Financing of Road Infrastructure

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ABSTRACT: Over the last several years, there was an increased contribution of the private sector to finance transport infrastructure in general, and roads in particular, in both the developed and developing worlds. However, in view of the current global financial crisis, there has been a relative retraction of private financing for infrastructure, which may affect negatively the capacity of many countries to expand, and even keep up their road networks. While this is an observed short-term phenomenon, it is still not clear what will be the medium- to long-term effect of the current crisis. It may well be that governments may be willing to increase public contribution to roads projects so as to make it attractive to private investors to dedicate significant private financing to potentially profitable projects. In this way, we may be seeing increased use of government support to public-private partnership (PPP) projects, in the form of more grants to support the project construction, as well as operational grants or minimum revenue guarantees during the operational phase of the PPP projects.

This paper covers the most commonly used means to charge road users, such as fuel taxes, vehicle taxes, vignettes, and tolls. A brief survey of road user charging systems in selected European countries is presented. Consideration is also given to private financing of roads through different forms of PPP, including a review of potential applications of the World Bank Toolkit for PPP in Roads and Highways as an instrument to help decision-makers and practitioners to define the best PPP approach for a specific country. Developing and transition economies can also take advantage of guarantees offered by international financial institutions, an example of which is the World Bank’s partial risk guarantees that can increase a project’s attractiveness to private investors through lower interest rates and longer maturities of loans.

1 INTRODUCTION
An efficient transport system is important for economic development, as 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% of a country’s GDP (World Bank Global Road Safety Facility 2008).

Experience has shown that timely maintenance is much less expensive than delayed maintenance. If roads can receive maintenance at the appropriate time, then the overall cost of maintaining the roads is less 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, as well as for the expansion of road networks with essential new or upgraded links that will reduce traffic congestion, travel times and transport costs.

Over the last several years, there was an increased contribution of the private sector to finance transport infrastructure. However, in view of the current global financial crisis, there has been a relative retraction of private financing for infrastructure, which may affect negatively the capacity of many countries to expand, and even keep up their road networks. While this is an observed short-term phenomenon, it is still not clear what will be the medium to long term effect of the current crisis. It may well be that governments may be willing to increase public contribution to roads projects so as to make it attractive to private investors to dedicate
significant private financing to potentially profitable projects. In this way, we may be seeing increased use of government support to public-private partnership (PPP) projects, in the form of more grants to support the project construction, as well as operational grants or minimum revenue guarantees during the operational phase of the PPP projects.

As the availability of more public resources will be essential to support such PPP projects, it is expected that many countries will be looking to modern road user charging (RUC) systems that would provide more funds for maintaining and expanding their road networks, both through purely public projects, or some form of PPP scheme.

In Western Europe, countries such as the UK, Spain, Italy and France have taken considerable advantage of private financing of road infrastructure, while countries such as Norway and Sweden still have a vast potential to explore. In Central and Eastern Europe there has been limited PPP experience. 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.

This paper covers the most commonly used means to charge road users, such as fuel taxes and tolls, which provide a source of public funds for roads. A brief survey of road user charging systems in selected European countries is presented. Consideration is also given to private financing of roads through different forms of PPP. Developing and transition economies can take advantage of guarantees offered by international financial institutions, an example of which is the World Bank’s partial risk guarantees that can increase a project’s attractiveness to private investors through lower interest rates and longer maturities of loans.

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 are charges 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, as 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 tollbooth, 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.ibttta.org/information/content.cfm?ItemNumber=542&navlItemNumber=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 dirty. Information on the Virginia system is available at:


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_priceing/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 12%), 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:


The current global economic crisis is leading in several countries to reduced vehicle utilization. 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

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, 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. While several EU member countries have earmarking for roads, Poland is the only one which still has a 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 15 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
Table 1: Summary results of a brief survey of road user charges in selected European countries

<table>
<thead>
<tr>
<th>Country</th>
<th>National road expenditures (mln EUR)</th>
<th>Length of national roads (km)</th>
<th>Total road network (km)</th>
<th>Total fuel tax (mln EUR)</th>
<th>Toll collection (mln EUR)</th>
<th>Vignettes (mln EUR)</th>
<th>Vehicle registration fees (mln EUR)</th>
<th>Other road use related taxes (mln EUR)</th>
<th>Total road user charges (mln EUR)</th>
<th>Total road expenditures (mln EUR)</th>
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<td>51</td>
<td>0</td>
<td>83</td>
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Note: Not all data is available for each of the 15 countries surveyed.
Source: Queiroz et al. 2008

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

<table>
<thead>
<tr>
<th>Country</th>
<th>National road expenditures (mln EUR)</th>
<th>Length of national roads (km)</th>
<th>Total fuel tax (mln EUR)</th>
<th>Total road user charges (mln EUR)</th>
<th>User charges % of national road expenditures</th>
<th>Stock of motor vehicles (000)</th>
<th>User charges per vehicle (EUR) in 2006</th>
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<td>683</td>
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</table>

Note: Not all data is available for each of the 15 countries surveyed.
Source: Queiroz et al. 2008
revenue. In this respect, Norway is followed by France (about 25 percent) and Italy (about 15 percent).

5 ELECTRONIC TOLL COLLECTION

5.1 Background

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.caltc.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).

5.2 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.cc.london.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/INTECAREGT
OPTTRANSPORT/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).

5.3 Toll Rings in Norway

After a long political debate, toll cordon was
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 (this was the second such ring in the
world, the first being in Singapore); 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)
include (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 currently NOK 25
for cars and NOK 75 for trucks. The toll collection
uses automatic vehicle identification and there is
no need for speed reduction. The operation is done
by private companies under contract with the
Norwegian Public Roads Administration. The link
below provides more details:
www.vegvessen.no

Toll rates in Norway are available at:
http://www.autopass.no/binary?id=71526

5.4 Toll Roads in the United Kingdom

In the UK, in addition to the London congestion
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:
www.m6toll.co.uk
.aspx

5.5 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://wwwTRL.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.

5.6 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 roadside 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: www.lsva.ch

5.7 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

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.

Figure 1. GPS-based on board unit mounted on a truck (Source: http://www.tollroadsnews.com/cgi-bin/a.cgi/rwxBNloREdmceElj61nxlxA)

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_einfuhrungstext_gb.pdf and
http://www.toll-collect.de/frontend/HomepageVP.do;jsessionid=D99B2A0AB884D72D690B4EB25D608E99

5.8 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, i.e., 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 toll 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 FINANCE OF ROADS

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 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 concessioned 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/fbadaptive/database.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.ibtt.org/Information/content.cfm?ItemNumber=542&navItemNumber=1238

7 TOOLKIT FOR PUBLIC PRIVATE PARTNERSHIP IN ROADS AND HIGHWAYS

The Toolkit for PPP in Roads and Highways, developed by the World Bank, with support from the Private Participation in Infrastructure Advisory Facility (PPIAF), 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 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.worldbank.org/transport

With the use of the Financial Simulation Tools, which are included in the Toolkit, 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 OR DELAYED PPP 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 road projects reached financial closure between 1990 and 2001, representing a committed investment of US$76 billion. In the same period, only 19 (or 5.8%) 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 16% 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.

Although it is still too soon to assess the full impact of the current crisis on new PPP projects, there is indication of lower rates of financial closure and projects being postponed and canceled, mainly in energy and transport. Izaguirre
(2009) provides more details on the assessment of the impact of the crisis on new PPP projects.

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.

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/coms/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 (Shoaul 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_3/\APublica2006-35.asp and
http://www.tfl.gov.uk/tfl/corporate/modesoftransport/tube/pppcontracts/3_0_2_0.asp

11 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 Roads and Highways developed by the World Bank. 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 for PPP in Roads and Highways, 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.

Although it is still too soon to assess the full impact of the current crisis on new PPP projects, there is indication of lower rates of financial closure and projects being postponed and canceled, mainly in energy and transport.

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