVs do not pay anything for using the Finnish road network, unless they stop to fill up. There has been some talk in

Finland about introducing HGV road pricing, but the reports so far have concluded that collecting such charges is not in line with our transport policy objectives.

Road charging must not be discriminatory, so Finland cannot decide to introduce HGV taxes or charges that apply to foreign-registered vehicles only. Any HGV road pricing scheme would have to apply to domestic hauliers as well. Finland's geographical distance from major international markets is considerable, and even within the country transport distances are long. For these reasons the tax burden on HGV transport has been kept at the lowest level possible. The HGV motive force tax and diesel tax in Finland are very close to minimum EU levels. If Finland were to introduce a vignette charge, for instance, that would push up costs for domestic road hauliers. Taxes corresponding to the vignette charge could not be deducted from the motive force tax, which it is close to the EU minimum as it is. A survey by the Ministry of Transport and Communications and the Ministry of Finance in 2010 showed that the introduction of the Euro-vignette would have added tens of millions of euros on domestic road hauliers' existing tax burden. At the same time the collection of vignette fees from foreign HGVs would have generated annual net revenues of no more than some EUR 6 million.

Congestion charging

In Finland, significant congestion problems are only experienced in the metropolitan Helsinki region. The Ministry of Transport and Communications has twice conducted a survey to assess the impacts of congestion charging in and around Helsinki. Both these surveys considered the societal and traffic impacts of congestion pricing and the question of how congestion pricing can contribute to achieving transport policy objectives.

The findings showed that a transport system that incorporates congestion charging better meets the objectives set for the Helsinki region than a transport system that does not include congestion charging. Congestion charging would reduce congestion in the region, make traffic move faster, increase the competitiveness of public transport and the proportion of travel by public transport, reduce greenhouse gas emissions and other environmental harm, and improve traffic safety.

Furthermore, the surveys clearly showed that congestion pricing is most effective as part of a long-term strategy that combines a commitment to developing public transport, infrastructure investment and the financing of these investments. Despite all this strong evidence, no decisions have as yet been made on the introduction of congestion pricing in the Helsinki region.

5.4 Impacts of taxation based on vehicle use

Abandoning fixed taxes and adopting a tax regime based exclusively on vehicle use would have a variety of impacts. Taxing vehicle use would change people's perceptions of the costs of transport, which in turn would affect the volume of traffic. There would probably be fewer passenger cars on the road, which would also mean less emissions from transport and increased safety. Lower traffic volumes also reduce the costs of road maintenance. If the volume of traffic were to fall significantly, it might be possible to postpone or even withdraw some infrastructure investments.

The increased costs of car use would improve the relative competitiveness of public transport, driving up the number of people using public transport.

Price of new cars

Abandoning the car tax and other fixed taxes would inevitably affect the automotive market. The key factor is how the withdrawal of the car tax would affect the price of new cars. Studies have shown that car manufacturers' pre-tax prices are lower when sold to countries that levy car taxes and other similar fees. Therefore the factory prices of new cars imported to Finland are slightly lower than in countries that do not have a car tax. However country differences are considerable.

It is a frequently voiced concern that if the car tax were withdrawn, this would only lead to car manufacturers putting up their prices accordingly. The benefits from the tax reduction would be eaten up by car factories abroad. However this scenario does not seem very likely. This is largely because the market situation in Finland is different from those countries that do not have a car tax. In Finland the consumer knows exactly how much the car price needs to go down if the tax rules are changed. If in this situation there is no movement in salesroom prices, the consumer will simply go to some other market or buy a car make that has reduced its prices. This is possible because if the car tax were indeed withdrawn, consumers could go to Estonia or other countries to buy their car without having to pay any car tax in Finland. Therefore the price of new cars sold in Finland could not be significantly higher than the prices in nearby markets. It is quite natural that car manufacturers and retailers are keen to increase their own margins. However this is a fiercely competitive market. Normal market mechanisms will ensure that car prices in Finland will be at or around the European average. This average is lower than current prices, but higher than the current pre-tax price.

This change would also have a bearing on the tax-free import of used cars, as well as on the value and markets of domestic used cars. However the Working Group has not assessed these impacts.

The existing car tax rate is based on the vehicle's carbon dioxide emissions. This encourages consumers to purchase lower emissions cars. Sales of low emissions cars have indeed increased in recent years. The true scale of emissions from new cars has not necessarily decreased accordingly because people typically drive more than average when they have a new car. The impact of the car tax on emission levels, therefore, will play out slowly over the long term.

The decision to abandon the car tax would obviously mean losing this particular regulatory instrument. Consumers might be inclined to go back to buying high emissions cars again, creating a risk of increased emissions. This, however, can be prevented by determining part of the kilometre tax rate according to the vehicle's emissions. The emissions component of the kilometre tax can be adjusted exactly according to the intended regulatory effect.

A reduced car tax rate would also have the effect of gradually lowering the average age of the existing car fleet, which in turn would affect emissions levels and road safety.

The kilometre tax has a greater impact on emission levels than the car tax. Even so the achievement of emissions targets may require some regulatory intervention through car prices. The Working Group has not made any assessment of whether a combined car and kilometre tax would be more effective in the achievement of emissions targets than the current system or a kilometre tax alone.

Whole passenger car fleet to be taxed based on vehicle use

One key question in the possible switchover to a tax regime based on vehicle use is whether or not this reform would only affect new cars or all cars on the road. It would obviously be easier for consumers to understand the kilometre tax reform if it only applied to new cars. This, however, is not practically possible because if the kilometre tax were to apply only to new cars purchased after the reform, then that might encourage consumers to favour domestic second-hand cars, which would be at variance with the transport policy, environmental policy as well as public finances objectives of the kilometre tax. Furthermore vehicles manufactured and imported second hand into Finland before the introduction of the tax would be excluded from all tax regulation, because EU rules would not allow either of these taxes to be applied. This might lead to increased imports of vehicles in this age bracket. For the reasons stated above it is possible that tax revenues might fall short of targets, and an attempt to fill this shortfall by the introduction of a kilometre tax applied only to new cars might excessively hamper the renewal of the existing passenger car fleet. For these reasons the Ministry of Finance

has taken the view that the kilometre tax should be applied to the whole existing passenger car fleet from the very outset. However this question requires further investigation because a stepwise approach to changeover would be a much easier way to move forward for both technical and practical reasons.

HGVs excluded from kilometre tax

In the case of passenger cars the basic idea is to replace fixed taxes with a kilometre tax. Buses and coaches in Finland only pay fuel tax, i.e. no fixed taxes at all. They would therefore be exempted from kilometre tax. The application of the tax to buses and coaches would increase bus and coach service costs, which would contravene transport policy objectives.

HGVs are subject to a fixed tax in the form of the motive force tax. However this tax cannot be changed into a kilometre tax because the motive force tax is already very close to the minimum level specified in the Euro-vignette directive. Therefore the effects of imposing a kilometre tax could not be offset by reducing fixed taxes. The imposition of a kilometre tax on HGV transport on top of existing taxes would drive up Finland's logistics costs and again contravene transport policy objectives.

Community structure

The price of transport also affects the community structure. Several international studies have shown that economic regulation of transport contributes to creating to a denser community structure. This in turn is conducive to a more effective transport system, a more coherent urban structure, and to reduced costs of both public transport and municipal infrastructure provision.[7] On the other hand the prevention of urban fragmentation and the development of a denser community structure are crucially important to the maintenance of an effective transport system. A more cohesive community structure adds to productivity in society.[8]

A kilometre tax is also capable of affecting transport costs in different regions. For instance, lowering the tax rate in regions that have no public transport can help to preserve the vitality of rural areas. Accordingly the kilometre tax can be higher in areas where people have ready access to public transport. However regional pricing schemes must not be allowed to compromise the competitiveness of regions.

Business opportunities

The increasing integration of technology into transport, the growth of intelligent transport, the increasing on-board use of broadband etc. are all set to create new business opportunities for companies in the areas of intelligent transport and transport pricing solutions. Already the global intelligent transport markets are worth tens of billions of euros. It has been predicted that by 2019, the value of the global services market will be in excess of 100 billion euros.[9]

Smart transport services open up new business opportunities in three directions:

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[7] SCATTER: Sprawling Cities and Transport: from Evaluation to Recommendations (2005), System for planning and research in towns and cities for urban sustainability (1998).

[8] Heikki A. Loikkanen "Kaupunkialueiden maankäyttö ja taloudellinen kehitys – maapolitiikan vaikutuksista tuottavuuteen sekä työ- ja asuntomarkkinoiden kehitykseen", VATT (2013) ["Urban land use and economic development : effects of land policies on productivity and functioning of labour and housing markets"]

[9] Transparency Market Research 2013: Global Connected Car Market – Industry Analysis, Size, Share, Growth, Trends and Forecast, 2013-2019, Albany, New York (PRWEB) October 17, 2013

1. Continuing advances in technology are creating whole new services that make it easier for people to move and travel and that are integrated with other everyday services used by road users.
2. Significant business opportunities are also created through the evolution of existing business services.
3. Indirect effects are created through other industries as transport services are linked up with them.

Some of these services may grow and develop very quickly, but others will unfold over the longer term with the development of competencies and facilitating technologies.

Strong growth potential makes these services a high attractive future proposition for Finnish businesses that have world class expertise in all key technologies. For instance, GPS-based pricing using a multi-service concept would be a world first and give Finnish experts a competitive edge in the future global markets.

The collection of road charges has been moving from physical toll booths towards on-board GPS units, such as in the case of the HGV charges collected in Germany and Slovakia. Third generation road charges are paving the way to the evolution of other services that use the same technology. In these models users can choose the most suitable technology for each situation and select the services they want. Already a large market has grown up around second generation road charges, with the biggest commercial operators coming from countries that have pioneered electronic road toll collection systems, such as Norway and Austria. Local businesses have developed significant expertise in these areas and grown into major international concerns. However third generation road pricing has not yet been started anywhere, so the field is open for new entrants.

In Finland, too, a large part of intelligent transport services and related business opportunities will materialise regardless of the fate of the GPS-based kilometre tax. However international experiences have shown that the introduction of road pricing systems has always and in all countries generated new business as well.

It is difficult to give an accurate estimate of the value of the new business. In 2012 ITS provided work for 1,700 people, and the sector is export-oriented.[10] In comparative countries the introduction of road pricing has provided a major boost to industry growth. In Austria more than 20,000 people are employed in this sector, and exports account for some 80% of its EUR 1.1 billion turnover. A realistic target for Finland would be to achieve a one per cent share of the world's ITS turnover, which in 2019 would be around one billion euros. This would mean close to 20,000 jobs. A kilometre tax system based on a multi-service concept would certainly support the achievement of these objectives.

Obviously a prerequisite for job creation in Finland is that Finnish companies are successful in the competitive international marketplace.

[10] Leviäkangas, P.; Zulkarnain, Z.; Roine, M. 2012. The Finnish ITS market size and structure – a microeconomic approach. 19th ITS World Congress 2012, Vienna Austria, 22-26 Oct. 2012

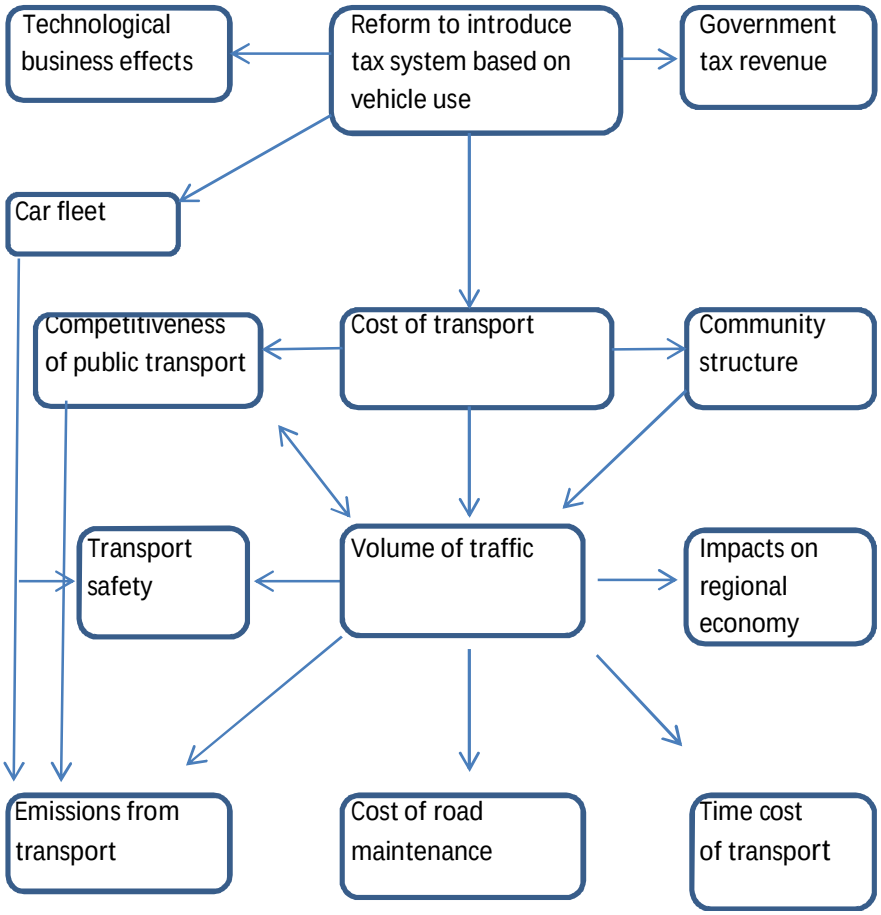


Figure 1. Socio-economic effects of road taxing based on vehicle use

6. Legislative issues

There are several important legislative issues that must be considered in planning and implementing a road pricing mechanism. These include the conditions laid down by EU law and the Constitution regarding the organisation and content of such a system, the requirements of privacy protection and information security, and questions related to monitoring, sanctions and legal protection.

One key consideration in planning a road pricing scheme is EU legislation and its development. Road pricing would probably be built around an on-board units transmitting information, so for this reason system developers will have to take account of EETS regulations governing European electronic toll services. In rough outline the EETS system involves the following parties:

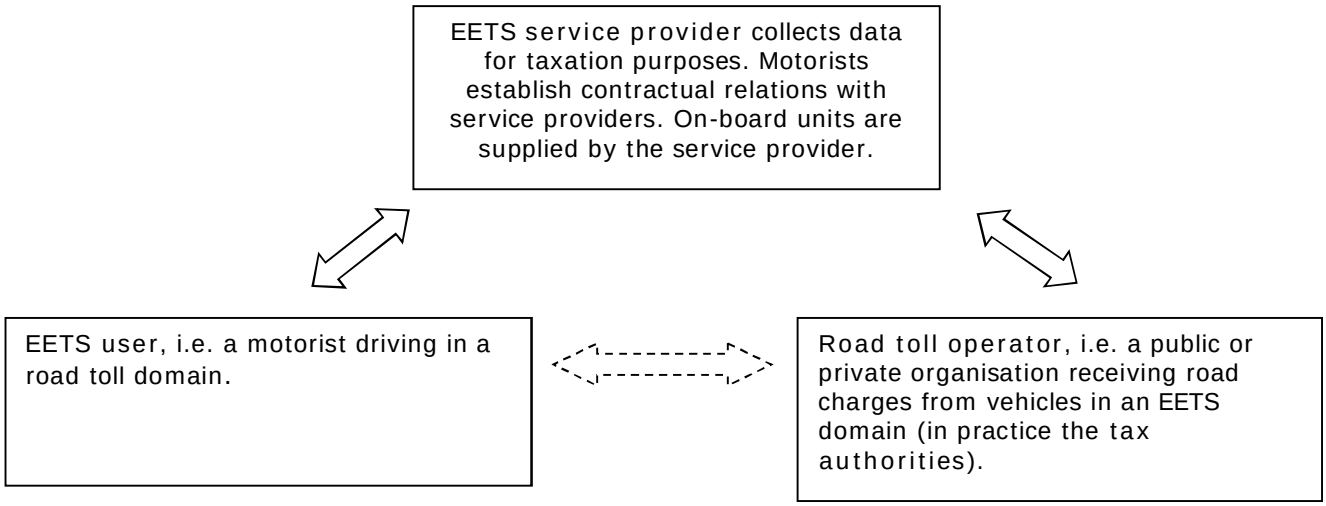


Figure 1. Main parties in EETS system

EETS regulations are in place to govern the technology used as well as the broader operation of the system. Since the purpose of these regulations is to promote freedom of movement by ensuring the interoperability of road toll systems, it can be safely assumed that any new technologies developed in the future will also be covered by these regulations. It is paramount therefore that an active effort is made to monitor European developments in this sector and to influence the development of EU legislation. This also applies to the energy tax directive and the Euro-vignette directive which, as they stand, prevent the replacement of the fuel tax and HGV motive force tax with a kilometre tax.

6.1 Tax or fee?

The constitutional nature of road pricing impacts the required legislative standard, the level of legislative detail, the payer's duties and legal protection, and the authority's powers. Furthermore it also determines how revenue from road pricing shall be handled and how and for what purposes it may be allocated.

According to the Constitutional Law Committee's established decision-making practice a constitutional charge is defined as a remuneration or consideration for a service provided by a public authority. The service provided in exchange for payment must be identifiable. The payment must reflect the costs arising from the provision of the service, although full cost equivalence is not always required. Gratuitous payments or fees or charges collected for purposes of financing some activity without any service provided in exchange, on the other hand, are taxes. The key to this distinction lies in the question of what constitutes the identifiable service provided in exchange for a fee or charge collected, and whether

that payment is voluntary or involuntary. The fact that road tolls and charges are involuntary points in the direction of a tax payment.

In the case of road pricing the assessment of whether or not the charges are involuntary must also consider the options available to road users. The road charge might be considered voluntary in situations where the destination concerned can be reached via more than one route; the charge is simply applied to the choice of using the option that provides a better standard of service. However this is not possible in a national road pricing scheme that would provide the most effective avenue to economic regulation.

The cost equivalence principle, in this context, means that the payment charged should not exceed the costs arising from the production of the service or commodity. There should be no surplus, and at least the revenue generated should not be available for other purposes. For instance, charges collected from motorists should not be spent on subsiding public transport in general.

The choice of specific term is irrelevant. Bearing in mind the objectives set for the road pricing system and the concerns voiced about fairness, road pricing would in any case be considered a form of taxing. Indeed instead of a toll charged for the use of a specific road or road network or a charge designed to cover road maintenance costs, it might be possible to refer to a tax levied on the use of a motor-driven vehicle. It would be natural to extend this tax to apply to all vehicle use in Finland, but the tax rate could be varied, within the bounds of equal treatment of taxpayers, according to time, place and type of vehicle.

According to Section 81 of the Finnish Constitution, the imposition of a state tax must be expressly established by law. The Act shall contain provisions on the grounds for tax liability and the amount of tax payable, as well as on the legal remedies available to the persons or entities liable. The legal provisions must be specific and accurate so that the authorities enforcing the law have limited discretion in the determination of the tax. The requirement of legislative accuracy also means that the definition of tax liability or the amount of tax payable cannot be left to be done in connection with the drafting of decrees or even lower level rules and regulations. Questions related to legal protection have a bearing on such issues as access to data collected on the vehicle's movements in the event of appeals, for instance. If road charges could be defined constitutionally as fees or charges, then it would be necessary to adopt legal provisions regarding the general grounds for charging fees and the size of the fees charged. The accuracy requirements with regard to the determination of fees are somewhat less stringent than those concerning taxes.

6.2 Information protection and monitoring

The retailed regulatory requirements related to information protection will only become clear once system planning has reached a more advanced stage and more is known about technical implementation, system organisation and the specific data processed. Legislation and restrictions arising from legislation must be considered against the various taxation options. It is certainly worthwhile to compare alternative models of implementing a tax system based on vehicle use and to weigh their relative effects on privacy protection. For instance, such questions as where the data are stored, who and where can these data be accessed, and where and when they can be linked with other data are of crucial significance to how legislation restricts or enables the processing of personal data. Indeed at the planning stage it makes sense to consider which option is least restrictive from a privacy point of view. Furthermore it is important to bear in mind that EETS regulations limit the range of options available. Also it is necessary to observe that EU personal data legislation is being revised, and any changes will have an immediate impact on privacy protection on the Finnish system of taxing vehicle use.

New ways of processing privacy sensitive information are now being developed and will soon be available. Instead of registers kept by the authorities, data on vehicle use could

be administered (but not modified) by owners or keepers of vehicles for instance via an online citizen account. The authorities responsible for collecting the tax would at regular intervals receive the information necessary for determining the tax, which might include distances driven in each tariff zone or simply the amount taxable. No details would be needed on location data, nor any mechanisms for up-to-date monitoring. This would go a long way towards allaying people's concerns about their privacy protection. Furthermore taxpayers could for themselves ascertain that their taxes are right, which would effectively eliminate any unnecessary complaints. The authorities would have the right to access more detailed information about vehicle use only on grounds separately detailed in the law in cases where a tax decision is contested or in the event of suspected misuse. Taxation and its accuracy could be automatically controlled through information systems without jeopardising privacy protection. The following chart illustrates the flow and management of information:

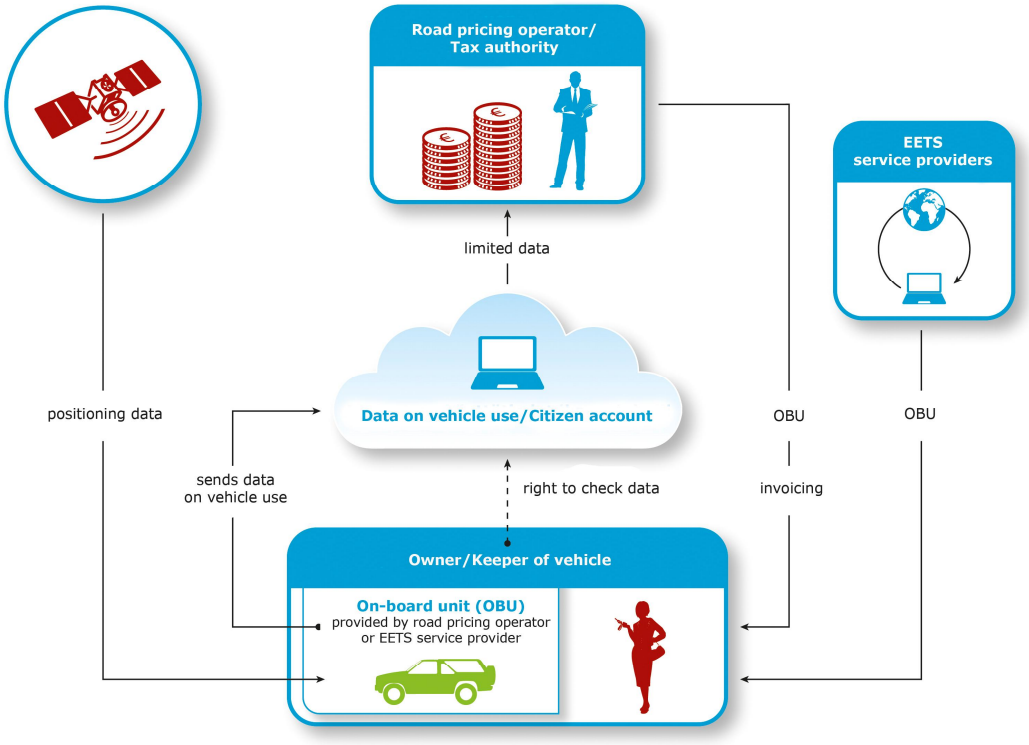


Figure 2. Flow and management of information

In this example (Figure 2) vehicle location coordinates are transmitted to on-board units (OBU) via satellite. Based on this information the OBU stores the required positioning data and at regular intervals transmits the data in encrypted form via a GSM connection to the vehicle owner's or keeper's citizen's account. Using the coordinates provided and an electronic map, the software attached to the account makes the necessary calculations to produce the vehicle use data, which can only be accessed by the owner of the citizen's account. The system would transmit to the national tax authorities only a limited amount of data necessary for the determination of the tax; no detailed information would be passed on regarding the actual use of the vehicle. Furthermore the data would be transmitted at legally defined intervals after a time delay, so based on this information it would be impossible to monitor the vehicle's movements in real time.

One example of an online citizen's account comes from Estonia where such an account has been compulsory for some ten years now. It was launched at the same time as the X-road service platform, a joint venture by the relevant authorities and private organisations. In Finland the State Treasury has launched an online service via which citizens can access a host of electronic government services. Furthermore the Ministry of Finance has taken charge of a project to develop a national service architecture that follows the Estonian example: the idea is to integrate government services and a selection of private services approved by each user. Planning has reached an advanced state and the portal is due to open for business in 2015. Electronic services are bound to attract increasing numbers of users in the near future, and they open up some interesting opportunities for the implementation of a tax system based on vehicle use. These opportunities must be given the closest possible attention in the subsequent preparation of this matter.

One of the most critical considerations in planning a tax regime based on vehicle use is privacy protection. Fail safe mechanisms must be put in place to ensure that data can only be accessed by authorised people. Data transfer must be secured in such a way that all data content remains unaltered during the transfer process and that no data is lost. In the event that changes have occurred in the data, it must be possible to rectify the mistakes. Furthermore EETS service providers must have adequate controls and procedures in place to ensure that all private data (data on vehicle use) is protected. Service providers will also be required to sign appropriate confidentiality provisions before beginning to process these data.

One absolute precondition for the introduction of a tax system based on time and place is to have in place a reliable control and monitoring mechanism. The only way to achieve this is by means of automated technology. Monitoring must be effective and credible so as to ensure that the collection of taxes works as planned. The collection of traffic and transport data would probably require an on-board unit, which raises the possibility of misuse. The extent to which OBU use can be controlled and monitored will largely depend on its technical specifications. It is necessary to have some way of testing the OBU's operation, for instance through a memory that records all data related to the use of the vehicle. The supervisory authorities or some other party should be able easily to check the OBU data. At the same time, the unit should be protected to prevent unauthorised access. On the other hand it must be possible from the outside to ascertain that the unit is working without having to stop the vehicle, for instance by means of automatic monitoring devices. The unit should also be equipped with sensors to detect and store information of any deliberate attempt to damage the unit or any malfunction, and automatically transmit a notification to the supervisory authorities. The OBU technical specifications shall also detail the method of on-board installation. If it is installed into the car's electrical system, the unit will detect when the car is driven. Moving the car under tow or on a flat bed will not attract tax.

If all passenger cars registered in Finland were equipped with OBUs, there would be 3.5 million vehicles in the country running such units. In addition it would be necessary to account for foreign-registered vehicles. This poses some challenges to the principle of freedom of movement. It is impossible to imagine any other credible mechanism for monitoring the movement of foreign-registered vehicles than an automated system. The police do not have the resources to monitor the use of OBUs other than in connection with regular traffic patrolling, and in general the main concern and focus for the police is on traffic safety. There are several options for how to organise this monitoring. Finnish Customs, the Frontier Guard, MOT inspectors, the Finnish Transport Safety Agency and the Finnish Transport Agency could all assist the police in its monitoring role (assuming that it is automatic).

The legal protection of the individual liable to annual circulation tax must be prescribed in legislative provisions regardless of whether this tax is defined as a tax or a fee. Good governance and legal protection in administrative matters are constitutionally guaranteed

basic rights. In the case of an annual circulation tax it is necessary to make provision for legal remedies open to road users and possibly for earlier procedures for lodging a complaint. Furthermore it is necessary to ensure by means of legislation that persons liable to circulation tax have right of access to the data on vehicle use on which their taxes are based. The introduction of a circulation tax does not require a whole new set of provisions for legal protection, as remedial actions available to administration for purposes of correcting material, procedural or typographical errors, for instance, are provided for in the Administrative Procedure Act (434/2003).

National legislation poses no obstacles to the development of a comprehensive national road pricing system, but there are several significant legislative boundary conditions. If such a system were to be introduced on a smaller scale, there would be less legislative issues to consider as well, or they would be easier to resolve. The differences between different solutions are considered from this point of view in the legislative working group’s summary table.

7. Impact assessments

This chapter discusses the impacts of a kilometre tax as compared to the existing tax regime. The examination is based on a scenario analysis for the situation in 2025. The decision to focus on this year is grounded in the recognition that decision-making, legislation and technical implementation all require several years to play out. Furthermore the possible move from the current system to a kilometre tax regime would in any case require a transitional period.

The examination works from the assumption that the kilometre tax system would generate the same amount of tax revenue as the current tax system in 2025. This technical assumption is made because the level and amount of taxes collected from motorists are political decisions.

The fiscal tax revenue requirement of no change in government tax receipts is at variance with the principles of economic regulation. Economic regulation, say by means of increased prices, is aimed at steering and changing people's behaviour. If people do change their behaviour and drive less, for instance, the objective of pricing changes will be achieved. At the same time, however, government's tax revenue will decline because of the reduced overall volume of traffic. If in this situation the government decides to put up taxes in order to offset the losses from reduced tax receipts, consumers will easily consider this as a punishment for doing what they have been asked to do. For this reason it is necessary to have open public debate about the relationship between fiscal requirements and economic regulation. The Working Group takes no stance on this issue, however.

7.1 Models used

The impact assessment is based on the national strategic transport models developed in the Finnish Transport Agency's methods development programme. The analyses of projected impacts are described in more detail in a separate report. The discussion here only outlines the main findings and results.

The impact assessments use computational models to provide broad and diverse information about the kilometre tax system and its effects on individual passengers and the transport system as a whole. For this purpose two separate, mutually complementary assessment models have been developed: the individual model and the transport forecasting model. The individual model simulates the choices made by individual people in different parts of the country, while the transport forecasting model assesses the national impacts at the transport system level.

The individual model estimates the ability of citizens to adapt to changes in the transport system in the long term, in a scenario where residents can respond to those changes not only by choosing another route or mode of transport, but also by changing their destination or car ownership status. The model describes local transport conditions in great detail, and therefore it is also used to describe the future transport structure.

The transport forecasting model, by contrast, describes at a strategic level the main national transport links between relatively large regions and transport system service standards in different scenarios using short-term elasticities, based on the assumption that only mode of transport and route can be chosen. The forecasting model therefore is effectively a change model that only predicts changes in the relative proportion of different modes of transport as a result of changes in transport supply and costs. This is the primary objective of the forecasting model because it is easy to change and analyse the model's description of transport system especially in future scenarios. The individual model, then, is based on small grid cells, allowing local demand to be modelled with much greater accuracy. At the same time, however, it is much harder to provide a detailed description of transport systems. The two-model approach therefore effectively combines the strengths of different methods.

7.2 Alternatives compared

The analyses are based on trend projections extending to 2025, with traffic volumes projected to increase by 16% from 2012 as a result of population growth and economic development. There are no changes in the structure of the system or prices, but improved fuel efficiency as a result of advances in vehicle technology mean there will be less revenue from fuel tax. Car tax and annual vehicle tax revenue will also fall because of reduced carbon dioxide emissions.

Current tax system

The existing tax model consists of current taxes. Increasing fuel efficiency has the effect of reducing revenue from the base component of the annual vehicle tax and fuel tax. The examination works from the assumption that government will increase these taxes accordingly so that overall tax revenue remains unchanged at its current level. In addition the growing number of cars on the road will drive up revenue from car tax. Fuel tax revenue is the same in all scenarios.

Kilometre systems

The existing passenger car tax system consists of fuel tax, car tax, the base component of the annual vehicle tax and the motive force tax. The latter three are fixed taxes; the amount of tax payable does not depend on kilometres driven. In the kilometre tax model these taxes are replaced by a kilometre tax so that the amount of tax payable is dependent on the distance driven.

The basic idea of the kilometre tax model is that the car tax and base component of the annual vehicle tax are changed into a kilometre tax. In 2025 the kilometre tax would be 3.3 cents per kilometre and charged to all passenger cars regardless of the fuel they use.

The kilometre tax is divided into two components, the emissions component and the regional tariff zone component. The emissions component is based on the vehicle's CO_2 emissions and it is designed to have an environmental regulatory effect. The regional component of the tax is variable and can be used to influence transport costs in different regions. The impact assessments use no set unit price for the carbon dioxide emissions component, but the unit price is included in the average regional component. This is because the relative weight attached to these factors is a political decision.

The existing motive force tax levied on passenger cars is replaced one-on-one by a motive force kilometre tax, which is charged to all cars using fuels other than petrol (e.g. diesel cars). The motive force kilometre tax would be determined based on the weight of the car, as is the case under the current regime. The average motive force kilometre tax in 2025 is 2.0 cents/km.

The reason for replacing the motive force tax with a separate kilometre tax is that if the motive force tax were added together with the car tax and the base component of the annual vehicle tax and divided by the total number of kilometres driven, owners of petrol cars would have to pay taxes on behalf of diesel owners, and the taxation of diesel cars would be reduced. The assessment proceeds from the assumption that the tax levied on diesels fuel in 2025 remains lower than the tax levied on petrol.

The differences between the current tax system and the kilometre tax system are described in Figure 3 below.

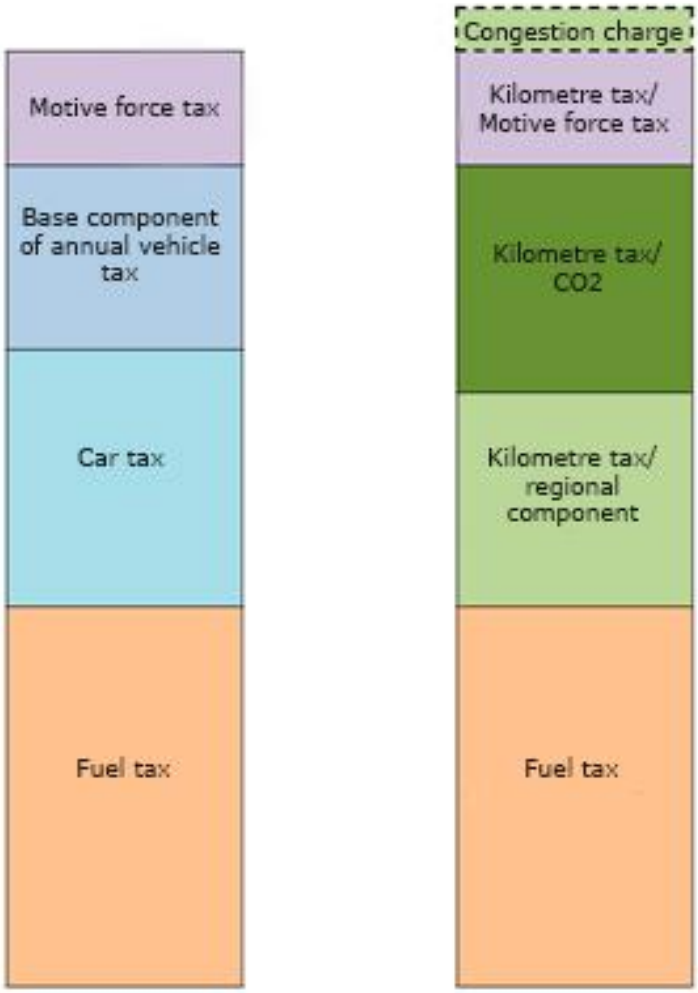


Figure 3. Current tax system and kilometre tax system

The examination of the kilometre tax system is based on two separate models. The first kilometre tax model applies a flat kilometre tax rate for the whole country (3.3 cents/km). In the second model the kilometre tax rate varies in different regions (regional kilometre model). The classification for the regional kilometre model is based on the Finnish Environment Institute's autumn 2013 typology of urban-rural areas (Figure 4).

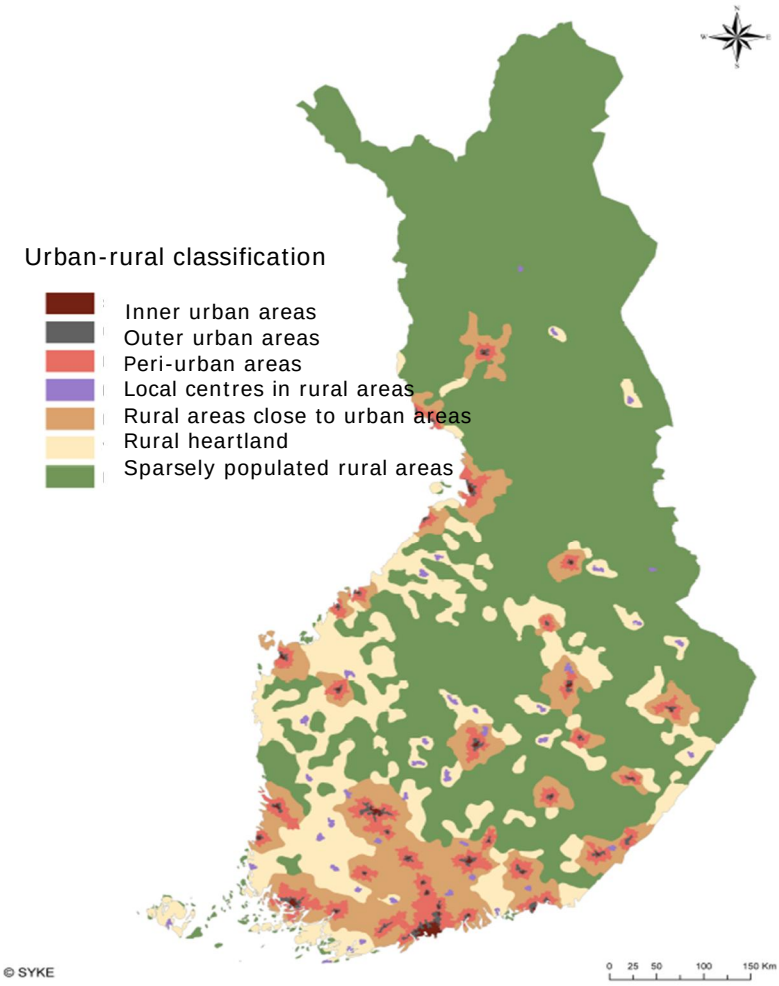


Figure 4. Urban-rural functional typology (Finnish Environment Institute)

Based on this typology Finland is divided into three types of regions: urban areas, densely populated rural areas and sparsely populated rural areas. Urban areas consist of *inner urban areas*, *outer urban areas* and *peri-urban areas*. Densely populated rural areas consist of *local centres in rural areas* and *rural areas close to urban areas*. Sparsely populated rural areas comprise *rural heartlands* and *sparsely populated rural areas*.

The regional kilometre model compares two different modulations. These regional modulations are examples for purposes of illustrating the effects of different prices in different tariff zones. The regional price also includes the CO_2 component of the kilometre tax.

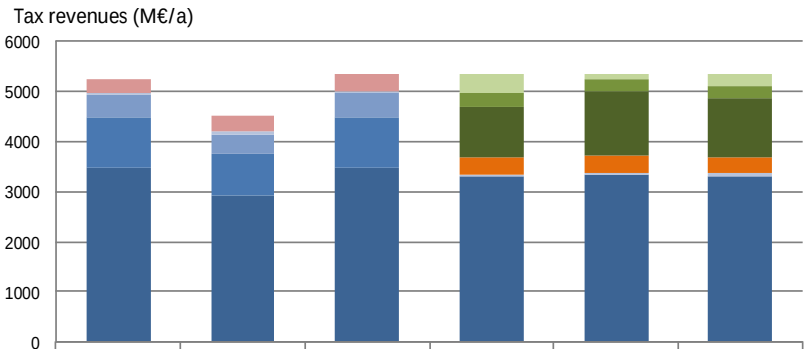
Area	Modulation 1	Modulation 2
Urban area	4.15	3.85
Densely populated rural area	3.0	3.0
Sparsely populated rural area	1.0	2.0

Table 2. Regional kilometre tax, cents/km

Tax revenue in different models

Figure 5 describes the level of tax revenue generated in different model. The trend projection describes a scenario where taxes are unchanged at their current level. Under this scenario improved fuel efficiency would reduce tax revenue by some EUR 700 million from 2012 to 2025. Reduced revenue from car tax would account for some EUR 180 million and reduced revenue from the base component of the vehicle tax for over EUR 50 million.

In the current system tax revenue can be retained at its current level by increasing the rates of car tax, vehicle tax and fuel tax to reflect improving fuel efficiency. Under the current tax system, therefore, tax revenue in 2025 would come in at EUR 5.35 billion. Tax revenue from the kilometre systems is set as equal to revenue under the current tax system in 2025. The kilometre tax would contribute to reduce the total number of kilometres driven because it has a greater effect on consumer behaviour than fixed taxes. For this reason it has been necessary to increase the unit price of the kilometre tax so that government revenue would remain the same as in the current model. The Table also shows the effect of regional modulations on tax revenue.



	2012	2025 trend	Current regime	Kilometre model	Regional model 1	Regional model 2
Kilometre tax - sparse rural (base part)				398	128	249
Kilometre tax - dense rural (base part)				254	236	230
Kilometre tax - urban (base part)				1011	1266	1176
Kilometretax energy-part				340	340	340
Vehicle tax (energy part)	274	340	340			
Heavy Goods vehicle energy tax (KVV)	50	50	50	50	50	50
Vehicle tax (base part)	438	382	486			
Car purchase tax	1 000	824	1 000			
Petrol taxes (inc HGV+VAT)	3471	2 927	3 472	3 289	3329	3303

Figure 5. Tax revenue and its breakdown in different scenarios

Impacts on number of trips taken

Figure 6 shows the impacts of different tax models on the number of trips taken. Comparisons are made with the trend projection so that the impacts of the current tax system can also be made clearly visible. The kilometre tax system would reduce the volume of passenger car traffic by some 30 million trips, which would be made by public transport instead. These changes are relatively minor in passenger car transport where the annual number of trips is around 3.5 billion, but very considerable in public transport where the baseline figures are much lower.

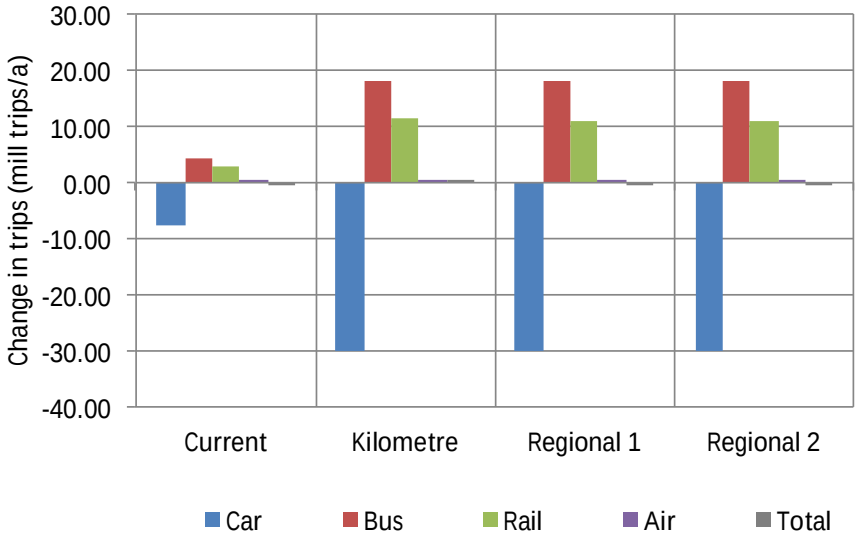


Figure 6. Impacts of current tax system and different kilometre tax models on number of trips compared to the 2025 trend projections as based on the forecasting model.

Changes in transport performance

Changes in transport performance are a major focus in assessing the impact of regulatory charges and fees. This is because the effects on performance, emissions and safety are directly dependent on how much people would drive under different models. Figure 7 shows the impacts on transport performance at a national level. The kilometre models would reduce the volume of passenger car traffic four times more than the current tax system. Overall the differences between the models are minor, but it does seem that transport performances decrease somewhat more under the flat rate option than under the other kilometre models.

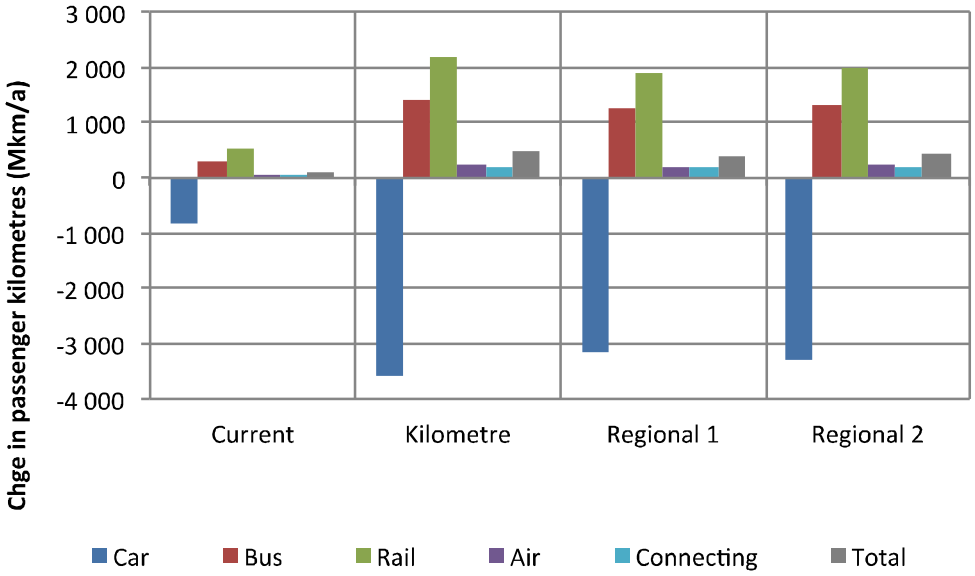


Figure 7. Impacts of current tax system and different kilometre models on passenger performances compared to 2025 trend projection

In percentage terms the changes in passenger car transport are quite marginal, but again in public transport rather significant because of the lower reference levels. An increased demand for public transport would obviously increase the costs of public transport provision, but on the other hand the so-called Mohring effect would also come into play: a marked increase in the number of users would improve service standards and increase competitiveness because the large number of commuters means it is necessary to increase the frequency of services. In the best case scenario it will also be possible to reduce the volume of contracted transport services. These mechanisms have been described as the positive feedback effects from the demand for public transport. However these effects have not yet been incorporated into the model networks.

Figure 8 shows the changes in transport performance on the road network in different pricing zones. Urban areas account for most of the performance, and in kilometre terms the changes brought about by different models are greatest in the same areas. However in percentage terms the biggest changes are seen in sparsely populated rural areas, depending on their pricing levels. This observation lends support to the differences in the nature of trips as discussed earlier.

The transport forecast presented here is not detailed enough to allow an assessment of whether the introduction of a kilometre tax would reduce congestion in the metropolitan Helsinki area, for instance, or whether it would increase the need to expand the supply of public transport in this area. An assessment of these impacts would require a more detailed analysis. The kilometre tax differs from congestion charging in many ways. For instance, the kilometre tax is the same regardless of the time of day, whereas congestion charging is applicable during certain hours of the days only. A national kilometre tax could obviously be used for purposes of local congestion pricing by imposing different charges for peak congestion hours in specified areas.

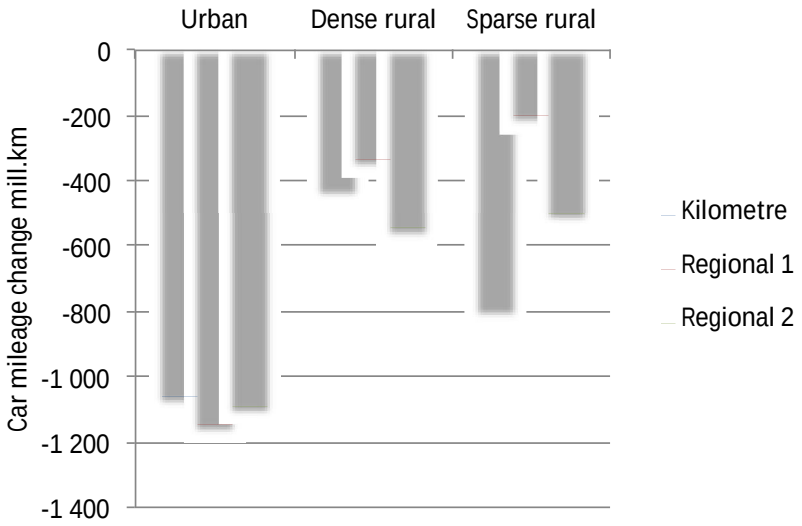


Figure 8. Changes in passenger car and van transport performance under different kilometre models compared to the current tax system by pricing zone. Computed based on trip location on the road network rather than place of residence.

Externalities

With respect to externalities, the change in the number of traffic accidents and emissions is a direct result of changes in transport performance. The kilometre tax model has a considerably greater impact than the current tax system (Figure 9). Furthermore it is noteworthy that in all models the magnitude of the overall impact could be influenced by abandoning the requirement of fiscal impacts. The models therefore are not purely regulatory in nature, but place heavy emphasis on the fiscal element.

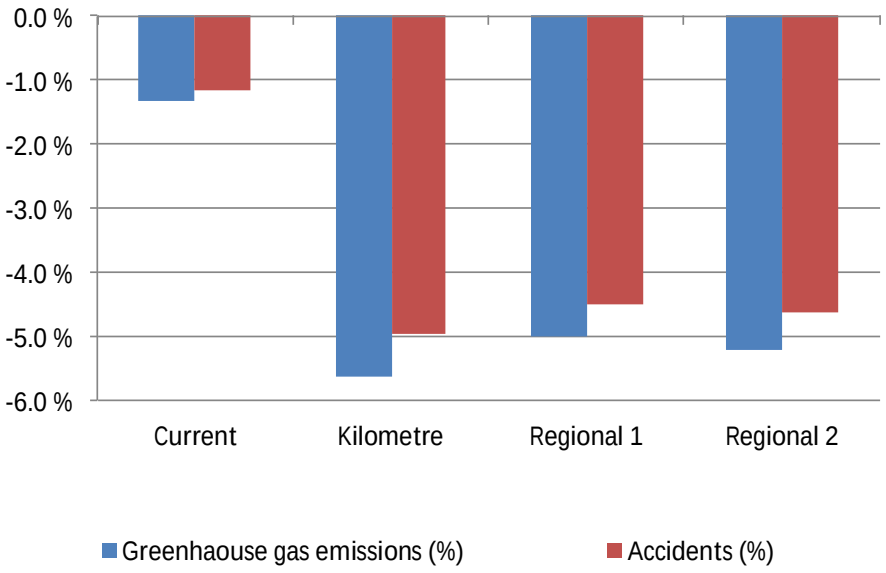


Figure 9. Impact of different models on greenhouse gas emissions and number of road accidents.

Changes in externalities can also be converted into money terms (Table 3). Under the kilometre models annual emissions and accidents costs would decrease by EUR 140-180 million as compared to the trend projection.

Cost category	Current system	Kilometre model (flat rate)	Regional modulation 1	Regional modulation 2
Emission costs	-3.3	-14.7	-11.5	-13.1
Costs from accidents	-38	-166	-131	-159
Total	-41.3	-180.7	-146.5	--172.1

Table 3. Impact of different models on emission and accident costs compared to trend projection, EUR million.

Impacts on traffic volumes

Although the various road pricing models have only a relatively minor impact on the number of trips and overall transport performance, their effect on the major national road transport corridors are quite significant (Figure 10). As is clearly evident, the impacts on road traffic volumes are most substantial in areas where public transport services are strong enough to provide a clear alternative, i.e. between the major cities in southern Finland. The impact on the breakdown of investment needs between the road and public transport infrastructure would probably be substantial.

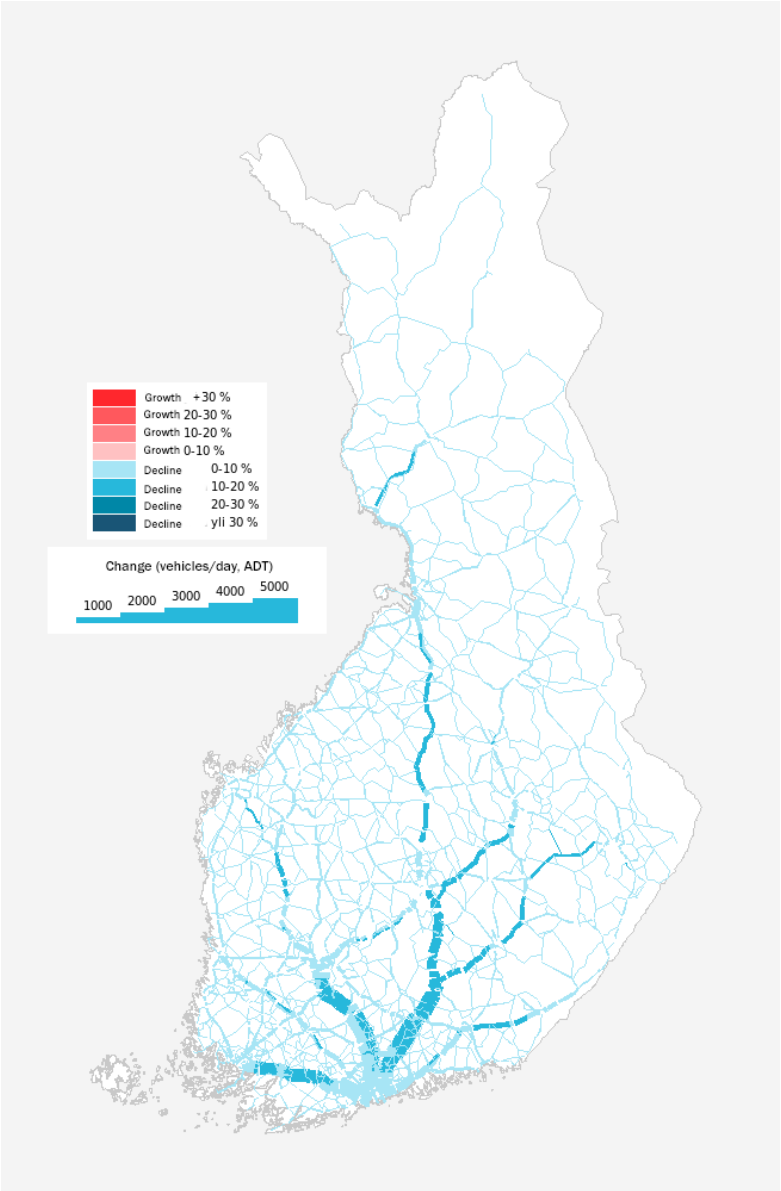


Figure 10. Changes in passenger car and van traffic volumes under flat rate kilometre model compared to current tax system.

Distribution of impacts

The distribution of impacts has been assessed based on the individual model. Calculations are based on the average vehicle (age) of the region concerned because no household data are available on the average age of cars. Therefore the results describe average changes; individual changes can obviously be very different.

Figure 11 describes the impact of the kilometre tax system on public transport use. As expected the use of public transport as a proportion of total transport performance would increase most in southern Finland and in urban municipalities where demand conditions are strongest for public transport. The change in passenger car performance would be quite evenly distributed across the country (Figure 12).

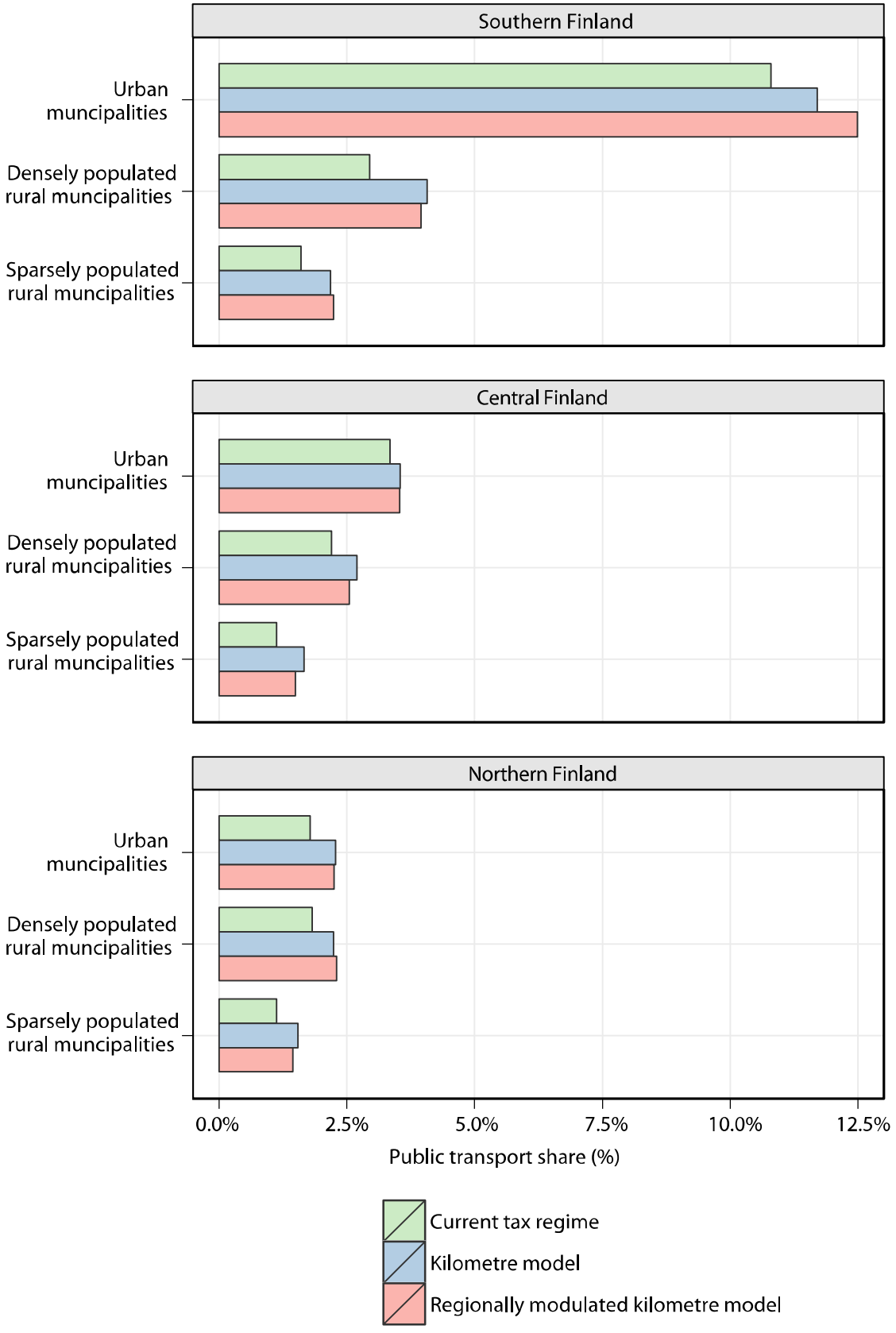


Figure 11. Changes in the share of public transport by region

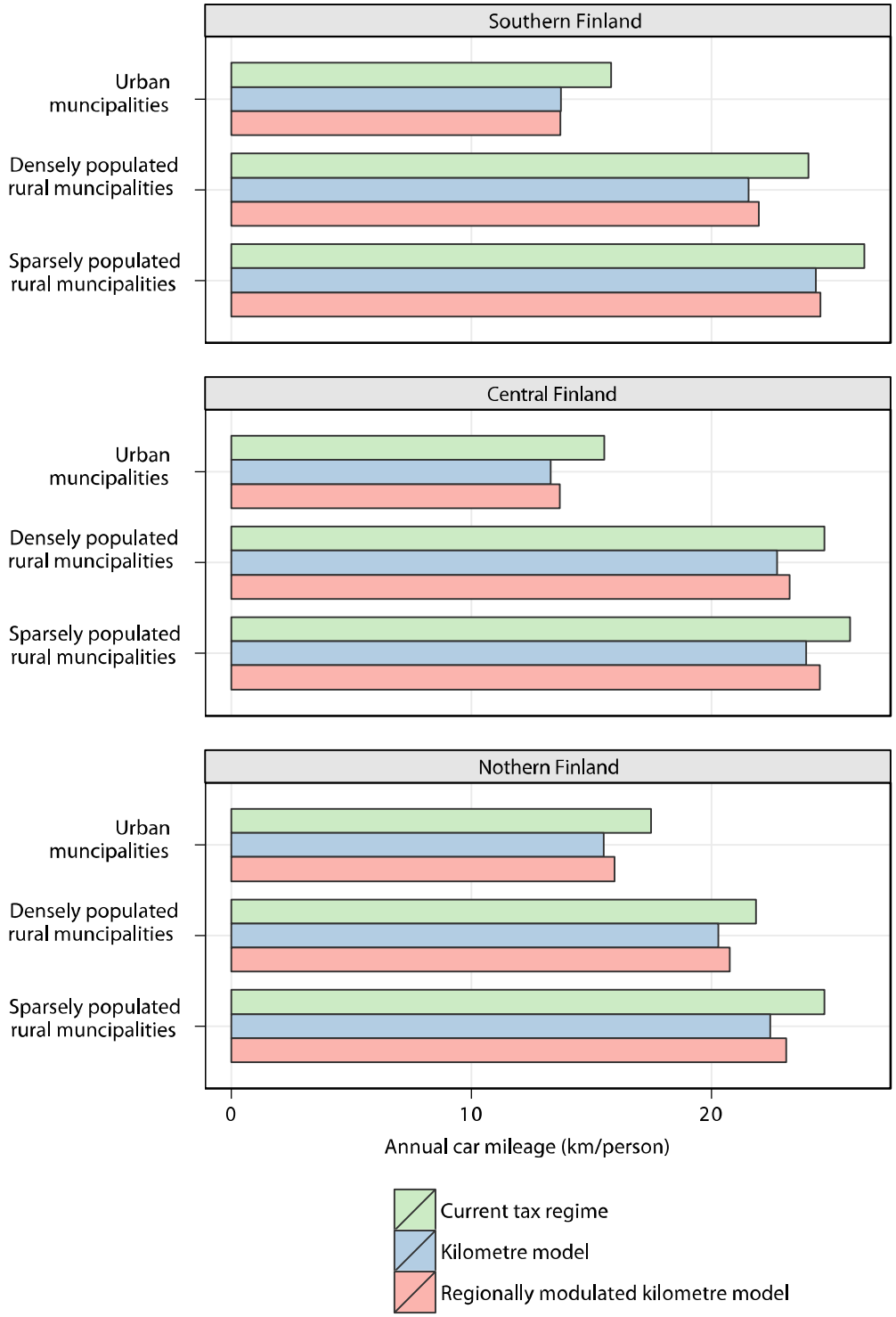


Figure 12. Changes in passenger car performance by region

Figures 13 and 14 describe the impacts of the road taxation overhaul on the total costs of passenger car transport in different regions and under different alternative models. As can be seen, the taxes paid by motorists would be lower in the kilometre model than in the current tax system in all income brackets and in all regions. This result is explained by the fact that the individual model describes people's behaviour in the long term. The model takes account of how motorists react to changes in their costs for instance by driving less, by exchanging their car for a make or model that is more fuel efficient, etc. In other words the model describes the very changes in behaviour that a tax reform would bring about.

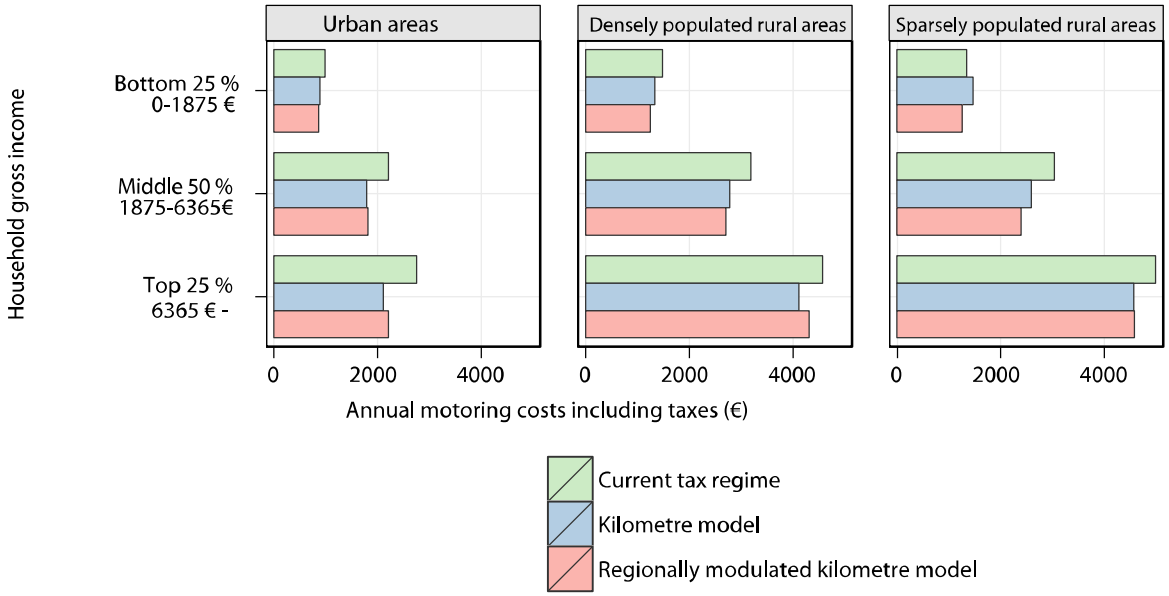


Figure 13. Impacts of changes in passenger car taxation on overall road transport costs (all fixed and variable taxable journey costs) in different income brackets by region (place of residence)

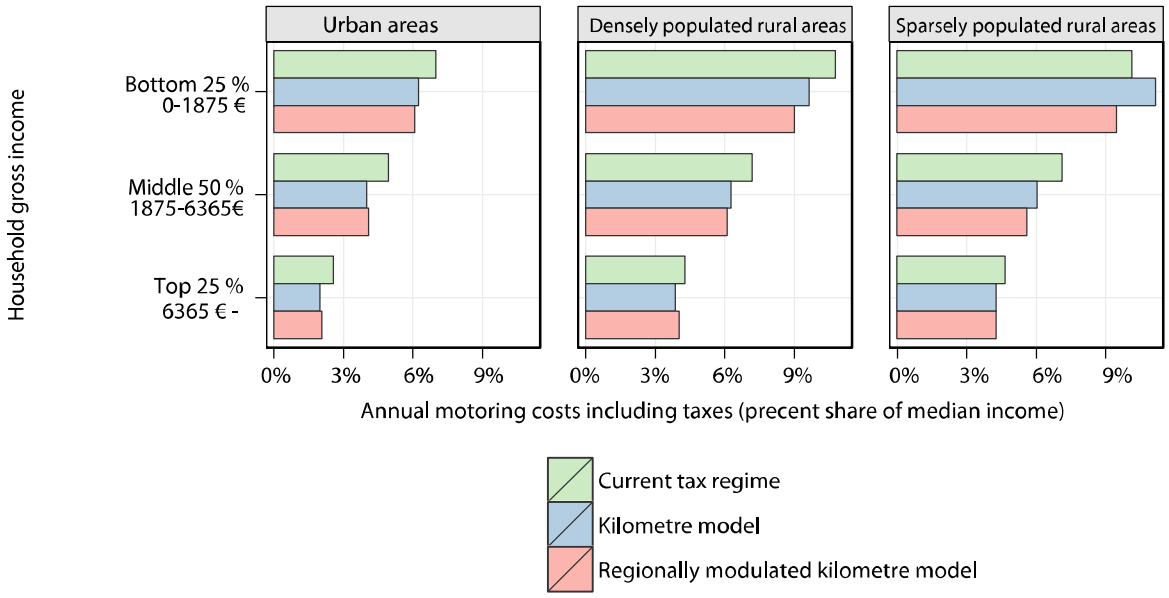


Figure 14. Impacts of changes in passenger car taxation on overall road transport costs (all fixed and variable taxable journey costs) in different income brackets by region (place of residence).

Figure 15 describes the costs incurred by motorists according to how much they use their car. Most households drive less than average, and therefore they would pay less tax under the kilometre regime than they do under the current tax system. By contrast households who drive a lot would have to pay more. This is a natural result of having a system where the taxation of motoring is based exclusively on vehicle use.

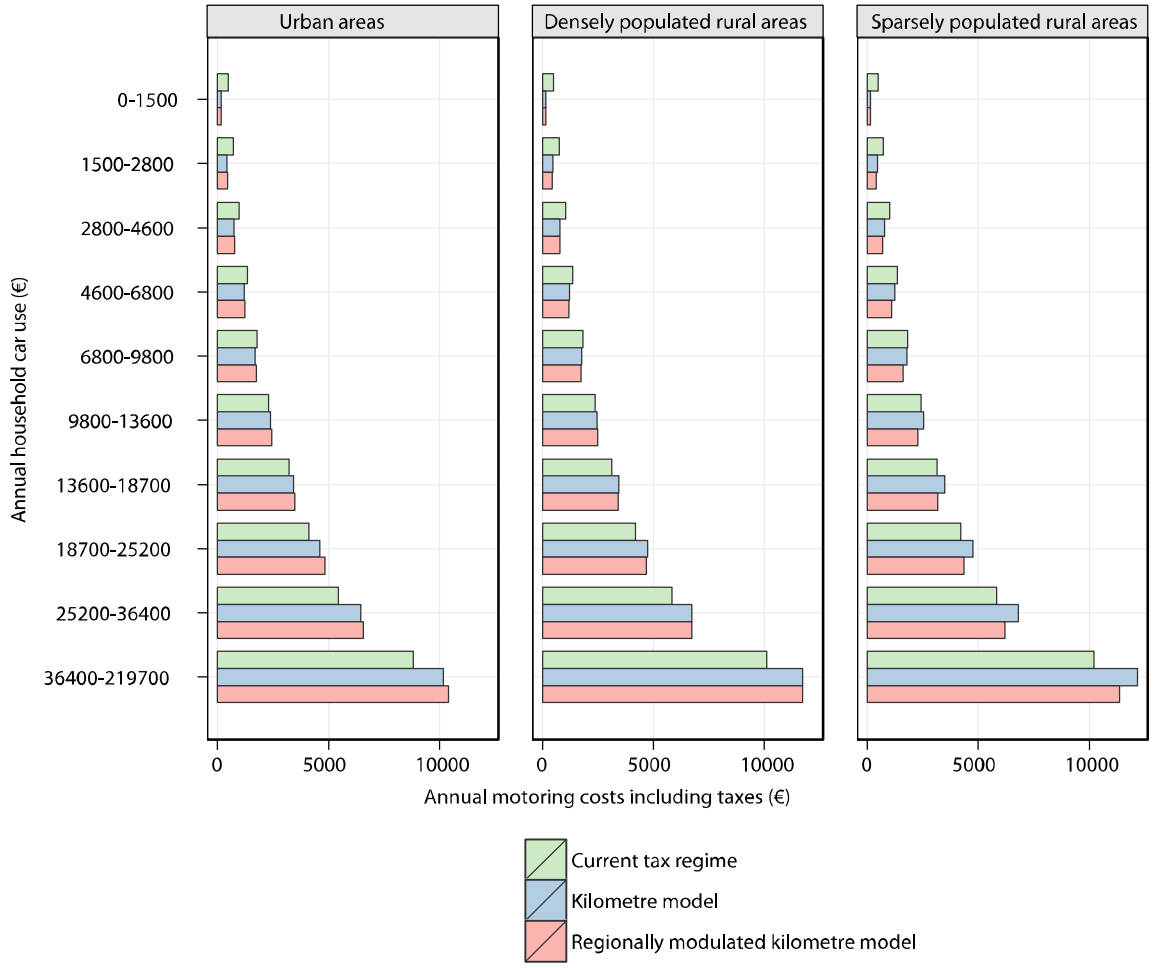


Figure 15. Impacts of changes in passenger car taxation by annual household car use in different regions

Figure 16 describes the impacts of the different tax models on different types of households. It seems that under the kilometre model, pensioners and other households would have to pay less than under the current tax regime. The flat kilometre model would slightly increase the motoring costs of families with children. Costs under the regionally modulated kilometre model would seem to be similar to those under the current tax system.

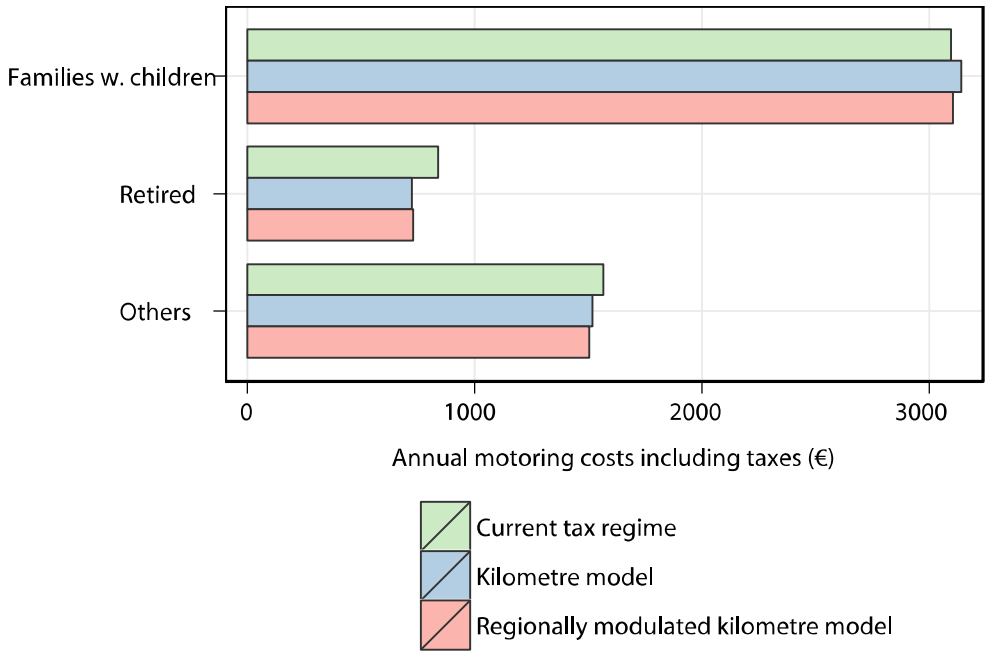


Figure 16. Annual motoring costs under different tax models by type of household

7.2.1 Examples: specific vehicles

The discussion above has considered the impacts of introducing a kilometre tax system from the point of view of road transport as a whole. However it is also interesting to consider how the taxation of specific car makes and models would be affected.

It is necessary to observe that the kilometre tax is first and foremost a transport policy tool, i.e. the tax rate can be set with specific transport policy objectives in mind. If the aim is to reduce emission levels from road transport, greater weight should be given to the emissions component of the kilometre tax; while if the main focus is on regional regulation, then the emphasis is placed on the regional component. These are political decisions.

The impacts of the kilometre tax are described for four different car makes, which differ from one another in terms of prices, taxes and emissions. For simplicity the examination is conducted for the present situation. The underlying assumptions of the calculations are described in more detail in a separate Annex. The cars featuring in the example calculations are Ford Focus 1.0 Eco Boost (price including tax 21 293 €, 109 g/km), Toyota Avensis 1.8 (26 928 €, 152 g/km), Volvo Xc 60 5D (diesel, 55 294 €, 169 g/km) and Nissan Qhasqai 1.6 L (20 890 €, 139 g/km).

The amount of car and vehicle tax payable varies depending on carbon dioxide emissions. To maintain this element of environmental regulation, the kilometre tax must also be based on emissions. The average kilometre tax is 3.3 cents per kilometre. In this example the kilometre tax is set at a level that corresponds to the emissions-based vehicle tax scale so that for vehicles with average carbon dioxide emissions of 160 g/km, the kilometre tax is 3.3 cents per kilometre. The kilometre tax rate for a vehicle with emissions of, say, 130 g/km would thus be 2.46 cents/km and for a vehicle with emissions of 190 g/km 4.35 cents/km. There is no inherent reason why the tax scale should be kept in line with existing scales, but it can be adjusted in various ways and according to various objectives.

Figure 17 provides an example to illustrate the difference between the existing tax system and the kilometre tax system. The vehicle in this example is Nissan Qhasqai 1.6L. As can be seen, the costs incurred by the motorist (taxes + fuel) under the kilometre tax system are lower than in the current tax system so long as the car's annual mileage is less than 17,000 kilometres. If annual car use is more than 17,000 kilometres, the costs incurred by the motorist will be higher than in the current system.

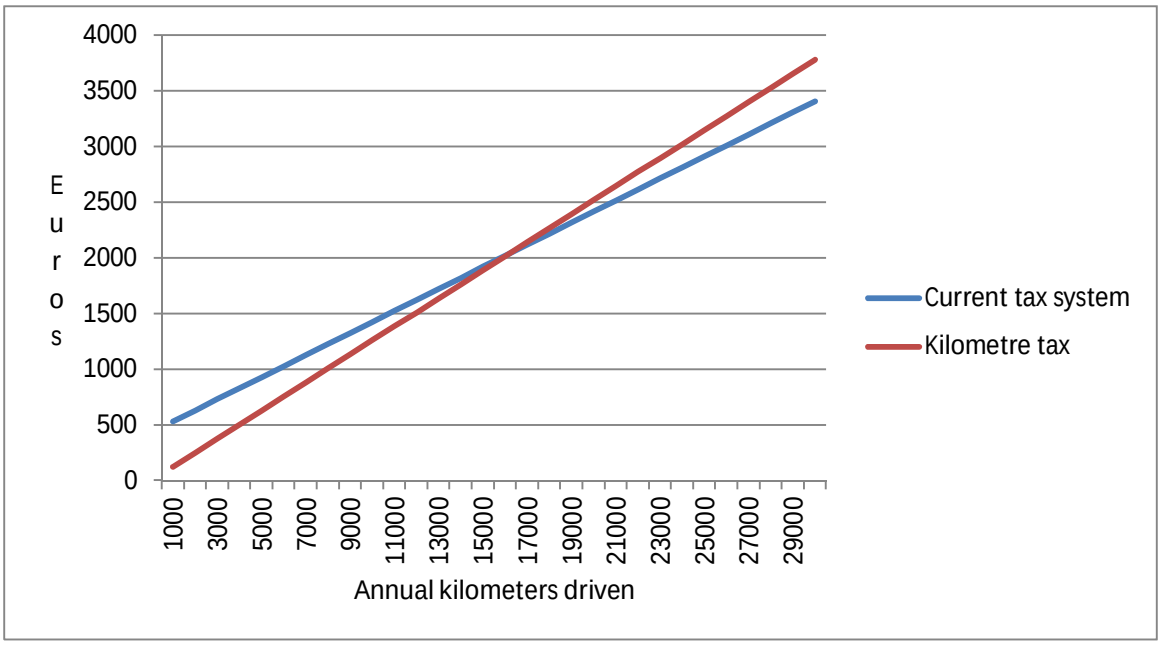


Figure 17. Annual driving costs (taxes + fuel) by kilometres driven under current tax system and kilometre tax system, Nissan Qhasqai 1.6L

Figure 18 shows the differences between our example vehicles under the kilometre system and the current tax regime for different annual mileages. In the cases of Ford Focus 1.0 Eco Boost and Nissan Qhasqai, the amount of tax payable under the kilometre system is smaller than under the existing system so long as the annual mileage is less than 17,000 kilometres. For the Toyota, the corresponding mileage limit is 19,000 km. The Volvo, on the other hand, differs clearly from this pattern in that the kilometre tax would only be higher than the current tax after 30,000 kilometres a year. The reason for this is that the car tax on the Volvo in question (15 594 €) is clearly higher than the car taxes on the other example cars (3633 €, 6698 € and 4680 €). Car tax is based on the value of the car and is therefore progressive: the higher the car's pre-tax price, the higher the car tax. For this reason the benefits of abandoning the car tax would inevitably be the greatest for owners of the most expensive cars. On the other hand it has to be borne in mind that the tax scale might be set differently to have different impacts. Furthermore the tax authorities have at their disposal a variety of means with which to offset tax effects if that is considered necessary.

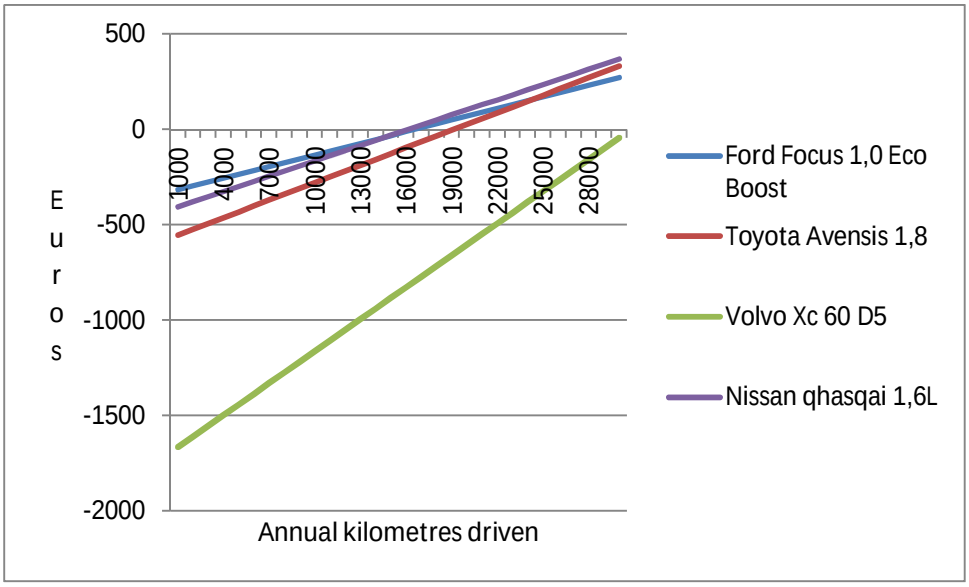


Figure 18. Differences in taxes payable by example cars under kilometre system and current tax system according to annual kilometres driven

It is also possible to incorporate in this analysis the impacts of regional pricing. Tax rates may be set at a lower level in regions where there are in practice no options to using a car and at a higher level in areas that have a good public transport infrastructure. This is taken into account in the example by using two different assumptions to calculate the amount of annual tax revenue from the kilometre tax as compared to the current tax regime. The kilometre tax in urban areas is assumed to be 20% higher than in densely populated rural areas (averaging at 3.3 cents/km) and the tax in sparsely populated rural areas is accordingly assumed to be 20% lower than the tax in densely populated rural areas.

Furthermore two assumptions are made regarding the breakdown of kilometres driven in different areas. The first assumes a high proportion of driving in urban areas (80%) as compared to driving in densely (5%) and sparsely populated (15%) rural areas. The second calculation works from the assumption of a high proportion of driving in sparsely populated rural areas (80%) as compared to densely populated rural areas (5%) and urban areas (15%). Figures 20–23 show the impacts of regional pricing on the use of the example cars as compared to the current tax system. In this example for people who drive a lot in rural areas the number of kilometres required for the kilometre tax rates to become more expensive than the current tax regime is higher than for people driving a lot in urban areas. Based on the pricing rates used in the example, the rural motorist would pay the following amounts less if they drove 20,000 kilometres a year: in a Ford Focus 1.0 Eco Boost 105 euros, in a Toyota Avensis 159 euros, in a Volvo Xc 60 D5 187 euros and in a Nissan Qashqai 140 euros.

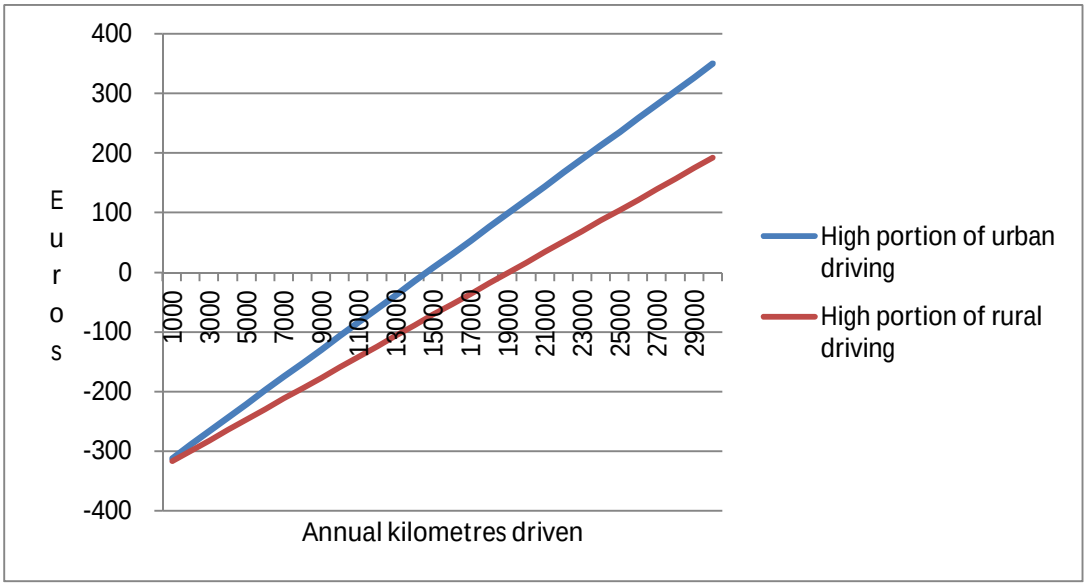


Figure 19. Impact of regional pricing compared to current tax system, Ford Focus 1.0 Eco Boost

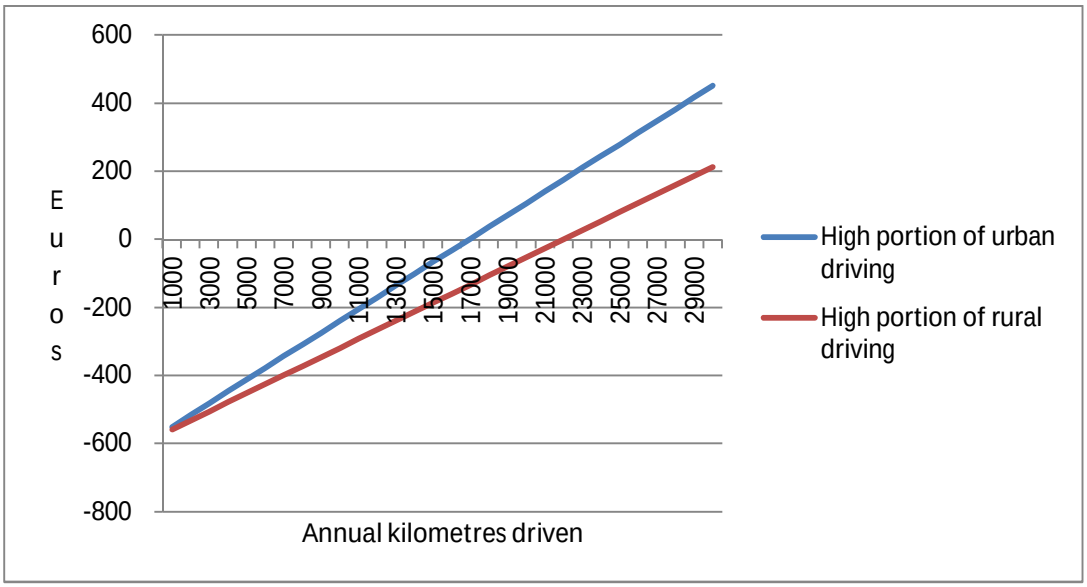


Figure 20. Impact of regional pricing compared to current tax system, Toyota Avensis 1,8

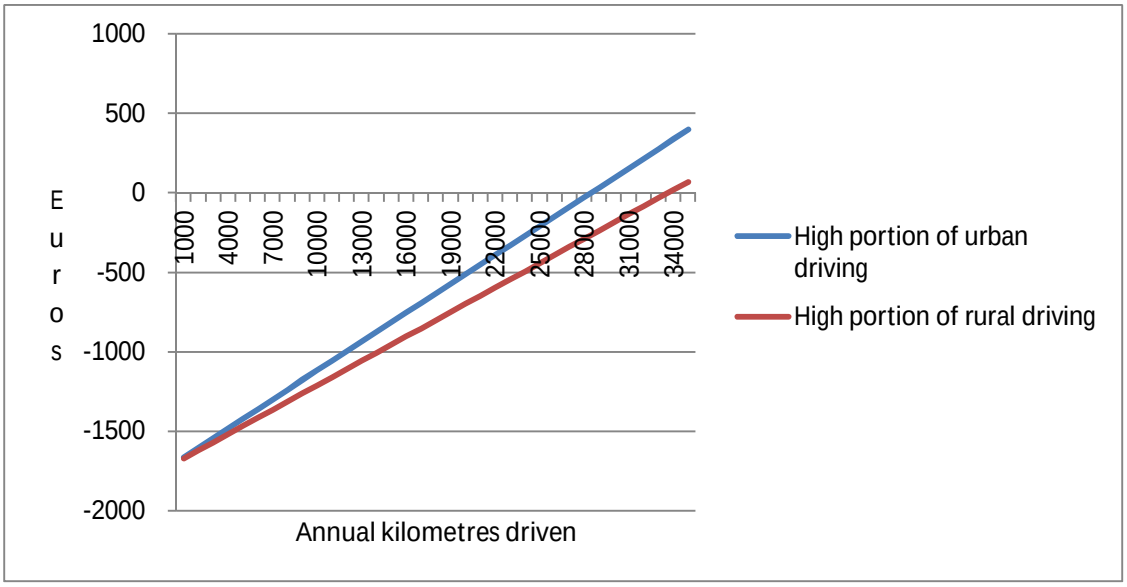


Figure 21. Impact of regional pricing compared to current tax system, Volvo Xc 60 D5

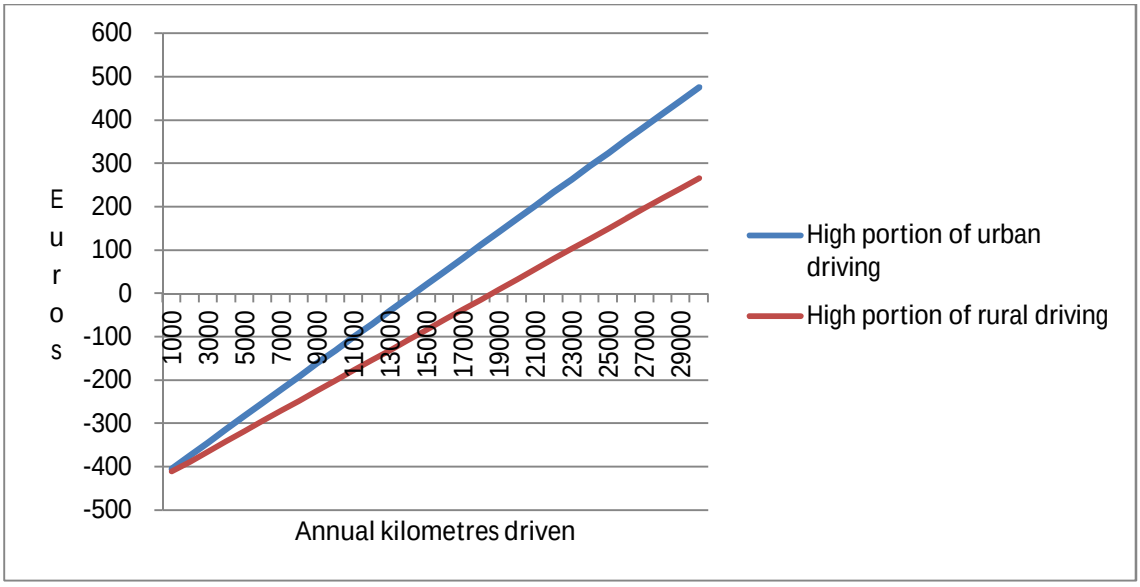


Figure 22. Impact of regional pricing compared to current tax system, Nissan Qhasqai 1,6L

7.2.2 Summary of impact assessments

The kilometre tax is an instrument of economic regulation aimed at influencing the choices and behaviours of passenger car users. It is clear from the impact assessments above that the kilometre tax does what it is expected to do: motorists will change their behaviour. Some will drive less, choose another route, use public transport for some trips, buy a new car, etc. This in spite of the fact that overall, the amount of taxes levied on passenger cars is exactly the same as in the current situation. The consequences of behaviour changes are reflected in the reduced number of accidents and the reduced level of emissions.

The kilometre tax is most beneficial to motorists who drive less than average. Motorists who drive more than average, on the other hand, will have to pay more, in line with the user-pays principle. People buying more expensive cars will also benefit from the tax reform as the discontinuation of the progressive car tax will have greatest impact at the top end of the price scale.

In an overall assessment the introduction of a kilometre tax would not increase the motoring costs of households or different population groups. There may, however, be marked differences in individual cases, depending largely on such factors as the age of the car.

7.3 Costs of payment systems

The following cost estimates of running different road pricing payment systems have been compiled by RAPP Trans (Switzerland) together with Finnish traffic planning consultants Traficon Oy. There is a separate report on these cost estimates, and therefore only a brief discussion is given here. The main focus is on the costs of payment systems to government.

Kilometre models

The costs of running a kilometre-based payment system are estimated for three different alternatives. Under the first alternative the system only allows for the collection of the kilometre tax. Under the second alternative it is assumed that private service providers can also offer other services to road users; road pricing data is just one of these services (multi-service model). These two alternatives support regionally differentiated pricing systems (regional kilometre model). In the third alternative the same kilometre tax rate is applied to all motorists throughout the country (kilometre tax model). This means there is no need to know the location of the vehicle.

The Finnish Constitution says that a task involving significant exercise of public powers can only be delegated to public authorities. The Constitutional Law Committee's interpretation is that taxation is just such a task. It follows that powers to levy taxes and monitor the payment of taxes cannot be assigned to private companies. For this reason implementation of a kilometre tax system would have to be charged to a public authority, which in Finland would be the national road pricing operator. The road pricing operator (RPO) would have responsibility for developing and maintaining the kilometre tax system, collecting taxes, and for the rectification and supervision of taxation, including the supervision of transport data service providers.

The road pricing operator would charge motorists for kilometres driven. The operator would receive the necessary information either directly from the on-board unit installed by the operator, or via an EETS service provider or via a private service provider (Figure 23).

In the regionally modulated kilometre tax model all Finnish-registered cars would be required to have an on-board unit to register data on kilometres driven in each tariff zone. In this model data on kilometres driven could be recorded not only from the OBU but also the vehicle's milometer.

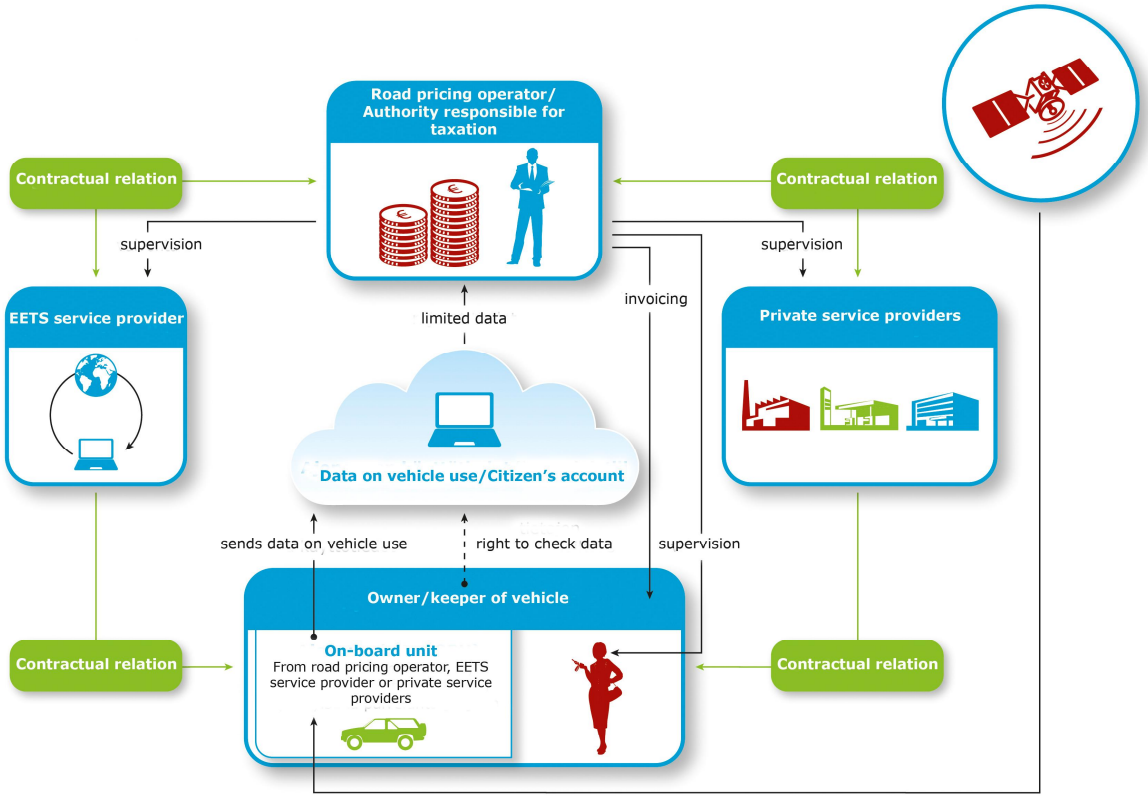


Figure 23. Outline description of kilometre tax system

Motorists will have three different ways of obtaining an on-board unit. First, they can sign a contract with the road pricing operator, who will install the on-board unit in the vehicle. The RPO would charge an annual fee for the OBU. Second, the motorist can sign a contract with an EETS service provider or a private service provider. In these cases the OBU will be provided and installed by the respective service provider.

The cost estimate is based on the assumption of an estimated OBU price of 100 euros in 2025. This is a relatively high figure because already OBUs are retailing at less than 150 euros. The high price may be justified by the fact that the OBU must be "strong", i.e. it must report any malfunctions and attempts to damage the unit. A strong OBU also reduces the costs of supervision. Furthermore the price includes charges from OBU installation.[11]

The OBU will be installed and serviced by the road pricing operator, who will charge an annual rent. In practice, therefore, the motorist will pay for the OBU. The OBU will need replacing after ten years. The RPO will therefore charge an estimated rent of 10–14 euros a year. The EETS operator will similarly charge a rent for the OBU, but the rent will be lower than charged by the RPO. The private service provider's business idea, then, is based on using the same platform to provide additional services to the motorist other than just kilometre readings. For this reason private service providers will be able to charge less in rent than the RPO, or possibly even offer OBUs free of charge if the motorist is interested in the additional services available.

[11] By 2025 OBUs will probably be plug&drive devices with very low installation costs.

7.3.1 Investment costs

The RPO's investment costs break down into several items. These costs are shown in Table 4.

	ALT1	ALT2	ALT3
Project costs	8	11	8
IT-back office	25	25	25
Road data (digital maps)	5	5	0
OBUs plug&drive	50	50	0
Advance funding	2	0.5	2
Support and service network	3	3	5
Payment system for foreign registered vehicles (vignette)	5	5	5
Monitoring equipment	31	31	40
Training + other	3.5	3.5	3.5
Total	132.5	134	88,5
OBUs	330		

ALT1 = taxation only (regional pricing)
ALT2 = multi-service model (regional pricing)
ALT3 = kilometre tax model (flat rate)

Table 4. RPO investment costs for kilometre tax payment system, EUR million

The set-up of a road pricing system involves certain administrative costs (project costs), such as legal services, contracts, IT licences etc. In alternatives 1 and 3 these costs come to around EUR 8 million. The multi-service model involves signing a larger number of contracts and therefore project costs are slightly higher than in the other two alternatives, i.e. EUR 11 million. IT infrastructure costs are the same in all three alternatives at around EUR 25 million. This will also cover investment costs in the tax system (data exchange and storage, customer register, tax collection, ledger, collection of receivables, monitoring).

To ensure that taxation is equitable and to discourage people from registering cars in other countries, it is necessary to collect taxes from foreign-registered cars as well. A separate payment system is needed for foreign-registered cars. It is not feasible to require that foreign vehicles arriving in Finland are fitted with an OBU. One way of taxing foreign motorists would be to make OBUs available for rent, against a deposit, at border crossing-points. This would only be possible with plug&drive units. Some foreign motorists might prefer to choose a time-based vignette fee for a maximum of, say, 10 days. This would entail creating two separate tax and monitoring systems for foreign-registered vehicles. This additional cost is reflected in the cost estimate. Motorists who already have a contract with an EETS operator would not have to obtain an OBU or purchase a vignette, as their existing OBU would be compatible with the Finnish system.

The cost of OBUs needed for foreign-registered vehicles would be in the region of EUR 50 million in the case of GPS-based systems. In the kilometre alternative no OBUs are needed because the kilometres driven by foreign motorists would be checked at border crossing points insofar as that is possible under internal market rules. In all alternatives the investment costs for the vignette system needed for foreign motorists is EUR 5 million.

Setting up a monitoring system represents another significant cost item. A national monitoring system would be designed around fixed monitoring points (gates) and mobile monitoring units. In the GPS alternatives the monitoring investment costs are EUR 31 million. The kilometre model requires more roadside monitoring than the other alternatives, which is why investment costs in monitoring (EUR 40 million) are higher than in the other alternatives.

The costs to the RPO from setting up a road pricing system are almost the same in alternative 1 and the multi-service model, i.e. EUR 132.5 and 134 million, respectively. The investment costs in the kilometre tax model are 88.5 million euros. The difference compared to the other alternatives is explained by the fact that in this case it is not necessary to obtain OBUs for foreign-registered vehicles.

OBUs obviously represent a major cost item. In 2025 there would be need for some 3.3 million OBUs. OBU investment costs would therefore come to EUR 330 million. However this is not included in the RPO's investment costs because the cost would be covered by motorists. Furthermore the number of OBUs supplied by the RPO varies in different alternatives. In connection with the launch of the system the costs of installing OBUs in the entire vehicle fleet would come to an estimated EUR 330 million. Replacing these units at least once every ten years would entail an additional cost of the same magnitude. Changes in the OBU model used or in contract partners in connection with car ownership changes might also entail additional costs; this may happen several times during the vehicle's lifespan. Today the annual number of car ownership changes in Finland is around 600,000.

In alternative 1 where OBUs are used for taxation purposes only, most of the investment burden rests with the RPO. It is estimated that the RPO would purchase 95% of all OBUs and EETS operators the remaining 5%. In the multi-service model, then, the assumption is that private service providers would supply 80% of the units, EETS operators 5% and the RPO 15%. In the kilometre tax model the RPO is responsible for providing the OBU, but the number of OBU users is only 500,000. Other motorists are expected to have readings taken from their milometer.

The RPO will supply and deliver OBUs to motorists, and therefore the costs from OBU installation, financing etc. are taken into account in the RPO's annual operating costs.

7.3.2 Operating costs

Annual operating and maintenance costs from the kilometre tax payment system consist of administrative expenditure, the acquisition of new OBUs, customer service, invoicing, customer information, the collection of fees from foreign motorists, servicing, remunerations to other service providers, monitoring including the monitoring and sanctioning of service providers, safeguarding the legal protection of persons liable to tax and depreciations,

The major cost items arise from the invoicing and monitoring of domestic and foreign motorists. Table 5 shows the annual costs of different charging systems.

The annual costs in alternative 1 are EUR 133 million (including depreciations). The annual costs from the multi-service models are slightly lower at EUR 126 million, and from the kilometre model EUR 116 million.

EUR million	ALT1	ALT2	ALT3
RPO administration, IT, customer information, etc.	9	9	6
OBUs admin, new, handling	10	9	1
Collection of charges domestic	53	38	53
Collection of charges foreign	20	20	18
Support and servicing network	1	1	1
Supervision personnel costs + new equipment	26	26	26
Others	1	1	1
Compensation to EETS operators			
- domestic	2	2	2
- foreign	1	1	1
Compensation to private service providers			
- domestic	0	7	0
Total	121	114	109
Depreciations	12	12	8
Total	133	126	116

Table 5. Annual operating and maintenance costs of kilometre tax payment systems, EUR million, introduction in 2025

Annual operating and maintenance costs do not differ significantly between the different models. This is mainly because the volume of traffic and number of cars are largely the same under each system. The differences could be significantly greater and the costs much lower if legislation permitted EETS service providers and especially private service providers to collect road pricing charges and to invoice customers.

7.3.3 Assessing the costs: how much is much?

Are the above costs of running a road pricing system high, reasonable or low? The answer obviously depends on what these costs are compared with.

The cost effectiveness of taxation is usually measured by comparing the costs of tax collection with the revenue from the tax in question. The current system of road taxation is highly cost effective. The costs of collecting fuel tax are no more than 0.01% of fuel tax revenue. Car tax is collected by Finnish Customs, which reports annual collection costs of less than EUR 5 million or some 0.5% of car tax revenue. Customs is in the process of upgrading its information systems, and it is anticipated that the costs from collecting car tax will fall further to some EUR 2 million a year.

The Finnish Transport Safety Agency Trafi is tasked with collecting the annual vehicle tax and motive force tax. Annual costs come to around EUR 11 million or 1.2% of vehicle tax revenue. HGV traffic accounts for some 15% of these costs, which means that the share of passenger cars and vans is some EUR 9 million a year.

In 2025 the kilometre system would generate tax revenue of around EUR 2.0 billion. The annual costs of collecting the kilometre tax under the three alternatives above (6.7 %,

6.3 % and 5.8 %) would therefore be much higher than in the existing system. Increasing traffic volumes will obviously generate more tax revenue and reduce the relative share of collection costs, since those costs will not increase accordingly. However the collection costs would be very reasonable if compared with existing road pricing schemes.

However the savings from the kilometre tax system in reduced accidents and emissions are somewhat higher (depending on the regional modulation) than the system's annual operating costs (Table 6). The benefits in public finances terms, therefore, are equal to the annual costs of operating the road pricing system.

	Kilometre model (flat rate)	Regional tariffs (modulation 1)	Regional tariffs (modulation 2)
Operating costs	-133	-126	-126
Reduced costs from accidents	129	94	121
Reduced emissions costs	11	8	10
Savings to public finances total	7	-24	5

Table 6. Annual operating costs of road pricing systems and the savings in reduced accidents and emissions from the kilometre models as compared to the current tax system, EUR million

To gain a rough idea of the cost burden of the kilometre tax system to public finances it is useful to look more closely at central government revenue and expenditure. One difference between the kilometre system and the existing tax regime is that under the kilometre model, tax revenue would also be received from foreign-registered vehicles on Finnish roads. This is not the case with the existing car tax and annual vehicle tax. Revenue is generated, by contrast, from fuel tax, as foreign-registered vehicles arriving in Finland are only permitted to bring in as much fuel as they can carry in their fuel tank plus a 10-litre reserve tank. However the fuel tax is the same in all three alternatives, so they do not differ from each other in this respect.

Today, the annual number of cross-border car trips into and out of Finland is around 6.5 million. Foreign-registered vehicles account for around 80% of this. It is projected that cross-border traffic will rise sharply in the future. If visa requirements are lifted for Russian tourists, for instance, the influx of Russian passenger cars would certainly increase. In 2025 it is estimated that the number of cars crossing Finnish borders will be close to 10 million a year, with foreign-registered vehicles accounting for 70%.

It is thought that the majority of foreign vehicles would opt for the vignette payment, which is a simpler solution than an OBU. Tax revenue from foreign-registered vehicles in 2025 is estimated at EUR 80 million. A number of factors obviously combine to influence the number of foreign cars on Finnish roads. Annual kilometre tax revenue from foreign motorists in Finland would probably be in the region of EUR 50–100 million.

The annual net costs of running a kilometre road pricing scheme to central government, counting only the tax revenue generated and the costs of collecting the tax from both domestic and foreign motorists, would be around EUR 53 million, EUR 46 million and EUR 36 million, respectively. The cost savings from the reduced collection costs under the current tax system would reduce these figures somewhat. Therefore the immediate costs from the kilometre tax system would not be very high.

8. Working Group's conclusions

The continuing growth of road traffic, increasingly rigorous environmental standards and the current state of public finances all underscore the need for more effective transport policy. Economic regulation is an effective way of steering and controlling transport. The growing wave of digitalisation that has swept most sectors of society in recent years is inevitably going to make a major impact on transport as well.

Advancing technology and the growth of smart transport solutions provide an opportunity to move towards a fairer system of road transport taxation that is based on vehicle use. At the same time the improving fuel efficiency of modern cars and the growing number of electric cars mean that the system of motoring taxation will have to be updated in any case so as to ensure stable tax revenues.

The Working Group agrees that in this situation it is advisable to align and integrate transport policy objectives with the objectives of road transport taxation.

A more effective achievement of transport policy objectives would require a tax regime in which taxes are based more on how much drivers use their cars. This is consistent with EU transport policy objectives. In practice one way of moving in this direction would be to substitute fixed taxes (the motor car tax and annual vehicle tax) with taxes based on kilometres driven.

The kilometre tax would be a more flexible transport policy tool than the current tax system in that it can be adjusted depending on time, place and type of vehicle, within the bounds of equal treatment of citizens. The relative weight placed on these factors could be varied according to shifting transport policy emphases and priorities, such as reducing emission levels or targeting local transport costs.

The available evidence suggests that a tax model based exclusively on vehicle use, i.e. a kilometre tax coupled with fuel tax, would better serve the achievement of transport and environmental policy objectives than the existing tax regime. It would reduce passenger car use, emission levels and road accidents and increase the use of public transport. Furthermore the kilometre tax would contribute to a denser community structure.

The collection of a kilometre tax would require a technically far more sophisticated and expensive system than the current tax collection methods. The annual costs of implementing the kilometre tax would be in the region of EUR 120–130 million. This comes in at around 6.5% of annual tax revenue, a significantly higher figure than currently. In other words the kilometre-based system would be less cost effective than the existing method. However the annual savings from the kilometre tax in reduced accident and emission costs to society would be equal to the costs of collecting the kilometre tax. Furthermore the additional costs incurred to government would be offset by the tax revenue gained from the inclusion in the tax regime of foreign-registered vehicles driving on Finnish roads.

An overhaul of the road tax system that would make the amount of tax payable entirely dependent on car use would affect the costs incurred to drivers. The basic principle is that a tax system based on kilometres driven would mean that people who drive less than average would have to pay less, while those who drive more than average would have to pay more. Again, the magnitude of the impact depends largely on the vehicle (age and air pollution emissions).

The analyses conducted showed that, on average, the kilometre tax would not significantly affect the amount of tax paid in different income bands or households. However there might be marked interindividual differences.

The kilometre tax has the potential to affect transport costs in different regions. However it is paramount that regional tax rates and charges based on vehicle emissions are carefully aligned so that there are no conflicts or contradictions. The Working Group has made no attempt to develop an optimal pricing scheme that would best serve the overall policy objectives. This issue comes down to political choices and to which factors are to be given the greatest weight. Therefore the unit prices used by the Working Group are not intended as proposals for actual kilometre tax units, but merely serve the purpose of describing the relative effects of different weights.

The Working Group takes the view that the estimated impact of taxing drivers based on kilometres driven lends support to a possible move in motoring taxation towards the introduction of a kilometre tax in Finland.

Existing national and EU legislation pose no obstacles to the development of a national road pricing system. There are, however, several significant legislative boundary conditions for the implementation of such a system. Privacy protection is just one of the considerations that must be resolved from the very outset in developing a kilometre-based tax system. The default idea is that data on vehicle use shall be exclusively accessible to, but not modifiable by, the owner or keeper of the vehicle so that the data necessary for the determination of the tax or the amount of tax due is passed in correct time to the tax authorities. The authorities would only be allowed to request more detailed information on the use of the vehicle in special cases provided for in the applicable legislation.

The Working Group takes the view that privacy protection is a fundamental precondition for the introduction of a kilometre tax system.

Overhauling the motoring tax system to make the amount of tax payable entirely dependent on car use is a major public issue that involves a number of challenges and uncertainties, such as the question of what stages are needed to see this change through.

One key challenge stems from the discontinuation of the existing tax system. For the kilometre tax to have sufficient powers of economic regulation, the unit price needs to be sufficiently high. Replacing the annual vehicle tax with a kilometre tax would be relatively simple and straightforward and would have very little impact on the automotive market. However in this case the unit price of the kilometre-based tax would not be very high and therefore the impact would also remain quite marginal. For this reason it is necessary to also replace the motor car tax, currently the main source of fixed tax revenue, with the kilometre tax. This in turn means that the kilometre tax should be applicable to all passenger cars, both old and new. However the biggest challenge has to do with how the motor car tax can be discontinued in such a manner that the effects on the automotive market, for instance, can be easily predicted and controlled. The Working Group has not looked into the question of how this change could be implemented and what kinds of effects it would have.

There are several uncertainties with the technology. A kilometre-based tax system should most ideally be based on a multi-service concept in which individual service providers would largely cover the costs from on-board units, for instance. This arrangement would only be viable if extensive services other than kilometre tax data collection were in place and if the necessary on-board units were in widespread use before the introduction of the kilometre tax.

The Working Group considers it important that before any final decisions on the adoption of a kilometre tax are taken, it is crucial to ensure that the necessary technology works as intended and that it is suited to taxation purposes; that the cost estimates are accurate; and that privacy protection is maintained.

For this reason the Working Group recommends a step-by-step approach through trials and experiments. The first stage should involve extensive testing of technical systems, information security and monitoring methods.

The Working Group has considered the viability and effects of a kilometre tax in a 2025 scenario, basing its assessments on certain assumptions regarding the removal or modification of existing taxes, even though no decisions have been made to that effect. The Working Group expresses no view on the question of when the kilometre-based tax system should be introduced, because the decision on implementing such a system is a political one.

International experiences have shown that the introduction of road pricing systems has generated and accelerated related business opportunities. If Finland were to adopt a positioning-based transport tax system that makes use of the multi-service concept, that would probably generate new competence in this area as well as create new jobs in Finland.

The Working Group is keen to stress that the early introduction of a kilometre-based tax would contribute to create new business opportunities and jobs in Finnish industry.

Annex 1

SUPPLEMENTARY OPINION 13 Dec 2013

The Working Group has made the recommendation that transport policy objectives be integrated and aligned with the objectives of road taxation, and suggests that the estimated impacts of taxing drivers based on kilometres lend support to a possible move in road taxation towards the introduction of a kilometre tax in Finland. The Working Group has particularly focused on the grounds and reasons for moving from the current system of car and vehicle taxation to a kilometre tax based on GPS monitoring of vehicles. In my capacity as representative for the Ministry of Finance I should like to offer the following viewpoints regarding the viability, costs and impacts of the tax model in view of the possible further preparation of this matter.

Taxes are levied first and foremost for reasons of public finance. Sound tax policy is about creating and operating a cost-efficient, neutral and fair tax system. Taxes must be cost effective: the costs of tax collection and tax control must be kept to a minimum.

The kilometre tax would be an entirely new type of tax. Existing commercial applications based on smart services or GPS technology have not been designed for purposes of tax collection. No country has in place a comprehensive kilometre tax system for passenger cars, and therefore there are no international experiences of how these systems work or how much they cost. By way of comparison, the costs of such a system in the Netherlands, where planning has reached a far more advanced stage, have been estimated at over five billion euros. Investment costs were estimated at EUR 3.6 billion and operating costs in 2012–2016 at EUR 2.1 billion.

It is difficult at this early stage to assess the accuracy and robustness of the Working Group's cost calculations and the possible revenue risks in the tax model, since it is not year clear how the model will be implemented and how effectively it will work. The Finnish Constitution stipulates that all powers of taxation are vested in public authorities, and therefore data on vehicle transport use and individualised data on taxable persons must be available for purposes of taxation, tax control and tax correction processes for several years. This raises questions about the viability of the privacy protection model discussed by the Working Group where transport data are exclusively accessible to the motorist or to some other private party. The volume of data concerned is considerable and the collection of taxes based on that data an administratively cumbersome task, even if the tax were to be levied in the same way as the existing vehicle tax for specified time periods. Changes in the registered owner or keeper of the vehicle would further add to the administrative burden. Watertight tax control is crucial to an effective tax regime and to ensuring that motorsists receive equal and fair treatment. Control should extend from the installation of on-board units and making sure they work properly through the prevention of misuse to ensuring that service providers meet their legal and contractual obligations. In an EETS based tax system there might be several service providers, which would probably include foreign-based operators. As yet there is no experience of setting up such control and monitoring mechanisms.

Cost calculations for setting up the system must also include the on-board units and the costs from their installation, as well as the costs incurred to the service provider from the collection of transport data, regardless of who is going to pay those costs. Further costs may arise from the possible need to update equipment and to rewrite service contracts in connection with car ownership changes, which happen around 600,000 times a year. Cars usually have several owners during their lifespan. Furthermore, it needs to be pointed out that in an EETS compatible kilometre tax system the tax authorities have no say over how much motorists have to pay for their on-board units or under their contract with a service provider: this will be determined in what may be a competitive marketplace. The commercial services offered to motorists in the so-called multi-service model may be a competitive asset to the service provider and help to lower the hardware and service costs, but not all motorists will necessarily need or want them. People liable to pay tax may find themselves in a situation where they do not know how much tax or incidental costs they are going to have to pay.

The taxation of foreign-registered vehicles presents a major challenge in the EU internal market because of the prohibition of border formalities and tax discrimination, and would be a major source of additional costs. Finland would be able to levy taxes on vehicles equipped with OBUs once it receives the relevant data and the motorist's address from the foreign service provider. However the tax authorities might often have to recover unpaid taxes from abroad, which is notoriously difficult. This would further add to the administrative burden of the tax system, significantly driving up its costs relative to the amount of tax revenue. In addition, other foreign-registered vehicles would have to be taxed in some other way. The model proposed by the Working Group where motorists could choose between a kilometre tax by using a hired OBU or a time-based vignette fee would imply creating two separate tax and control systems for foreign-registered vehicles, which again would drive up overall costs. It is unclear how much revenue would be generated from taxing foreign-registered vehicles, and the concept is questionable from the point of view of the equitable treatment of motorists. Closer investigation is needed to ascertain the comptability of the tax models with the internal market principle of free movement.

In the further development of this project it is necessary first of all to establish what would be the most appropriate approach to implementing the tax model. On this basis it needs to be assessed whether the cost calculations are realistic in view of the distinctive character of Finnish tax practice. It is clear even from the Working Group's own calculations that the investment and operating costs would be significantly higher than those of the existing road tax system, which are around 0.2% of overall tax revenue.

The Working Group points out that the kilometre tax will bring important social benefits through reduced congestion on the roads and fewer road accidents. Future work needs to assess to what extent these benefits could and will be achieved through the proliferation of other smart, GPS-based services that help drivers avoid congested roads, for instance, a trend that is thought will inevitably continue.

A closer assessment is also needed of environmental impacts. The existing car tax encourages consumers to buy low-emission vehicles because the amount of car tax payable is dependent on the vehicle's CO_2 emissions, which have a transparent effect on the consumer price. As the Working Group points out, this regulatory effect would be

lost with the removal of the car tax, which would make more expensive and higher emissions cars in particular more attractive. It is not clear whether the kilometre tax and its carbon dioxide component would be enough to counter the effects of this shift on overall emissions levels. Even though the removal of the car tax would reduce the consumer prices of some cars, it would still not be possible for everyone to buy a new car. A possible reduction in the price of new cars would probably lower the value of used cars on the domestic market. In all likelihood the removal of the car tax would increase the pre-tax prices of new cars to the same level as in countries that do not have a car tax. The burden from the current car tax is carried by foreign manufacturers and only in part by consumers, as international price comparisons show that the supply side pays for the bulk of Finland's car tax.

The socio-economic impacts of the kilometre tax and its effects on income distribution need to be examined in more detail than just averages, which distort the effects of the current car tax on cars of different ages, for instance: the amount of tax as a proportion of the value of the car decreases with increase age. The amount of car tax as a proportion of overall road taxes is highest in cars that are less than 7 years old, whereas in older cars the current fuel tax, which is based purely on vehicle use, already represents the single biggest tax cost. In other words abandoning the car tax and introducing a kilometre tax would have differential effects on the tax burden placed on different types of cars. Furthermore, given that it is directly dependent on consumer prices, the car tax can be considered a form of progressive taxation which takes account of the willingness and ability of car owners to pay tax. Even a regionally differentiated kilometre tax regime would not achieve the same effect. On the other hand, if a regionally differentiated tax system is a politically driven objective, then it is possible to develop the existing system in this direction because the time-based vehicle tax can at reasonable cost be modified for regional modulation within the bounds of equal treatment of citizens.

Further assessments are also needed of the impacts of a kilometre tax on labour mobility or economic activity, for instance. Taxation is effective when it does not distort the choices of households or businesses, and when it is not dependent on the taxable person's own actions. Under a kilometre-based tax system taxable persons would be able to directly influence the amount of taxes they have to pay, which would undermine the efficiency of the economy as well as economic activity.

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ANNEX 2.

Background assumptions for example calculations

	Ford Focus 1,0 Eco Boost	Toyota Avensis 1,8	Volvo Xc 60 D5	Nissan Qhasqai 1,6L
CO_2 emissions g/km	109	152	169	139
Consumption l/100km	4.7	6.5	6.4	6.2
Car tax euros	3633	6698	15594	4680
Price including tax euros	21293	26928	55294	20890
Vehicle tax euros	92.3	137.2	682.9	121.2
Km tax cents/km	2.021	3.0567	3.593	2.685
Fuel cents/km	7.52	10.4	9.40	9.92
Motive force tax cents/km	0	0	2	0
Car tax per year (15 yrs) euros	242	447	1040	312

Petrol price including tax 1.6 euros/litre

Diesel price including tax 1.47 euros/litre

CO2/km	Km tax
100	1.77
105	1.94
110	2.04
115	2.14
120	2.24
125	2.35
130	2.46
135	2.59
140	2.71
145	2.85
150	3.00
155	3.15
160	3.30
165	3.46
170	3.63
175	3.80
180	3.98
185	4.16
190	4.36
195	4.56
200	4.77