

TRANSPORT PAPERS

TP-23
NOVEMBER 2008

Road User Charges: Current Practice and Perspectives in Central and Eastern Europe

Cesar Queiroz, Barbara Rdzanowska, Robert Garbarczyk and Michel Audige



**TRANSPORT
SECTOR
BOARD**

ROAD USER CHARGES: CURRENT PRACTICE AND PERSPECTIVES IN CENTRAL AND EASTERN EUROPE

Cesar Queiroz, Barbara Rdzanowska, Robert Garbarczyk and Michel Audige



THE WORLD BANK
WASHINGTON, D.C.

© 2008 The International Bank for Reconstruction and Development / The World Bank
1818 H Street NW
Washington, DC 20433
Telephone 202-473-1000
Internet: www.worldbank.org

This volume is a product of the staff of The World Bank. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the Executive Directors of The World Bank or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Rights and Permissions

The material in this publication is copyrighted. Copying and/or transmitting portions or all of this work without permission may be a violation of applicable law. The International Bank for Reconstruction and Development / The World Bank encourages dissemination of its work and will normally grant permission to reproduce portions of the work promptly.

For permission to photocopy or reprint any part of this work, please send a request with complete information to the Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; telephone: 978-750-8400; fax: 978-750-4470; Internet: www.copyright.com. All other queries on rights and licenses, including subsidiary rights, should be addressed to the Office of the Publisher, The World Bank, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2422; e-mail: pubrights@worldbank.org.

To order additional copies of this publication, please send an e-mail to the Transport Help Desk transport@worldbank.org

Transport publications are available on-line at <http://www.worldbank.org/transport/>

CONTENTS

<i>Acknowledgements</i>	v
<i>Overview</i>	1
1 Introduction.....	2
2 Road User Charges	3
3 Developing a Road Financing Plan.....	5
4 A Brief Survey of Road User Charging in Europe	5
5 Electronic Toll Collection	7
6 Private Financing of Road Infrastructure	12
7 Toolkit for Public Private Partnership in Highways	13
8 Partial Risk Guarantees.....	14
9 Canceled Toll Road Projects	14
10 Some Lessons Learned from Successes and Failures	15
11 The Case of Poland	16
12 Summary and Conclusion	20
References	23

ACKNOWLEDGEMENTS

The authors are grateful to the participants in the road user charge workshop held in Warsaw in June 2008 and the special support provided by Jaroslaw Waszkiewicz, Edgar Saravia and Radoslaw Czapski. The authors benefited from comments of Neil Schofield, Goran Mladenovic, Edith Buss, Kristian Wærsted, Alain Fayard. This paper reflects only the authors' views, and should be used and cited accordingly. The findings, interpretations, and conclusions are the authors' own. They should not be attributed to the World Bank, its Board of Directors, its management, or any of its member countries.

OVERVIEW

Over the last decade, several transition countries have experienced diminishing funding for their road infrastructure which significantly affected their capacity to expand, maintain and rehabilitate their road networks. The severity varies from one country to another in terms of budget cutbacks, but in many cases, total road expenditures (including construction) has amounted to less than 0.8 percent of GDP. This ratio compares unfavorably to the 1 to 2 percent of GDP generally considered necessary to adequately maintain highway networks and to carry out a modest amount of construction.

As a result of such low expenditures, networks have been fast deteriorating and vehicle operating costs increasing. In a large number of countries, more than one third of the main road network is in poor condition. The problem is further exacerbated by the rapid increase in road vehicle fleet and commensurate road usage. This serious situation has led several countries in Central and Eastern Europe (CEE) to consider establishing improved, modern road user charging (RUC) systems that would provide more funds for maintaining and expanding their road networks. Use of such systems can also help decision makers to take advantage of increased private sector involvement in financing and operating highway assets.

While countries such as Chile have seen motorways as an important means to attract private savings, especially from abroad, in Central and Eastern Europe there has been limited experience. So far, only Hungary, Croatia, and Poland have concessioned some motorway projects to private contractors or consortia. Nevertheless, several countries in the region (Russian Federation, Serbia, Albania, Slovakia and Latvia) are currently making good progress toward launching PPP (public-private partnerships) programs in highways.

This paper covers the most commonly used means to charge road users, including fuel taxes, vehicle taxes, vignettes and tolls. It presents a brief survey of road user charging systems in selected European countries and a more detailed overview of current status and perspectives of road user charges in Poland.

Consideration is also given to private financing of roads through different forms of public-private partnerships (PPP), including a review of potential applications of the *World Bank Toolkit for PPP in Highways* as an instrument to help decision makers and practitioners to define the best PPP approach for a specific country.

1 INTRODUCTION

An efficient transport system is important for economic development because transport costs are a significant part of the cost structure of the goods that a country produces or imports. If transport costs are unnecessarily high, then the country's products will not be competitive on international markets. Road transport costs include not only the cost of building and maintaining the road network, but also vehicle operating costs which increase as roads deteriorate due to increased vehicle maintenance costs, the costs associated with increased time in transit, as well as the costs associated with road crashes, which amount to up to 1 to 3 percent of a country's GDP (World Bank Global Road Safety Facility 2008).

In several Central and Eastern Europe (CEE) countries, a significant portion of the roads, including the main road network, is in poor or only in fair condition (requiring attention immediately or in the next three to five years). Experience has shown that timely maintenance is much less expensive than delayed maintenance. If roads can receive maintenance at the appropriate time, the overall cost of maintaining the roads is lower than if roads deteriorate to the point that requires reconstruction rather than less expensive treatments such as surface dressings or asphalt overlays. For example, reconstruction costs in the order of five times as much per kilometer as an overlay, and 25 times as much as a bituminous surface dressing.

Consequently, it is imperative for the efficient operation of the road transport system that resources be available for timely road maintenance. This is not only in the interest of the road administrations and the Ministry of Transport, but also the Ministry of Finance and road users. However, several countries have experienced diminishing funding for road maintenance and rehabilitation. The severity varies from one country to another in terms of budget cutbacks, but frequently total road expenditures (including construction) amount to less than 0.8 percent of GDP. This ratio compares unfavorably to the 1 to 2 percent of GDP, generally considered necessary to adequately maintain the road networks and carry out a modest amount of construction.

This serious situation has led several countries in Central and Eastern Europe to consider establishing improved, modern road user charging (RUC) systems that would provide more funds for maintaining and expanding their road networks. Use of such systems can also help decision makers to take advantage of more private sector involvement in financing and operating highway assets. While countries such as Chile have seen motorways as an important means to attract private savings, especially from abroad, in Central and Eastern Europe there has been limited experience. So far, only Hungary, Croatia, and Poland have concessioned some motorway projects to private contractors or consortia. Nevertheless, several countries in the region (Russia, Serbia, Albania, Slovakia, and Latvia) are currently making good progress toward launching PPP programs in highways.

This paper reviews the most commonly used means to charge road users, including fuel and lubricant taxes, vehicle taxes, vignettes and tolls, as well as mechanisms to allocate funds for roads (budget allocations or road funds). A brief survey of road user charging systems in Europe is presented. Consideration is also given to private financing of roads through different forms of public-private partnerships (PPP), including a review of potential applications of the *World Bank Toolkit for PPP in Highways* as an instrument to help decision makers and practitioners to define the best PPP approach for a specific country.

2 ROAD USER CHARGES

It is in the interest of the road users to have well maintained roads, as the operating costs of their vehicles are reduced substantially more than the corresponding cost of road maintenance. Thus, the first step in seeking financing for road maintenance is to look to the users of the roads to pay the cost of road maintenance. Experience in a number of countries has shown that road users are willing to pay for road maintenance, as well as expansion, if they can see that the fees and taxes that they pay result in improved road condition.

The preferable road user charges are those that link the charges most closely to the use of the roads. Generally, the most appropriate charges are ones for the use of the road space, and charges for the disproportionate damage caused by heavy vehicles.

Method of Charging for Roads. The principles of taxing road users are that charges should be economically efficient, equitable, cost little to collect and are not easily evaded. They should also be adjusted for inflation (Yenny 2002).

Taxes on Vehicle Fuel satisfy, to a certain extent, the above criteria and are widely used. They are relatively inexpensive to collect, easy to administer and reasonably equitable, since they are proportionate to road use. Their main disadvantage is that they do not reflect the much higher damage done to roads by heavy vehicles. Although trucks consume more fuel per kilometer than cars and would therefore pay more fuel taxes per kilometer traveled, this is not in proportion to their higher impact on the roads. Therefore, fuel taxes need to be supplemented by additional charges on heavy vehicles.

Taxes on fuel are also used by governments for purposes such as restraining fuel consumption or raising revenues for the budget, and this is common practice in many developing and developed countries. Nevertheless, what is needed is that sufficient funds be allocated to carry out an appropriate level of road maintenance and expansion.

Vehicle Licenses are common in most countries, mainly in the form of annual license fees (or for a two-year period, as in the United States). They are easy to collect and can differentiate between types of vehicle and reflect the costs that each type causes to the roads. The main drawback is that they are not use related. A truck used for only 20,000 km per year would pay the same as one traveling 100,000 km per year.

Vehicle-distance Traveled Charges (or Fees) have been implemented in a number of countries, including Norway, Sweden and New Zealand. The charges are administered through sealed hub odometers or other measuring devices. The problem is that such systems require a substantial initial outlay, sophisticated administration, and are prone to evasion. Even in law-abiding New Zealand, the evasion is estimated at 10 to 20 percent. Some of these shortcomings can be avoided with more modern charging systems, such as the ones now in use in Germany and Austria (discussed later in this paper), which are considered a form of tolling. Vehicle-distance traveled fees and tolls are usually called "direct user fees."

Tolls are used for specific roads, bridges and tunnels. Although they charge directly for the use of particular facilities and are therefore equitable, they are a relatively expensive form of revenue raising. They have significant capital costs (construction of toll plazas and tollbooths, controlled access) and operating costs (toll collection). A rough rule of thumb is that tolls should not be

considered for roads with traffic of less than some 10,000 vehicles per day, to keep the administrative costs at a relatively low percentage of the toll revenues. Toll systems also reduce the economic benefits of the tolled facilities by minimizing entry and exit points, delaying traffic at tollbooths and diverting traffic to parallel roads with higher vehicle operating costs. Modern toll collection procedures, such as the German Toll Collect system, discussed later, can minimize such inconveniences.

Issues regarding toll collection include *inter alia* the toll rate structure and enforcement systems. A review of the toll rate structure adopted in several countries indicates that a toll rate structure simply based on the number of axles of trucks and buses is commonly used. Several countries simply multiply the rate for a passenger car by the number of axles of a truck (or bus) to compute the toll rate for such vehicle. This is the case, for example, of all the federal highway concessions in Brazil, as detailed in the concession contracts published by the Brazilian Agency for Land Transport (ANTT). Such contracts are available on the ANTT website at:

<http://www.antt.gov.br/>

The site below, of the International Bridge, Tunnel and Turnpike Association (IBTTA), provides links to toll rates in 12 countries:

<http://www.ibtta.org/Information/content.cfm?ItemNumber=542&navItemNumber=1238>

Regarding toll violation enforcement, the system recently introduced by the US State of Virginia is an interesting example. As in several other systems, it uses cameras to take photos of toll violators. This may be challenging where license plates tend to be very dirt. Information on the Virginia system is available at:

<http://www.virginiadot.org/news/newsrelease.asp?ID=CO-072>

In the United States, the Federal Highway Administration maintains a comprehensive database of toll facilities, which can be accessed through the following link:

http://www.ops.fhwa.dot.gov/tolling_pricing/resources/toll_facilities_info/search_results.cfm

Vignettes have been substituted for tolls in a number of European countries, typically to charge for the use of an entire class of roads such as motorways and, except for Austria and Switzerland, applied to trucks only. This charge does not have the costs associated with tolls described above, but does not reflect usage as vignettes are usually sold for a fixed period (e.g., one year or shorter periods), when they can be used irrespective of the number of kilometers driven. Vignettes limited to one or a few days have been used, although short periods may add considerably to the cost of administering the system. Evasion is considered a serious problem, as random checks are the only way to verify that vignettes are displayed on the vehicles. Vignettes for the use of motorways are in effect, for example, in the Czech and Slovak Republics and Hungary. In Poland, vignettes are issued to trucks and buses with total weight over 3.5 tons.

Charges for non-standard and overweight vehicles are levied in many countries, the principle being that these charges should compensate for the extra damage caused to the roads by over-sized or overloaded vehicles. These charges seldom reflect the costs imposed on the roads by these vehicles and barely cover administrative costs. They are easily avoided by payment of bribes. In the case of

overloading, it would be better to enforce axle load limitations by stricter control, fines and forced unloading of contravening trucks.

Charges on the purchase of new vehicles, practiced in certain countries, can be graduated for different kinds of vehicles (more for trucks). Similar to annual vehicle registration fees, they are relatively easy to collect, but are not related to subsequent vehicle use.

Sales taxes, of which part of the revenues have been assigned to roads. This is the case, for example, of the State of Virginia, in the U.S. Despite the fact that these taxes are not directly related to road use, they have been used to provide funds for roads in several countries.

Most countries have found that the most appropriate road user charges are a combination of fuel taxes (usually responsible for 70 to 80 percent of the total road user charges); an annual vehicle registration fee that varies depending on the size of the vehicle; special charges for extra heavy vehicles in proportion to the damage that they do to the roads; and transit fees for foreign vehicles, to compensate for the local fees and charges that they do not otherwise pay. Electronic toll collection (e.g., US, Norway, France, Canada), congestion charges (e.g., London), and satellite-based system (e.g., Germany) are being adopted or considered for adoption by several CEE countries. The road user charging systems adopted in several countries are discussed later in the paper.

3 DEVELOPING A ROAD FINANCING PLAN

When the funds available to the road sector are significantly less than the amount required to maintain the road network in a stable long-term condition, as well as to undertake justified improvements (e.g., projects with an economic rate of return of more than 12percent), the main road agency should prepare an explicit long-term financing plan showing the size of the financing gap and suggesting how it might be bridged (Heggie and Vickers 1998). Among other things, the financing plan should consider the scope for getting better use out of existing resources by, for example, contracting out more design and implementation work to the private sector (or exposing in-house work to competition from outside contractors), and carrying out value engineering analysis for relatively large projects. The following World Bank site provides further information on developing a road financing plan:

http://www.worldbank.org/html/fpd/transport/roads/rd_fnds.htm

The rising fuel prices and their effect on road funds and the increase cost of maintenance, operations and construction is a current concern. As motorists cut back on their driving and buy more fuel-efficient vehicles, governments take in less money from fuel taxes.

4 A BRIEF SURVEY OF ROAD USER CHARGING IN EUROPE

A Road User Charging (RUC) Systems Workshop, jointly organized by the Polish Ministry of Transport and the World Bank, was held in Warsaw on June 11-12, 2007. The workshop's main objective was to share experience in the design and implementation of modern road charging systems and make this experience available to Poland, as well as other countries that are considering introducing new road user charging systems.

Topics addressed in the workshop included an overview of road user charging systems; the current situation of charging users in Poland (e.g., toll for cars, vignette for trucks) and plans for the future; the heavy vehicle fees of Germany (satellite based), Austria and Switzerland; the London and Stockholm cordon charge systems; the Norwegian toll ring system; charging systems in France, Italy, Hungary, Slovenia, Netherlands and United Kingdom; road financing in Estonia, Latvia and Lithuania; and EC requirements for interoperability of different charging systems. All workshop presentations are available on the World Bank website at:

<http://www.worldbank.org/eca/transport> or

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/EXTECAREGTOPTRANSPORT/0,,contentMDK:21411468~menuPK:571127~pagePK:64215727~piPK:64215696~theSitePK:571121,00.html>

The participants in the workshop, representing about 20 countries, were asked to reply a few questions regarding road user charges in their countries. Data requested included the total amount of fuel tax collected, the total public expenditures for roads, road budget (executed) in 2006, sources of funds for roads, and length of the national and total road networks.

Answers were provided by representatives of 14 countries, including 12 EU members and Norway and Switzerland. Also, subsequent to the workshop, data on Slovakia was included. A summary of the answers received is given in Table 1. Table 2 provides some comparison of the amount road users pay in terms of road expenditures and per vehicle in each country. For all the countries surveyed, there is no direct link between revenues from fuel tax and road expenditures, except for Lithuania and Poland. The situation in these two countries, however, is different. Lithuania abolished its Road Fund several years ago, but the legislation still includes earmarking of part of the fuel tax for roads. In Poland, about 12 percent of revenues from fuel excise duty is allocated for road expenditures. Additionally, the so called "fuel charge" goes directly to the Road Fund.

Fuel tax revenue is the most significant form of road user charge, amounting to about 87 percent of the total road user charges for the countries surveyed. On average, annual fuel tax collection is about 142 percent of a country's total expenditures on roads. However, fuel tax is relatively low in Norway and Switzerland, but this is compensated by higher vehicle ownership taxes, such as annual vehicle registration.

Tolls have been imposed by 8 of the 14 countries surveyed. Relative to fuel tax revenues, tolls are most significant in Norway, where annual toll collection is about 43 percent of annual fuel tax revenue. In this respect, Norway is followed by France (about 25 percent) and Italy (about 15 percent).

Table 1. Summary results of a brief survey of road user charges in selected European countries

Country	National road expenditures (mln EUR)	Sources of revenues for national roads (mln EUR)					Length of national roads (km)	Total road network (km)	Total fuel tax (mln EUR)	Total road expenditures (mln EUR)
		Fuel tax	Vehicle registration fees	Toll collection	Vignettes	Other sources				
Latvia	195	n.a.	n.a.	0	n.a.	195	20,167	69,675	314	240
Hungary	449	n.a.	n.a.	n.a.	108	341	31,067	187,800	1,848	n.a.
Finland	840	n.a.	n.a.	0	n.a.	n.a.	78,189	430,000	2,946	840
Slovenia	736	n.a.	n.a.	158		593	6,301	33,562	n.a.	n.a.
Sweden	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	103,000	572,000	2,800	1,850
Lithuania	295	253	11	0	11	1	21,328	80,509	377	373
Italy	2,900	n.a.	n.a.	5,394	0	n.a.	30,128	80,477	36,200	n.a.
Germany	6,120	n.a.	n.a.	1,080	n.a.	n.a.	55,000	231,581	40,000	n.a.
Switzerland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,800	70,000	3,000	4,500
United Kingdom	26,709	37,000	7,300	306	n.a.	n.a.	41,972	417,000	37,000	n.a.
France	5,100	n.a.	2,200	3,100	n.a.	2,000	20,000		26,000	n.a.
Norway	2,230	n.a.	n.a.	520	n.a.	n.a.	27,000	93,000	1,200	2,600
Austria	1,500	n.a.	n.a.	935*	300	n.a.	2,080	n.a.	n.a.	n.a.
Poland	2,200	605	n.a.	49	145	1,450	18,000	360,000	4,368	n.a.

Table 2. Comparison of road user charges in selected European countries

Country	National road expenditures (mln EUR)	Length of national roads (km)	Total fuel tax (mln EUR)	Total road user charges (mln EUR)	User charges % of national road expenditures	Stock of motor vehicles (000)	User charges per vehicle (EUR) in 2006
Latvia	195	20167	314	509	261.0	866	588
Hungary	449	31067	1848	2297	511.6	3334	689
Finland	840	78189	2946	2946	350.7	2805	1050
Slovenia	736	6301	n.a.	n.a.	n.a.	1016	n.a.
Sweden	n.a.	103000	2800	2800	n.a.	4628	605
Lithuania	295	21328	377	400	135.6	1593	251
Italy	2900	30128	36200	41594	1434.3	38942	1068
Germany	6120	55000	40000	41080	671.2	48939	839
Switzerland	n.a.	1800	3000	3000	n.a.	n.a.	n.a.
United Kingdom	9000	41972	37000	44606	495.6	31886	1399
France	5100	20000	26000	34800	682.4	36702	948
Norway	2230	27000	1200	n.a.	n.a.	2523	n.a.
Austria	1500	2080	n.a.	n.a.	n.a.	4949	n.a.
Poland	2200	18000	4368	4562	207.4	14723	310
Slovakia	388	3521	882	1016	261.9	1487	683

Note: Although 15 countries were surveyed, not all data is available for each country

Source: Authors' calculations

5 ELECTRONIC TOLL COLLECTION

Electronic Toll Collection (ETC) is a fairly mature technology that allows for electronic payment of highway tolls. ETC systems take advantage of vehicle-to-roadside communication technologies (traditionally via microwave or infrared communication, more recently via GPS technology) to perform an electronic monetary transaction between a vehicle passing through a toll station and the toll

agency. ETC systems require Onboard Units (OBU), vehicle detection and classification as well as enforcement technologies.

Essentially, ETC equipment substitutes for having a person (or coin machine) to manually collect tolls at toll booths. In addition, it allows such transactions to be performed while vehicles travel at highway cruising speed. A description of ETC benefits is available at:

http://www.calccit.org/itsdecision/serv_and_tech/Electronic_toll_collection/electronic_toll_collection_summary.html

Such benefits include:

- Increase in toll lane capacity
- Reduction in motorist waiting time
- Convenience for toll payers
- Fuel savings and a decrease in mobile emissions by reducing or eliminating waiting times
- Reduction in toll collection costs and enhancement of audit control by centralizing user accounts
- Possibility to implement congestion pricing by breaking technical barriers: non-intrusive toll collection requires much less infrastructure, automatic vehicle counting and classification and automated accounting systems
- Identification of toll violators through digital license plate recognition devices

ETC is a part of Intelligent Transportation Systems (ITS), which are systems that use electronics, communications and information processing to improve the efficiency and safety of surface transportation. More information on ITS is available for example at:

<http://www.itstoolkit.co.uk/index2.htm>
<http://www.itsa.org/>
http://www.its.dot.gov/modal/modal_fhwa.htm

The following sections will discuss application of innovative ETC systems in raising revenues for road agencies and implementing congestion pricing. Irrespective of the system adopted, implementation contracts need to make clear and specific the public authority's requirements from the charging system. Procurement needs to be very specific regarding functional requirements of the system, but should leave the choice of technology to deliver these requirements largely in the hands of the private partner (ECMT 2006).

Urban Congestion Charges. On February 17, 2003, London introduced a US\$8-a day congestion charge for those driving in the city center (the rate has now been increased to £8.00-a day, or about US\$13-a day). The scheme relies on 700 video cameras which scan the rear license-plates of cars which enter the area between 7 am and 6:30 pm during working days. This information is matched each night against a database of drivers who have paid the charge either by phone, via the internet or at shops and garages. Except for those with exemptions, anyone who fails to pay by midnight is fined about US\$130. More information on the London congestion charge is available at:

<http://www.cclondon.com>

While some road pricing schemes had to be aborted because of political opposition (e.g., Austria, Hong Kong), others are working well. Singapore has led the way in restraining traffic by price since 1975. In the 1990s, three Norwegian cities--Oslo, Bergen and Trondheim--set up charging schemes

(see more details below). Rome has introduced an electronic system to control entry into its historic center. San Diego, California, has adopted dynamic road pricing, using microwave transponders to assess congestion levels and deduct fees accordingly.

In Sweden, following a trial period, the parliament decided to introduce a congestion tax in Stockholm from August 1, 2007. The congestion tax is levied on Swedish-registered vehicles that enter or exit the city center Monday to Friday between 6:30 a.m. and 6:29 p.m. During the times when the congestion tax is levied, vehicles are automatically registered at control points. Each passage entering or leaving Stockholm costs SEK 10, 15 or 20, depending on the time of day. The maximum charge per day and vehicle is SEK 60 (about US\$9.00). More information on the Stockholm congestion tax is available at:

http://www.vv.se/templates/page3_17154.aspx

<http://siteresources.worldbank.org/INTECAREGTOPTRANSPORT/Resources/StockholmTrialfinal.pdf>

Congestion charges have also been adopted outside of Europe. For example, such strategy has been shown to effectively reduce traffic congestion in the United States (e.g., San Diego, Minneapolis, Denver, Houston), and in Singapore. Useful information on congestion pricing is provided, for example, on the U.S. Department of Transportation website at:

<http://www.etc.dot.gov/index.htm>

Where infrastructure is more appropriately treated as a public good, as in the case of road and inland waterway systems (other than high-density tolled freeways), costs are recovered through fuel taxes, vehicle registration fees, and other taxes rather than congestion pricing (World Bank 2008).

Toll Rings in Norway. After a long political debate, toll cordons have been introduced in Norway as a source of funding for urban road improvements with the main objectives of easing congestion and improving road safety and the environment. In 1986, the Bergen toll ring was opened in Norway (this was the second such ring in the world, the first being in Singapore, as mentioned above); the Oslo toll ring was opened in 1990, and the Trondheim toll ring was opened in 1991. In Oslo, alternatives to toll collection that were debated (and rejected) included (a) an extra fuel tax earmarked for local road improvements, and (b) an extra car ownership tax earmarked for local road investments. A reason for rejection was a general negative attitude to earmarking of taxes in Norway. Establishing toll cordon in Oslo, with 19 toll plazas, was facilitated by the city's topography, with the fiord to the south and large greenbelt areas to the north and to the east. With a few exceptions such as handicapped drivers, public transport, and ambulances, everybody has to pay toll when passing in the direction of the center of Oslo. Outbound traffic is not tolled. In 2001, toll revenues amounted to NOK 880 million (about US\$126 million) and the operating costs were NOK 95 million (about US\$13.5 million). Toll rates are NOK 20 for cars and NOK 40 for trucks (or about \$2.90 and \$5.70, respectively). The heaviest trafficked toll plaza, Plaza No. 11, with about 50,000 vpd, has 8 paying lanes -- 4 for tag users, with automatic vehicle identification and no speed limitation, 3 that are coin operated (equipped with high capacity French model machines), and 1 lane for manual services only. Operation is done by two private companies--a toll collection company, and a toll plaza operating company--both under contract with the Norwegian Public Roads Administration. The link below provides more details:

<http://www.vegvesen.no>

Toll Roads in the United Kingdom. In the UK, in addition to the London congestion charges, tolls are currently being charged on the M6 Toll road and the Dartford Crossing. Vehicles can either pay by

cash or through a tag which opens the barrier allowing the vehicle to cross. More details on these two toll facilities are available at:

<http://www.m6toll.co.uk>

<http://www.highways.gov.uk/roads/projects/4065.aspx>

Heavy Goods Vehicle Charging. Several countries have introduced or are planning to introduce schemes for charging heavy goods vehicles (HGV).

While many of the issues in road charging are institutional and political, it is essential that the technical systems work well. As reported by TRL (<http://www.trl.co.uk>), the European research program on electronic charging – INITIATIVE, has developed several designs of charging equipment incorporating microwave short-range communications, cellular radio technology, satellite positioning, and a smart card reader. Such equipment is capable of identifying when the vehicle enters a charging zone, applying the appropriate charge, and transmitting charging data to a billing center. A desirable feature for road user charging is that travelers should need only one set of on-board equipment for use with any local charging scheme.

Heavy Good Vehicles Charging in Switzerland. A distance-based charge collected electronically applies to HGVs over 3.5 tons on all roads. The fee depends on the distance driven, the total vehicle weight (e.g., tractor plus trailer), and the emission class.

For all domestic HGVs an on-board unit (OBU) is mandatory. The OBU is linked to the vehicle tachograph for distance recording. The driver is responsible for entering the total vehicle weight onto the OBU. All Swiss border stations are equipped with CEN-DSRC beacons which are used by the border recognition system to record entrance and exits, as well as for enforcement purposes. In addition, GPS is used for monitoring purposes (e.g., accuracy of distance recording, correctness of border recordings). DSRC - dedicated short-range communications - is a bi-directional communication link between the OBU and the road side equipment. For details on the CEN-DSRC standards, see for example Hjelmare (2001) or Persad, Walton and Hussain 2007.

Further information on the Swiss charging system is available at:

<http://www.lsva.ch>

Heavy Goods Vehicle Charging in Germany. Since January 1, 2005, all lorries (trucks) exceeding 12 tons gross weight pay between €0.09 and €0.14 for each kilometer of road traveled on Germany's 12,000 km motorway (Autobahn) network. The toll rate is calculated on the vehicle's environmental status (engine emission levels) and the number of axles. This distance-related motorway user charge replaced the Euro vignette system for traveling through Germany.

The system is a dual one, comprising not only a manual booking option but also, for the first time ever, satellite-based automatic tolling. This system uses a combination of satellite navigation and mobile communication technology to achieve a free flow system.

Lorries using the German Autobahn network are expected to be fitted with an On Board Unit (OBU) to enable payments to be calculated via the satellite tracking system. Figure 1 shows a GPS-based OBU mounted on a truck. Currently there are about 1.5 million trucks identified under the scheme in Germany, of which some 40 percent is equipped with an OBU.

To guarantee the principle of non-discrimination, payments can also be made by manual booking at so-called toll terminals at petrol stations, service areas and retail outlets, or by telephone or via the internet. So the dual system with automatic and manual booking alternatives ensures that all truck drivers can use the toll road system without discrimination. It is able to handle the full tonnage booked with the manual system if the automatic system goes down. Further information is available at:

www.toll-collect.de

Figure 1. GPS-based on board unit mounted on a truck



Source: <http://www.tollroadsnews.com>

The scheme is raising around €3 billion a year (gross amount). The revenue from electronic fee collection is about 5 times higher than the revenue gained previously from the vignettes. Most of the investment goes to the federal trunk roads sector. In keeping with the Federal Government's desire to pursue an integrated transport policy, some of it is also being used to upgrade railway infrastructure and waterways. The German government contracted with "Toll Collect" to operate the charging system, which is the first of its kind in the world.

The effectiveness of the German toll system depends mainly on the number of vehicles equipped with OBU. Key features of the automatic system include:

- It recognizes a fixed toll road network (about 12,000 kilometers of motorways) and only charge tolls there. This road network may be expanded at any time by the way of data transfer via mobile communication network (GSM)
- It is able to set environmental policy through taking the pollution class into account as well as the number of axles in calculating fees
- It offers the technical prerequisites to introduce other fee classes, such as the time and place of the trip
- It operates on a free flow system, which charges toll without causing stops and traffic jams

Updated information on the "Toll Collect" system is available at:

http://www.toll-collect.de/pdf/benutzerinformation/web_einfuehrungstex_gb.pdf and

<http://www.toll-collect.de/frontend/HomepageVP.do;jsessionid=D99B2A0AB884D72D690B4EB25D608E99>

Distance-related Charging System in the Czech Republic. The obligation of motor vehicles and trailer combinations with a total weight equal to or greater than 12 tons to have a toll sticker affixed on the windshield was cancelled as of January 1, 2007, and replaced with a distance-based toll charge based on modern microwave technology.

Vehicles that are subject to the toll must be equipped with a small electronic device - the "Premid Onboard Unit" - which communicates with the tolling system. A fee for the use of a specific road

section is charged when a toll transaction occurs, that is, when a vehicle passes under the tolling station installed on the road section.

The fee rate depends on the number of axles and the emission class of the vehicle. The amount to be paid for the use of a particular tolled section is calculated as a multiple of the applicable rate and the length of the section. According to Kapsch's estimations (system provider) the turnover on toll in 2007 was expected to exceed CZK 5 billion (about EUR 175 million).

When passing through a toll gantry, an acoustic signal from the onboard unit alerts the driver that the toll has been recorded. The driver can use any lane without having to reduce the vehicle speed. The tolling process is fully automatic and requires no intervention on the part of the driver.

Enforcement stations are equipped with technology to check whether vehicles have Premid units installed, whether they are installed properly, and to check toll payments.

In addition to the stationary gantries, there are also portable devices that can be deployed for random checks. More information on the Czech system is available at:

www.premid.cz

6 PRIVATE FINANCING OF ROAD INFRASTRUCTURE

Many governments do not have all the financial resources required to expand, maintain, and operate their country's highway networks and other transport infrastructure. The overall resources needed are enormous. In the United States, for example, it is estimated that \$55 billion will be required annually over the next 20 years simply to maintain the highway and bridges in their current condition.

In many countries, the private sector has been involved in financing infrastructure through concessions under a public-private partnership (PPP) program. Broadly defined, a concession is a legal arrangement in which a firm obtains from the government the right to provide a particular service (Kerf 1998). PPP schemes, however, are somewhat underutilized in developing economies, where the potential financing gaps are significant and growing, and there seems to be an enormous potential for more private sector involvement in the financing and operation of highway assets in these countries.

With many countries increasingly interested in attracting private capital to infrastructure projects, institutions such as the World Bank can contribute through greater use of their guarantee power, in addition to supporting, when required, the public sector contribution to the construction cost of a PPP project through loans. Partial risk guarantees are particularly relevant in the context of seeking more private involvement in the financing of road infrastructure.

Countries such as Chile (see Figure 2) have seen motorways as an important potential means to attract private savings, especially from abroad, to ease budgetary pressures. In Central and Eastern Europe, however, several countries have had unfruitful experiences and only Hungary, Croatia, and Poland have so far succeeded in concessioning some motorway projects to private contractors, using tolls or availability payments out of the budget to pay the concessionaires (World Bank 2007). Nevertheless, several countries in the region are currently making good progress toward launching a PPP program in highways, including Russia, Serbia, Albania and Latvia.

Worldwide information on private participation in transport infrastructure, including roads, can be obtained through a World Bank database at:

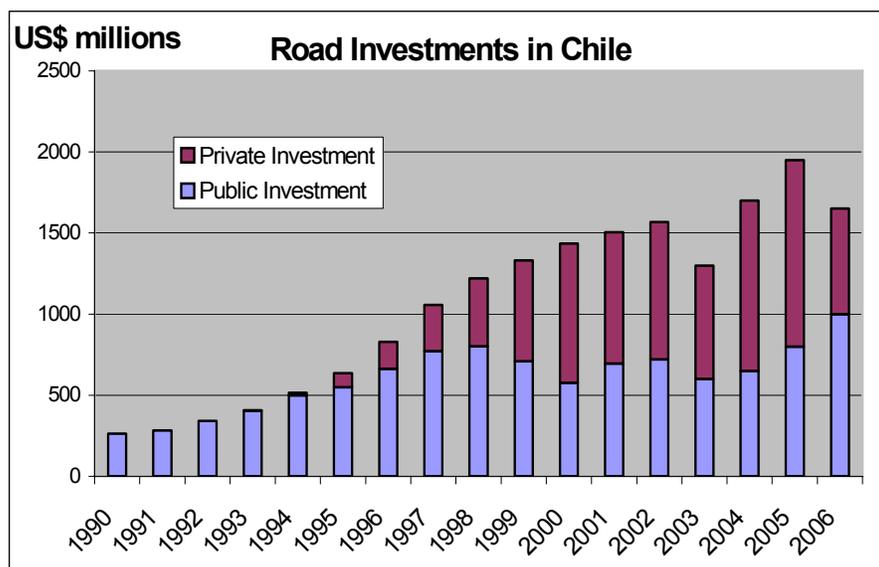
<http://ppi.worldbank.org/features/feb2007/Feature1.aspx>

or <http://ppi.worldbank.org/index.aspx>

Worldwide information on toll roads (both private and public) is collected by the International Bridge, Tunnel and Turnpike Association (IBTTA). Data is currently available for toll roads in 12 countries, which can be accessed at:

<http://www.ibtta.org/Information/content.cfm?ItemNumber=542&navItemNumber=1238>

Figure 2. Road Expenditures in Chile



Source: Ministerio de Obras Publicas, Chile

7 TOOLKIT FOR PUBLIC PRIVATE PARTNERSHIP IN HIGHWAYS

The Toolkit for PPP in Highways, developed by the World Bank, is a multimedia product aiming at assisting policy makers and transport officials in low and middle income countries in identifying different contracting, regulatory, and funding options for engaging the private sector in road development, maintenance, operation and financing. The Toolkit addresses all types of road projects, regardless of their complexity and scope of work, with or without private financing involved and irrespective of the term used to qualify them (e.g., performance-based contract, concession, franchise, BOT—build, own, transfer).

The Toolkit provides guidance to clarify public sector objectives and to set up project characteristics accordingly, in particular as regards:

- (i) the tasks (scope of work) entrusted to each party;
- (ii) the level of autonomy left to the private actors and the way their performance is assessed;
- (iii) the possibility and implications of including several road links in a single contractual package;

- (iv) the risk allocation principles and mechanisms;
- (v) the cost recovery system (general, specific taxes or direct road user charges);
- (vi) the financial scheme based on a government budget, private financing or a combination of both.

A CD-rom is available from the World Bank with the Toolkit, which can also be downloaded from:

<http://www.ppiaf.org/> or

www.ppiaf.org/toolkits/ppphighways/index.htm

The Financial Simulation Tool, which is included in the Toolkit for PPP in Highways, it is possible to assess the minimum required toll rate to attract private investors for motorway projects, as shown by Queiroz (2007). For example, if the initial traffic volume is expected to be 20,000 vpd and the construction cost US\$4 million/km, the minimum toll rate to attract private sponsors would be US\$0.09/veh-km, following some basic assumptions.

8 PARTIAL RISK GUARANTEES

Guarantees may be used to help attract private financing for roads. The World Bank partial risk guarantee covers specified risks arising from nonperformance of sovereign contractual obligations or certain political force majeure events. Partial risk guarantees are particularly relevant in the context of private financing of infrastructure. Such guarantees cover specific government obligations spelled out in a support agreement (e.g., concession agreement, implementation agreement, BOT contract) with the project entity. They are appropriate for enhancing a project's limited recourse project financing, the most common method of financing concessions for transport infrastructure.

Partial risk guarantees ensure payment in the case of debt service default resulting from the nonperformance of sovereign contractual obligations undertaken by governments or their agencies in private sector projects. Sovereign contractual obligations vary depending on project, sector, and country circumstances, and would be embodied in a support agreement negotiated between the government and the project sponsors.

Applications of partial risk guarantees to road concessions are discussed, for example, by Matsukawa and Habeck (2007), Irwin (2007) and Queiroz (2005). More information on the World Bank guarantee program is available at www.worldbank.org/guarantees

9 CANCELED TOLL ROAD PROJECTS

Some cancellations of private infrastructure projects should be expected, as the "freedom to fail" provides incentives for the private sector to be efficient (Harris et al. 2003). The projects canceled thus far represent only a small share of the projects that have encountered problems. Most problems are solved by adjusting key terms, by renegotiating contracts, or through other means short of cancellation. Even where substantial macroeconomic shocks occurred, most private infrastructure projects successfully withstood the impacts.

According to a survey by Harris et al. (2003), 327 toll road projects reached financial closure between 1990 and 2001, representing a committed investment of US\$76 billion. In the same period, only 19 (or 5.8percent) of these projects were canceled (one in Hungary, one in Thailand, two in Indonesia,

and 15 in Mexico), representing a total amount of investment canceled of US\$12.2 billion, or 16percent of the total commitment.

The small number of canceled projects, the attempts by governments to reprivatize some of them, and new private projects in countries that have seen cancellations all suggest that many governments still view the private sector as an efficient means of providing road infrastructure.

10 SOME LESSONS LEARNED FROM SUCCESSES AND FAILURES

An analysis of the experience with motorway development in the past ten to fifteen years in several developing countries showed that any PPP scheme, in order to be successful, requires strong government support and long lasting political will and engagement. This analysis highlights the following key pre-requisites for successful PPP schemes (World Bank 2004):

- A strong political will, an appropriate and stable regulatory and legal framework, and a stable macro-economic environment
- The willingness of the public sector to provide the (substantial) public sector contribution (up to 40-60 percent of total project cost in some cases). Public sector support may also include the provision of existing assets as an in kind contribution, sovereign guarantees, and subsidies
- Sufficient traffic volumes to make it viable to the private sector - A new road is unlikely to be financially viable without a flow exceeding 10,000 vehicles per day, unless the government offers an additional substantial subsidy to the concessionaire. By contrast, the rehabilitation of a road, particularly where there are no competing corridors, can be viable where the flow is just some 6,000 vehicles per day
- A robust economic and financial appraisal of the project that asks, and endeavors to answer, three questions: is the project beneficial for society, is it commercially viable for the potential concessionaire, and is the required public sector contribution justified in terms of the additional benefits engendered by that contribution?

Risks associated with PPP programs should be adequately managed. The main risks of PPP highway projects, in addition to changes in design during construction, which can lead to significant costs increase, are those that affect gross revenue. These revenue related risks usually reflect uncertainty in both the predictability of future traffic volumes and the willingness of road users to pay tolls, together with the possibility that expected land-use patterns do not materialize. A study of 67 toll road cases by Standard & Poor's (2002) found that actual traffic, on average, was 70 percent of the forecast volume, with a spread of 18 percent to 146 percent. For countries without previous tolling experience, the average actual traffic was only 56 percent of the forecast, compared with 87 percent for those with previous experience.

The World Bank has, together with the Public-Private Infrastructure Advisory Facility (PPIAF), developed the Toolkit for Public-Private Partnership in Highways. This resource (discussed earlier), when used appropriately, provides a reliable way of screening potential transport projects for private sector participation, prior to further detailed investigation.

Helpful PPP resource guidance, based on lessons learned, can be found in: (i) "Public and Private Sector Roles in the Supply of Transport Infrastructure and Services: Operational Guidance for World Bank Staff" (Amos 2004); (ii) "Public-Private Partnerships in Highways in Transition Economies:

Recent Experience and Future Prospects” (Queiroz 2007); (iii) “Guidelines for the Development of Successful Public-Private Partnerships” (European Commission 2003); and (iv) “Granting and Renegotiating Infrastructure Concessions – Doing It Right” (Guasch 2004).

The European Commission (EC), recognizing that countries can potentially benefit from the PPP approach to reform and upgrade infrastructure and services, has published, in addition to the “Guidelines,” a Resource Book with a number of PPP case studies across countries and sectors (EC 2004). Further related information can be found on the EC website at:

http://europa.eu.int/comm/regional_policy/sources/docgener/guides/pppguide.htm

PPPs should only be considered if it can be demonstrated that they will achieve additional value compared with other approaches, if there is an effective implementation structure, and if the objectives of all parties can be met within the partnership. Regarding additional value, as an example, the UK government (HM Treasury) has developed a value for money (VfM) framework, the application of which (including a “Quantitative Evaluation” tool) is mandatory for all PPP projects proposed in the UK. Further information regarding the UK “value for money” assessment is available on the HM Treasury website at:

http://www.hm-treasury.gov.uk/documents/public_private_partnerships/key_documents/ppp_keydocs_vfm.cfm

There has been some debate on the issue of PPP and good governance, two critical factors being the competitive selection of concessionaires (World Bank the appropriate dissemination of information. As noted by Sands (2006), the “insertion of commercial confidentiality clauses into PPP contracts effectively limits citizens’ access to publicly owned information, thereby jeopardizing the chance of informed public debate and healthy public accountability outcomes.” While confidentiality is most commonly sought by the private sector, there have also been cases where it is required by the public sector, an example of which is the design, build, finance and operate (DBFO) highway concessions in the UK (Shaoul et al. 2006). Conversely, examples of transparency are provided, *inter alia*, by the Brazilian National Agency for Land Transport (ANTT) and the UK Transport for London, which make available key information, including copies of concession contracts managed by them, on their websites respectively at:

http://www.antt.gov.br/acpublicas/apublica2006_35/APublica2006-35.asp

and http://www.tfl.gov.uk/tfl/corporate/modesoftransport/tube/pppcontracts/3_0_2_0.asp

11 THE CASE OF POLAND

Budgetary Allocations and National Road Fund. In Poland the road financing system is based on budgetary allocations. Road expenditures are mainly covered within revenues from fuel excise duty. According to the Act on Financing of Land Transport Infrastructure of 16 December 2005, 18percent of the annual overall income from the excise duty on fuel is to be used to finance the road and railway infrastructure investments. In practice about 65percent of income allocated to the road and railway projects go to road infrastructure projects and the remaining amount (35percent) is spent on railway infrastructure projects.

Another source of road financing is the so called fuel charge. The fuel charge was introduced on 1 January 2004 by an amendment to the Law on Toll Motorways and the National Road Fund of 27 October 1994. The revenues from fuel charge go directly to the National Road Fund (NRF) as earmarked source of financing of the national road network in Poland. In 2005 revenues from fuel charge amounted to PLN 1 bln (about EUR 263 mln). Since 2006, 20percent of the fuel charge income goes to the Railway Fund. In 2007 the total revenue from fuel charge exceeded PLN 1,7 bln (EUR 447

mln) – out of this sum PLN 1,373 mln (EUR 361 mln) went to the NRF and the remaining amount to the Railway Fund.

Fuel charge revenues can be only used to finance the construction, rebuilding, renovation and maintenance of motorways, national roads and railway infrastructure.

The total price of one liter of unleaded petrol (April 2008) comprises:

PLN 4.32 = PLN 1,89 (net price) + PLN 0,08 (fuel charge) + PLN 1,57 (excise duty) + PLN 0,78 (VAT)

The main purpose of creating the NRF in Poland was to improve the absorption of EU funds, by creating an instrument that provides the financial liquidity in the process of implementing the road projects.

Direct User Charges. In Poland, two types of user charges are imposed directly on road users: toll and vignette.

Pursuant to the above mentioned Law on Toll Motorways and the National Road Fund, toll motorways in Poland can be built and/or operated by private companies or the national road agency (General Directorate for National Roads and Motorways – GDDKiA). If tolls are collected by a private operator, they constitute the operator's revenue. Tolls are levied both on passenger cars and heavy goods vehicles. The toll rate depends on the number of axles. So far, there are three sections of toll motorways operated by private concession companies with a total length of 235 km:

- (i) Autostrada Wielkopolska – section from Nowy Tomyśl to Konin on A2 motorway (149 km)
- (ii) Autostrada Małopolska – section from Katowice to Kraków on A4 motorway (61 km)
- (iii) Gdańsk Transport Company – section from Rusocin to Swaróżyn on A1 motorway (25 km)

According to the Law on Road Transport of 6 September 2001 drivers of vehicles with total permissible mass (TPM) of over 3.5 tons are obliged to pay a vignette charge (time-based charge) on all national roads.

The new vignette rates introduced in October 2006 are as follows:

- Vehicle types:
 - TPM < 12 t (PLN 8 daily to PLN 500 per year)
 - TPM > 12 t (PLN 27 daily to PLN 2 500 per year)
 - Buses (PLN 11 daily to PLN 800 per year)
- Time types:
 - 1 day (PLN 8 to PLN 27)
 - 7 days (PLN 28 to PLN 88)
 - 1 month (PLN 70 to PLN 275)
 - 1 year (PLN 450 to PLN 2 500)
- EURO norm types:
 - EURO 0 and 1 (on average 10.9percent more expensive)
 - EURO 2 and higher

In total there are 24 types of vignettes.

Vignette Compensation. As the motorway network is a part of the national road network in Poland, there was a concern (until September 2005) that truck drivers had to pay twice for the same road section (by paying toll and paying for vignette card for a certain period of time). Since September

2005, to avoid the situation of double-charging on motorways that would be against EU law, vehicles with valid vignettes do not pay real tolls on motorways. Toll motorway operators may collect toll only from drivers of passenger cars. So as to compensate the loss of revenues from tolls on heavy vehicles, private toll motorway operators receive a financial compensation paid from the revenues from vignettes and international transport licenses. As a consequence a new element of payment mechanism for toll motorway operators has been introduced - shadow toll for heavy traffic. The operator receives 70percent of negotiated compensation rate per vehicle, different for various categories of vehicles. Compensation rates had been negotiated in the annex to operating contracts (concession agreements), indexed regularly for inflation, exchange rates and other factors. Table 3 presents real toll and compensation rates.

Table 3: Real toll rates and compensation rates on toll motorway sections

Autostrada Wielkopolska S.A (PLN)		
Category	Real toll (Per toll plaza)	Compensation rate*
I. 2 axles	11	-
II. 2 axles with twin wheel or trailer	27	38,60
III. 3 axles or 2 axles with twin wheels and trailer	41	57,90
IV. More than 3 axles or 3 axles and trailer	63	90,07
V. Other	110	110

Stalexport Autostrada Małopolska S.A. (PLN)		
Category	Real toll (Per toll plaza)	Compensation rate*
I. 2 axles	6,50	-
II. 2 axles with twin wheel or trailer	12,50	16,66
III. 3 axles or 2 axles with twin wheels and trailer	12,50	16,66
IV. More than 3 axles or 3 axles and trailer	24,50	16,66
V. Other	24,50	16,66

* The amount of compensation = 70percent x (compensation rate per vehicle x number of vehicles) (2007). Real toll is applied to trucks only in case of not having a valid vignette. On A-1 stretch the payment mechanism is based on availability payments.

The maximum compensation rates are equal to toll rates as of 1 September 2005. Toll rates were raised accordingly on that day to provide the operators with the negotiated compensation rate range. As a result of shadow toll mechanism, heavy traffic on motorways increased by up to 250percent. As heavy vehicles traffic on motorways has increased now the amounts of compensations are rising. Compensation for Autostrada Wielkopolska S.A. is significantly higher due to the longer stretch of operated motorway (149 km vs 61 km), higher traffic and higher compensation rates. The compensation is currently consuming most of the revenue from vignettes (in 2006 compensation amounted to nearly 74percent of the revenue from vignettes, in 2007 the ratio was 83percent) and is expected to exceed this revenue should new stretches of private-operated toll motorways be opened, including the second Autostrada Wielkopolska S.A. stretch and two stretches currently under tender (these are sections in central Poland: A2 Stryków-Konotopa and A1 Stryków-Pyrzowice).

Strategic Solution. The compensation mechanism was established as a temporary solution. A special task force group created in the Ministry of Transport (currently Ministry of Infrastructure) in October 2006 considered several options for the future of the Polish road infrastructure charging system, including:

- Vignettes for heavy vehicles on all national roads;
- Real tolls on motorways for light vehicles and heavy vehicles;
- Real tolls on motorways for light vehicles and real tolls on motorways and express routes for heavy vehicles;
- Real tolls on motorways for light vehicles and real tolls on motorways, express routes and major bridges on national for heavy vehicles;

Technical options for the tolling system included:

- Electronic tolls;
- Interoperability with other systems;
- Microwave vs GSM vs satellite tolls;

A package of new legal regulations on road user charging system in Poland - now under legislation process, includes:

- abolishing the vignette system, and consequently the compensation mechanism;
- introduction of an electronic toll collection system covering motorways (new sections) and express routes and applying to all vehicles with TPM of over 3.5 tons.

It is expected that revenues from distance-based fees will be about four times higher than revenues generated by the vignette system. The results of feasibility study to be carried out in the nearest future will reveal what technical specifications are optimal so as to minimize the cost of construction and maintenance of the system. The new toll collection system is to start operating in 2009 as a pilot project. Full operation of the system is expected to start not earlier than in 2012 after completing the construction of the motorway and expressway network according to the National Roads Construction Program for the period 2008-2012.

Private and Public Toll Road Operations in Poland. The following is a summary of existing and planned toll roads in Poland:

Toll motorway operator contracts:

- A2 Świecko-Konin: 2 stretches of toll motorway, one constructed (149 km), one to be completed in 2009, construction and operation by Autostrada Wielkopolska S.A.;
- A4 Katowice-Kraków: 61 km of motorway, adapted for tolling and operated by Stalexport Autostrada Małopolska S.A.;
- A1 Gdańsk-Nowe Marzy: to be constructed and operated by Gdańsk Transport Company S.A. (not yet fully operational, a stretch of 25 km has been recently opened, different payment mechanism including availability payments);
- Two new stretches of motorways (A1 Stryków-Pyrzowice, A2 Stryków-Konotopa) currently under tender for construction and operation.

Autostrada Wielkopolska S.A. – section from Nowy Tomyśl to Konin on A2 motorway:

- Open system with three toll plazas on a 149 km stretch of motorway, constructed by the current operator;
- 20 booths per toll plaza (10 in either direction), cash, credit;

- Adjoining Świecko-Nowy Tomyśl stretch (104 km) to be built by 2010 and to have two more toll plazas;
- Transition to a closed toll system planned for a future phase of the project.

Stalexport Autostrada Małopolska S.A. - section from Katowice to Kraków on A4 motorway

- Open system with 2 toll plazas;
- Pre-existing 61 km stretch of motorway, adapted to toll system by current operator;
- 14 booths per toll plaza (7 in either direction), cash, credit, pre-sold tickets;
- Transition to a closed toll system planned.

Plans for toll motorways to be operated by GDDKiA (national road agency) in the near future include:

- Newly constructed non-tolled motorways to be adapted to tolling system:
 - A4 Wrocław-Katowice
 - A2 Konin-Stryków
- Tender for adapting the motorways to tolling announced in March 2007 (also for building maintenance facilities and traffic management infrastructure)
- Intended tolling system:
 - A4 Wrocław-Katowice: open tolling system on one stretch, closed on the other
 - A2 Konin-Stryków: closed tolling system
- Deadline for adapting the two stretches for tolling: 24 months from announcing the results of the tender (competitive dialogue procedure near to be completed, best offers already selected).

12 SUMMARY AND CONCLUSION

A discussion was presented of the most commonly used means to charge road users, such as fuel and lubricant taxes, vehicle taxes, and tolls, as well as the mechanisms to allocate funds for roads (budget allocations or road funds). Some innovative methods to raise revenues for road agencies or charging congestion, recently adopted or being planned for adoption by several countries, were presented. These included the German "Toll Collect" system, the London congestion charging scheme, and the "toll rings" in Norway.

Consideration was also given to private financing of roads through different forms of public-private partnerships, including reference to the Toolkit for PPP in Highways developed by the World Bank. While countries such as Chile have seen motorways as an important means to attract private savings, especially from abroad, in Central and Eastern Europe several countries have had unfruitful experiences in this regard. Only Hungary, Croatia, and Poland have so far concessioned some motorway projects to private contractors or consortia. Nevertheless, several countries in the region are currently making good progress toward launching a PPP program in highways, including Russia, Serbia, Albania, Slovakia and Latvia.

Using the Financial Simulation model included in the Toolkit, as well as several basic assumptions regarding the micro- and macroeconomic environment, it is relatively easy to assess the minimum required toll rate to attract private investors for motorway projects.

In the case of Poland, the current vignette system is expected to be replaced by an electronic toll collection system. The new toll collection system is expected to start operating in 2009 as a pilot project. When fully operational, revenues should be about four times the amount of revenues generated by the current vignette system.

REFERENCES

Amos, Paul. 2004. "Public and Private Sector Roles in the Supply of Transport Infrastructure and Services: Operational Guidance for World Bank Staff." World Bank Transport Paper No. 1. Washington, D.C.: The World Bank.

http://siteresources.worldbank.org/INTTRANSPORT/214578-1099319223335/20273720/tp-1_pp-roles.pdf

Asian Development Bank (ADB). 2003. "Road Funds and Road Maintenance: An Asian Perspective." Manila, Philippines.

http://www.adb.org/Documents/Reports/Road_Funds_Maintenance/default.asp

Benmaamar, Mustapha. 2006. "Financing of Road Maintenance in Sub-Saharan Africa: Reforms and progress towards second generation road funds." Discussion Paper No. 6, Road Management and Financing Series. Sub-Saharan Africa Transport Policy Program.

Washington, D.C.: The World Bank.

<http://www4.worldbank.org/afr/ssatp/Resources/SSATP-DiscussionPapers/dp06.pdf>

Bousquet, Franck, and Cesar Queiroz. 1996. "Road Financing Systems: A Cross-Country Comparison of Typical Issues and Good Practices." 24th European Transport Forum, PTRC Education and Research Services Ltd. London.

Creightney, Cavelle. 1993. Road User Taxation in Selected OECD Countries. SSATP Working Paper No.3. World Bank, Washington, DC.

De Richecour, Anne Balcerac and Ian G. Heggie. 1995. African Road Funds, What Works and Why. SSATP Working Paper No. 14. World Bank, Washington, DC.

European Commission. 2003. "Guidelines for the Development of Successful Public-Private Partnerships." Brussels.

http://europa.eu.int/comm/regional_policy/sources/docgener/guides/ppp_en.pdf

European Commission. 2004. "Resource Book on PPP Case Studies." Brussels.

http://europa.eu.int/comm/regional_policy/sources/docgener/guides/pppresourcebook.pdf

European Conference of Ministers of Transport (ECMT). Conference on Road Charging Systems: Technology Choice and Cost Effectiveness. Paris, June 1, 2006.

<http://www.cemt.org/topics/taxes/Paris06/Conclusions.pdf>

<http://www.cemt.org/index.htm>

Guasch, J. Luis. 2004. "Granting and Renegotiating Infrastructure Concessions – Doing It Right." World Bank Institute Development Studies. Washington, D.C.: The World Bank.

<http://www->

[wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/05/06/000090341_20040506150118/Rendered/PDF/288160PAPER0Granting010renegotiating.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/05/06/000090341_20040506150118/Rendered/PDF/288160PAPER0Granting010renegotiating.pdf)

Gwilliam, K.M. and Z. Shalizi. 1997. Road Funds, User Charges and Taxes. Discussion Paper TWU-26. Transport, Water and Urban Development Department in collaboration with the Research Group in Development Economics. World Bank, Washington, D.C.

Harris, C., Hodges, J., Schur M., and Shukla, P. 2003. "Infrastructure Projects: A Review of Canceled Private Projects" Public Policy for the Private Sector, Note No 252. Washington, D.C.: The World Bank <http://rru.worldbank.org/Documents/PublicPolicyJournal/252Harri-010303.pdf>

Heggie, Ian G. and Piers Vickers. 1998. Commercial Management and Financing of Roads. Technical Paper 409. World Bank, Washington, DC. <http://www.worldbank.org/html/fpd/transport/publicat/twu-32/toc.htm>

Hjelmare, A. 2001. "CEN DSRC: A Robust Short Range Communications Link for Many Applications." 8th World Congress on Intelligent Transport Systems. ITS America. <http://ntlsearch.bts.gov/tris/search.do?b1=1&f1=0&t1=aupercent3Apercent22hjelmare+apercent22&r=1&d=tr&p=0&z=1&s=&o=&new=n> Accessed July 2007.

Irwin, Timothy. 2007. "Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects." World Bank, Washington, D.C. http://www-wds.worldbank.org/external/default/main?pagePK=64193027&piPK=64187937&theSitePK=523679&enuPK=64187510&searchMenuPK=64187295&theSitePK=523679&entityID=000310607_20070413163547&searchMenuPK=64187295&theSitePK=523679

Kerf, Michel, et.al. 1998. "Concessions for Infrastructure: A Guide to Their Design and Award." World Bank Technical Paper No. 399. World Bank, Washington, D.C. http://rru.worldbank.org/Documents/Toolkits/concessions_fulltoolkit.pdf

Malmberg Calvo, Christina. 1998. "Options for Managing and Financing Rural Transport Infrastructure." Technical paper 411. World Bank, Washington, DC.

Matsukawa, Tomoko, and Odo Habeck. 2007. "Review of Risk Mitigation Instruments for Infrastructure Financing and Recent Trends and Development." Public-Private Infrastructure Advisory Facility (PPIAF) and World Bank. Washington, D.C. <http://www.ppiaf.org/sections/Trendsandpolicy.htm>
<http://www.worldbank.org/guarantees>

Metschies, Axel. 2002. "Road Financing Issues in the EU Accession Countries." Draft Paper.

Persad, Khali, C. Michael Walton and Shahriyar Hussain. 2007. "Electronic Vehicle Identification: Industry Standards, Performance, and Privacy Issues." Center for Transportation Research. The University of Texas at Austin, Texas, USA. http://www.utexas.edu/research/ctr/pdf_reports/0_5217_P2.pdf

Potter, Barry H. 1997. "Dedicated Road Funds: A Preliminary View on a World Bank Initiative." Fiscal Affairs Department Paper on Policy Analysis and Assessment. IMF, Washington, DC.

Queiroz, Cesar. 2007. "Public-Private Partnerships in Highways in Transition Economies: Recent Experience and Future Prospects." Transportation Research Board 86th Annual Meeting, National Research Council, Washington, D.C.

<http://ntlsearch.bts.gov/tris/search.do?b1=1&f1=0&t1=kwpercent3Acesar+kwpercent3Aqueiroz&r=1&d=tr&p=0&z=1&s=yr&o=1&new=n>

Sands, Valarie. 2006. "The Right to Know and Obligation to Provide: Public Private Partnerships, Public Knowledge, Public Accountability, Public Disenfranchisement and Prison Cases." Forum Volume 12 No 2 - Public Private Partnerships. The University of New South Wales Law Journal Vol 29(3). Sydney, Australia.

<http://www.unswlawjournal.unsw.edu.au/lj2/issue.asp?id=f12-2>

Shaoul, Jean, Anne Stafford and Pamela Stapleton. 2006. "Highway Robbery? A Financial Analysis of Design, Build, Finance and Operate (DBFO) in UK Roads." Transport Reviews, Vol. 26, No. 3, 257-274, May.

World Bank. 2004. "Reducing the 'Economic Distance' to Market: A Framework for the Development of the Transport System in South East Europe."

<http://wbln0018.worldbank.org/ECA/Transport.nsf/ECADocByLink/BEF3FC761FF49D0785256FB20050>

World Bank. 2007. "Reforming Transport: Maximizing Synergy between Public and Private Sectors." Background Paper for Evaluation of World Bank Assistance to the Transport Sector, 1995 – 2005. Independent Evaluation Group, World Bank.

http://siteresources.worldbank.org/EXTTRANS/Resources/reforming_transport.pdf

World Bank. 2008. "World Bank Global Road Safety Facility."

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/EXTTOPGLOROASAF/0,,contentMDK:20933912~menuPK:2582239~pagePK:64168427~piPK:64168435~theSitePK:2582213,00.html>

World Bank. 2008. "Safe, Clean, and Affordable...Transport for Development." The World Bank Group's Transport Business Strategy 2008-2012.

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/0,,contentMDK:20259386~menuPK:5141563~pagePK:210058~piPK:210062~theSitePK:337116,00.html>

Yenny, Jacques. 2002. "Road Financing in Europe and Central Asia." World Bank. Draft Paper.