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Innovative ways for Financing Transport Infrastructure

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ECONOMIC COMMISSION FOR EUROPE

Inland Transport Committee

Transport Trends and Economics 2016-2017: Innovative ways for Financing Transport Infrastructure

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New York and Geneva, 2017

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UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)

The United Nations Economic Commission for Europe (UNECE) is one of the five United Nations regional commissions, administered by the Economic and Social Council (ECOSOC). It was established in 1947 with the mandate to help rebuild post-war Europe, develop economic activity and strengthen economic relations among European countries, and between Europe and the rest of the world. During the Cold War, UNECE served as a unique forum for economic dialogue and cooperation between East and West. Despite the complexity of this period, significant achievements were made, with consensus reached on numerous harmonization and standardization agreements.

In the post-Cold War era, UNECE acquired not only many new member States, but also new functions. Since the early 1990s the organization has focused on analyses of the transition process, using its harmonization experience to facilitate the integration of central and eastern European countries into global markets. UNECE is the forum where the countries of western, central and eastern Europe, Central Asia and North America – 56 countries in all – come together to forge the tools of their cooperation. That cooperation concerns economic cooperation and integration, statistics, environment, transport, trade, sustainable energy, forestry and timber, housing and land management and population. The Commission offers a regional framework for the elaboration and harmonization of conventions, norms and standards. The Commission's experts provide technical assistance to the countries of South-East Europe and the Commonwealth of Independent States. This assistance takes the form of advisory services, training seminars and workshops where countries can share their experiences and best practices.

Inland Transport Committee (ITC) – Centre of United Nations Transport Conventions

TRANSPORT IN UNECE

The UNECE Sustainable Transport Division is the secretariat of the Inland Transport Committee (ITC) and the ECOSOC Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals. The ITC and its 17 working parties, as well as the ECOSOC Committee and its sub-committees are intergovernmental decision-making bodies that work to improve the daily lives of people and businesses around the world, in measurable ways and with concrete actions, to enhance traffic safety, environmental performance, energy efficiency and the competitiveness of the transport sector.

The ECOSOC Committee was set up in 1953 by the Secretary-General of the United Nations at the request of the Economic and Social Council to elaborate recommendations on the transport of dangerous goods. Its mandate was extended to the global (multi-sectoral) harmonization of systems of classification and labelling of chemicals in 1999. It is composed of experts from countries which possess the relevant expertise and experience in the international trade and transport of dangerous goods and chemicals. Its membership is restricted to reflect a proper geographical balance between all regions of the world and to ensure adequate participation of developing countries. Although the Committee is a subsidiary body of EC OSOC, the Secretary-General decided in 1963 that the secretariat services would be provided by the UNECE Transport Division.

ITC is a unique intergovernmental forum that was set up in 1947 to support the reconstruction of transport connections in post-war Europe. Over the years, it has specialized in facilitating the harmonized and sustainable development of inland modes of transport. The main results of this persevering and ongoing work are reflected, among other things, (I) in 58 United Nations conventions and many more technical regulations, which are updated on a regular basis and provide an international legal framework for the sustainable development of national and international road, rail, inland water and intermodal transport, including the transport of dangerous goods, as well as the construction and inspection of road motor vehicles; (ii) in the Trans-European North-south Motorway, Trans-European Railway and the Euro-Asia Transport Links projects, that facilitate multi-country coordination of transport infrastructure investment programmes; (iii) in the TIR system, which is a global customs transit facilitation solution; (iv) in the tool called For Future Inland Transport Systems (ForFITS), which can assist national and local governments to monitor carbon dioxide (CO2) emissions coming from inland transport modes and to select and design climate change mitigation policies, based on their impact and adapted to local conditions; (v) in transport statistics – methods and data – that are internationally agreed on; (vi) in studies and reports that help transport policy development by addressing timely issues, based on cutting-edge research and analysis. ITC also devotes special attention to Intelligent Transport Services (ITS), sustainable urban mobility and city logistics, as well as to increasing the resilience of transport networks and services in response to climate change adaptation and security challenges.

In addition, the UNECE Sustainable Transport and Environment Divisions, together with the World Health Organization (WHO) – Europe, co-service the Transport Health and Environment Pan-European Programme (THE PEP). Finally, as of 2015, the UNECE Sustainable Transport Division is providing the secretariat services for the Secretary General's Special Envoy for Road Safety, Mr. Jean Todt.

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1.1. Tasks to be financed

During recent decades governments all around the world were faced with a complicated set of options for investing in transport, including transport infrastructure. This report examines main principles for determining the most appropriate models for financing transport infrastructure expenditures. Financing, in this context, means the provision of money at the time and in the quantity, that is needed to meet society's transport infrastructure and transport service provision needs. Thus, financing is a basic underpinning of the entire process of providing and operating transport infrastructure.

Accepting the view, that transport infrastructure is needed to provide a well-defined set of public services, at the highest-level financing the transport sector, including transport infrastructure expenditures, is fundamentally a sovereign task, which involves determining how much of the government's available (public) resources will be channeled into the transport infrastructure, during a given period, as opposed to other policy priorities. Sovereign tasks are fundamentally the role of government, and cannot be carried out by external parties.

A great array of tasks is involved in the provision of transport infrastructure and transport services. Some of these correspond directly to specific points in the life cycle of the transport infrastructure, while others are ongoing. The tasks associated with providing and operating transport infrastructure can be determined as follows:

(i) Administrative tasks:

(a). Establishing high-level policy directions, development and operation strategies related to provision of transport infrastructure and transport related public services.
(b). Definition and organization of the political and administrative framework for decision making.
(c). Allotment of responsibilities.
(d). Needs assessment and demand management.
(e). Definition, selection (evaluation), preparation and approval of multiannual programs and individual transport projects, based on appropriate feasibility studies (including cost-benefit analysis and environmental impact assessment), preferably carried out following standardized (e. g. European Union (EU)) methodologies.
(f). Selection of procurement and delivery methods.
(g). Supervision of works and assurance of performance and quality.
(h). Education and training of transport infrastructure specialists, research & development
(i). Regulation of the activities in the transport sector (permits, licenses, etc.)

(ii) Works and maintenance related tasks:

(a). New construction (increasing capacity of the existing transport network by extension, building new elements).
(b). Upgrading the existing transport infrastructure (increasing capacity by widening, strengthening pavements and bridges, improving alignment, etc.).
(c). Major repairs/rehabilitations.
(d). Maintenance.

(iii) Operation related tasks:

(a). Traffic survey, regulation and management, ensuring availability and safety.
(b). Survey and assessment of the condition of the transport infrastructure, i. e. quality of services provided.
(c). Establishment and operation of a transport infrastructure data bank.
(d). Asset management and accounting.
(e). Toll collection (if applicable).

All tasks outlined above must, of course, be financed, including the necessary administrative structures within the public sector required to oversee transport infrastructure and transport services provision, no matter what model is employed. Governments must also decide how the amount of available public (and potentially private) resources will be distributed among the different tasks, and between transport infrastructure and transport service provision.

This chapter is intended to study first, how the amount of public resources allocated to finance new construction and its share among total transport expenditures are determined for medium and long term, and what measures are needed to secure, that the allocated money will spent for that purpose and nothing else.

1.2. Sources and instruments of transport infrastructure financing

1.2.1. Primary and secondary sources

Concerning the resources available for transport infrastructure financing, at the most basic level, there are only two primary sources of revenue: taxpayers and transport infrastructure users. Although demand for provision of (more) transport infrastructure and (improved) transport services appear to be growing, the public revenues available for transport spending are becoming more uncertain. Motor fuel and vehicle taxes—which account for approximately two third of public funding for road projects—have not kept pace with inflation in many countries – especially in countries of UNECE Trans European Motorways (TEM) project - and nationally have declined in value and purchasing power. With the cost of fuel remaining high at the pump, motor vehicle fuel tax increases to pay for transportation projects are politically unpopular.

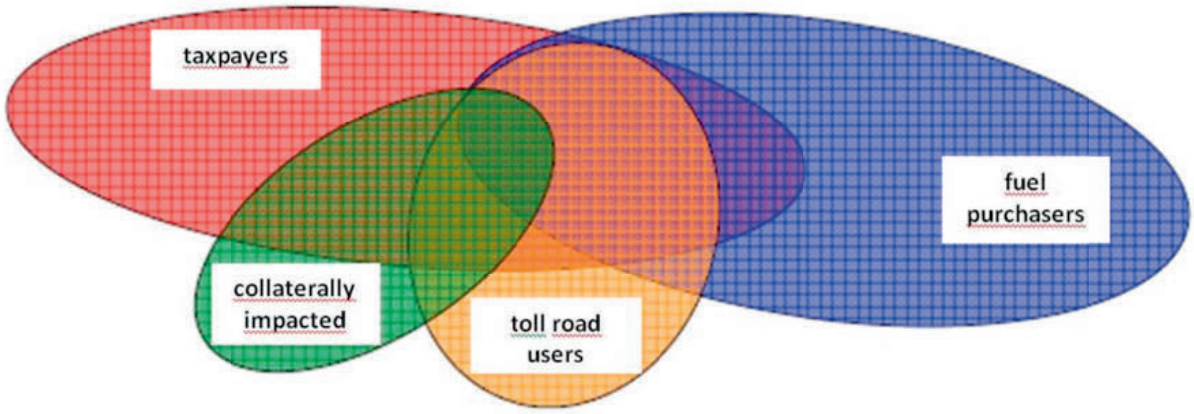
Other primary sources of public funding—such as tolls, vehicle registration fees, driver's license fees, special truck license fees, and a host of miscellaneous taxes and fees—can be politically unpopular, making it difficult to derive additional funding from these mechanisms to compensate for the increased need for transport network development.

Secondary, or additional resources may come from:

(a). ancillary services (e.g. renting space to service providers alongside public transport networks);
(b). third party contributions (e.g. land owners' or commercial firms' contributions to having new connecting transport infrastructure and interchanges built), or
(c). the sale of public land adjacent to the new transport infrastructure development.

All these additional resources will likely play a secondary role, and very often also come from taxpayers and transport network users. The taxpayer and the transport network user may be the same individual, although this is not necessarily the case (see Figure 1). A taxpayer may never use a given piece of transport infrastructure (e.g. a new motorway), especially if she or he lives in a quite different region of the country from where it is located. In other instances, taxpayers may not use a given transport infrastructure, but may indirectly benefit from it by purchasing goods that are moved over it. Users may be from other countries as well (in case main international traffic flows are transiting a given country), and thus not taxpayers in that country where the transport infrastructure itself is located.

Figure 1 Overlapping of cost bearers' groups taking part in road funding



Source: UNECE

The term "taxpayers" can refer to those paying taxes today, and thus contributing to general revenues, and to those who will pay in future, and thus pay off today's borrowings. The instruments by which financing from these sources may be channeled into transport infrastructure and transport services provision are also fundamentally limited, and are largely reduced to the following:

(a). General and earmarked taxation (budgetary resource allocation) and grants of international organizations, like the EU (if any).
(b). Operational revenues or user charges (fees and tolls).
(c). Non-user funding (revenues generated from ancillary services and third-party contributions).
(d). Capital accumulated by corporate entities, financial institutions and financial markets (borrowing and private sector involvement under public-private partnerships).

The choice of funding sources and instruments of tapping and channeling appropriate funds into transport infrastructure is not intrinsically linked to the model employed for the provision of transport infrastructure and transport services. However, the instruments of financing will have a profound impact on how each funding model functions. Thus, choosing which mix of taxes and user charges (or public and private capital) to employ is a fundamental sovereign task, and must be undertaken by government in advance of designing the model by which the transport infrastructure and transport services will be provided.

1.2.2. Financing instruments

There are many different types of instruments a government, public institution, or any corporate entity may use to finance its expenditure. In general, financing instruments fall into one of two categories - debt or equity. Although there are certain exceptions, debt instruments generally represent fixed obligations to repay a specific amount at a specified date in the future, together with interest. In contrast, equity instruments generally represent ownership interests entitled to dividend payments, when declared, but with no specific right to a return on capital. Public budgets' contributions, subsidies and grants of international organizations can be considered as specific equity instruments stripped from (direct) reimbursement in form of dividend payments or return on capital.

Within each of these two general categories, there are a wide variety of rights, privileges, and limitations that may be established by the investing or borrowing entity (see Table 1). Common stock is the most basic form of equity instrument. It represents an ownership interest in a corporation, including an interest in earnings, that translate into declared dividends as well as an interest in assets distributed upon dissolution. Preferred stock is another form of equity instrument. It represents a hybrid in the sense that it is an equity interest with certain features resembling debt. Holders of common stock (stockholders, or shareholders) have the greatest opportunity to share in a company's profitability because of the unlimited potential for dividends, appreciation in the value of their common stock, and realization of liquidation proceeds. However, common stock holders also bear the greatest risk of loss because they are generally subordinate to all other creditors and preferred stock holders.

Debt instruments, such as notes, bonds, and debentures, are generally entitled to receive payments which are senior in priority to preferred or common stockholders. Debt instruments may be secured by certain assets of the corporation or may be unsecured (i.e., backed by a simple pledge of the borrower's credit). Debt instruments may be long-term or short-term in duration, and carry variable or fixed interest rates. Debt instruments may impose certain affirmative or negative obligations upon the borrower, including restrictions on the ability of the borrower to complete certain transactions (such as incurring other indebtedness or issuing capital stock). Several advantages to issuing debt instruments include: predictability of payments to investors, no dissolution in management's interest in corporate growth and voting power, and investors assume less risk of loss in their investment. Disadvantages include: potential restrictions on operations, limitations on the use of working capital due to debt service obligations, and tying up assets through pledges as collateral.

There are numerous considerations involved in the transport infrastructure funding planning process to make use of debt or equity instruments. The planner should consider the various types of instruments which may be used and the respective advantages and disadvantages of each type from both the viewpoint of incumbent government or public entity as well as prospective taxpayers as investors or borrowers. Both near-term and long-term objectives for each should be duly considered when developing transport infrastructure financing strategies.

Table 1 Financing Instruments: and overview

Financing tools			**Private funding**	**Public funding**
Generally: budget			none	General taxes
Special case: extra budgetary funds or				Earmarked/dedicated
Capital financing (1)			Senior shares	
Mezzanin financing (2)	Equity		Preference shares, convertible shares	
	Debt		Subordinated loan (3), subordinated bonds,	
Debt financing	Loans		Commercial loans (syndicated loans)	Loans borrowed from governments, banks, international financial
	Bonds	Private issue	Project bonds	Bonds with sovereign guarantee, municipal bonds, bonds of publicly owned companies, bonds guaranteed by international financial institutions
		Public issue		
	Stand-by and conditional loans, buffer stocks (5)			
Guarantees			Commercial banks' guarantee, credit line guarantee (4), standby source (5), direct insurance (6)	Sovereign guarantee, guarantee of State financial institution, guarantee of international or regional financial institutions
Revenues generated by the project			Toll revenues, revenues generated by secondary developments	
Retained earnings			Retained profit, warranties	
Pledging assets			Bonds	none
Capital increase by share issue			Share issue at the	none
Value capture; using part of the added value, generated by the project, enjoyed by its beneficiaries			none	Increase of property taxes, tax surplus funding, land lease fee, special charges

(1) Investment;

(2) Funding facilities transient between investment and lending, showing some common features with each of them ;

(3) Disbursement is conditional upon certain tests; its principal and interest are to be paid only after scheduled debt service of senior debt was already duly met;
(4) Limited guarantee amount within a given credit line opened by a bank to a client;
(5) Facilities available only in case well defined conditions are met;
(6) Insurance provided by the insurance company, enjoying exclusivity.

1.2.3. Taxation

The most common financing instrument for transport infrastructure is the government budget, sourced from tax revenues and eventual public borrowing. Policy decisions establish the extent of public funding to provision of transport infrastructure and transport services as opposed to other priorities. This is based on consideration of taxpayers' priorities, often formulated in platforms established by politicians during the electoral process and finalized during discussions at the government level. Direct public financing may also be subject to negotiation between different levels of government. For example, in a federal system (like Germany), some taxes may be collected by the central government, although responsibility for transport infrastructure development, maintenance and operation may be at the state, or regional level. In these instances, central governments distribute appropriate tax revenues to the states (Länder), or regions. In some cases, allocations are earmarked for specific purposes, and the states may lobby and negotiate for more funds. A similar dynamic may exist between local (municipal) governments and regional, state or central governments, or even between national governments of EU member States and the European Commission.

Table 2 shows the share of taxes within the price of fuel in EU25 member States in 2007, while Table 3 provides information about motor vehicle tax revenues in EU15 member States in 2007 (no data are available for other EU member States).

Resources from the public sector's pool of general revenue are today, and are likely to continue being, a primary means of financing much of most European countries' transport systems. This means that, as governments contemplate the use of alternative financing instruments and mechanisms (including PPP-s), they must also determine the role of public contribution and subsidies in these.

Many models commit governments to using general revenues to pay for transport infrastructure over long time periods, and this must be accounted for when the original choice of funding model is made.

A primary complaint regarding traditional budget funding is that it does not meet transport infrastructure needs justified by ever growing demand reflected by the observed traffic volume and performance (Figure 2).

However, where this is so it may be a manifestation of other priorities being put before provision of transport infrastructure and transport services in the budgeting process, which in turn is the prerogative of political decision-making. For example, many European countries collect much more in transport infrastructure-related fiscal charges than they spend on provision of transport infrastructure (see Figure 3 and Figure 4).

Direct public financing is often seen as being inflexible and subject to political considerations. It may, therefore, be difficult to address the life-cycle costs of transport infrastructure and to prioritize

accordingly. Budget processes can, however, be made more flexible. For example, transport infrastructure funding may be considered in the context of medium- or long-term development plans and programs, instead of individual projects. Governments can also make long-term commitments to these programs and projects, and subject them to indexed adjustments. However, due to the inherent logic of annual budget processes, it is difficult for governments to fully apply life-cycle cost management in the transport sector.

Table 2 At the pump fuel prices in EU25, 2007. (ERF, 2009)

	Unleaded		Diesel	
	€/litre	of which taxes (%)	€/litre	of which taxes (%)
BE	1.28	64.70	0.98	50.80
CZ	1.03	56.70	1.00	51.70
DK	1.26	62.80	1.05	54.90
DE	1.30	66.40	1.11	58.40
EE	0.86	48.80	0.83	44.50
EL	0.98	50.10	0.95	44.80
ES	1.02	53.20	0.94	52.70
FR	1.25	64.80	1.06	56.90
IE	1.10	57.30	1.06	51.80
IT	1.28	60.50	1.13	53.70
CY	0.93	42.30	0.87	40.90
LV	0.90	51.60	0.88	44.50
LT	0.88	43.30	0.85	44.50
LU	1.09	55.10	0.92	46.90
HU	1.08	55.80	1.02	48.70
MT	1.04	45.20	0.94	41.30
NL	1.42	62.60	1.06	48.00
AT	1.08	57.50	1.00	53.00
PL	1.06	59.00	0.95	50.70
PT	1.30	62.00	1.05	52.00
SI	1.03	55.30	0.96	50.60
SK	1.09	58.10	1.08	55.60
FI	1.26	64.40	0.99	50.70
SE	1.22	57.90	1.09	57.50
UK	1.37	67.70	1.41	66.30

Table 3 Motor vehicle tax revenue in EU 15, 2007, € billion. (ERF, 2009)

	AT € bn 2006	BE € bn 2004	DK DKK bn 2008	DE € bn 2007	ES € bn 2007	FR € bn 2007	EL € bn 2006	IE € bn 2005	IT € bn 2007	NL € bn 2007	PT € bn 2006	FI € bn 2007	SE SEK bn 2008	UK £ bn 2007
Purchase or transfer VAT on vehicles. servicing/repair parts. tyres	2.510	4.291	n.a.	26.800	6.497	13.458	n.a.	0.058	19.560	2.643	1.200	1.219	15.000	1.283
New vehicles sales	n.a.	1.176	n.a.	n.a.	4.027	7.617	0.742	n.a.	n.a.	0.820	n.a.	n.a.	n.a.	n.a.
Second hand vehicles sales	n.a.	0.074	n.a.	2.100	0.071	0.627	0.115	n.a.	n.a.	0.089	n.a.	n.a.	n.a.	n.a.
Services and repair+tyres	n.a.	1.416	n.a.	4.200	n.a.	5.215	n.a.	n.a.	n.a.	1.573	n.a.	n.a.	n.a.	n.a.
Accessories and spare parts	n.a.	0.865	n.a.	1.300	2.399		0.18	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Fuels & Lubricants	5.523	5.765	15.000	39.300	18.601	33.673	2.820	2.339	33.370	6.943	3.700	3.314	50.000	24.510
Sales & registration taxes	0.53	0.319	24.000	n.a.	1.761	1.891	0.997	1.712	1.320	0.797	1.175	1.412	n.a.	n.a.
Annual ownership	1.510	1.463	9.626	8.900	2.412	1.109	0.819	0.802	6.210	2.766	0.080	0.585	11.850	5.38
Driving license fees taxes	n.a.	0.007	n.a.	0.008	0.099	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.07
Insurance taxes	0	0.449	2.096	3.520	0.752	3.900	n.a.	n.a.	4.550	n.a.	n.a.	0.272	3.350	n.a.
Tolls	1.300	n.a.	0.413	n.a.	n.a.	8.838	n.a.	0.039	1.180	n.a.	n.a.	n.a.	n.a.	n.a.
Customs duties	n.a.	0.093	n.a.	0.48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.125	n.a.	n.a.	n.a.
Other taxes	0.57	0.520	n.a.	0.29	0.391	1.163	n.a.	0.136	4.240	1.788	0.090	n.a.	7.250	3.710
TOTAL	12.236	12.148	50.490	80.000	30.513	64.033	5.673	5.086	70.430	17.419	6.370	6.802	87.450	46.5
€ bn	12.3	12.1	6.7	80	30.5	64	5.7	5.1	70.4	17.4	6.4	6.8	7.9	52.6
Total = € 378 bn														

Figure 2 Budget funding vs traffic volume and performance

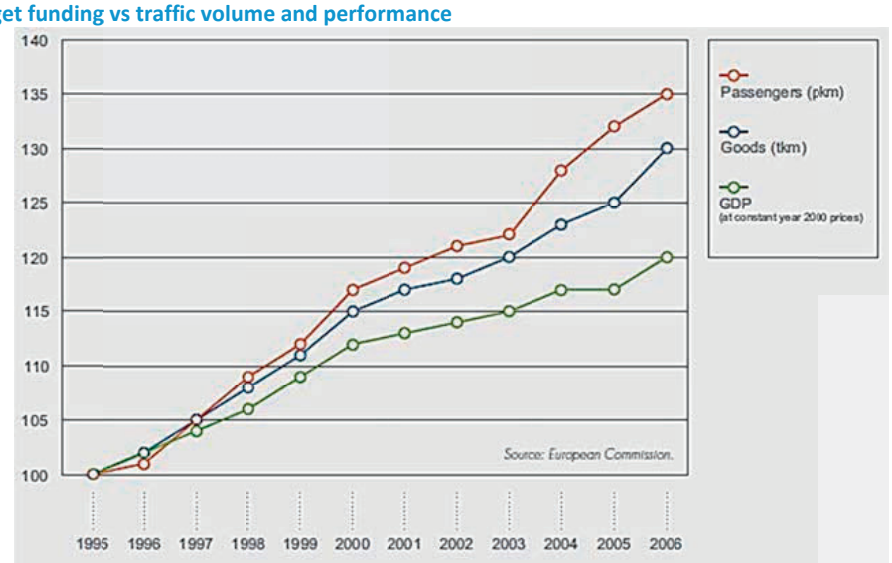


Figure 3 Investment in road infrastructure in selected EU member States in 2007 (€ million). (ERF, 2009)

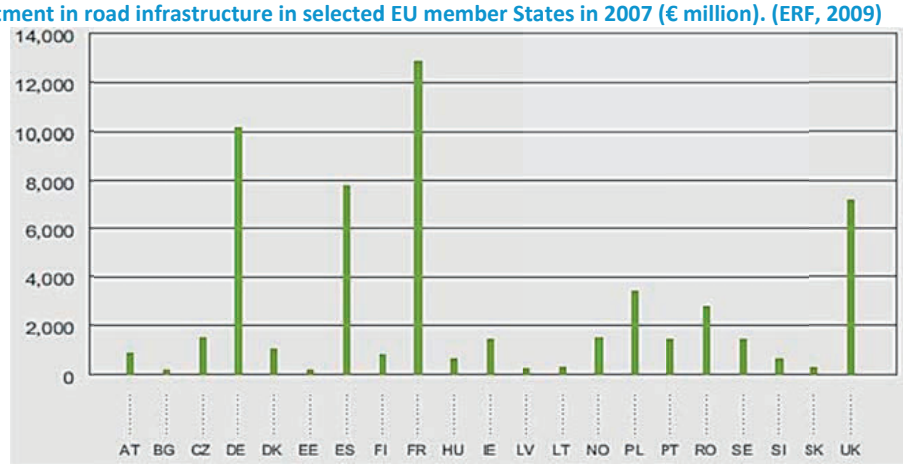
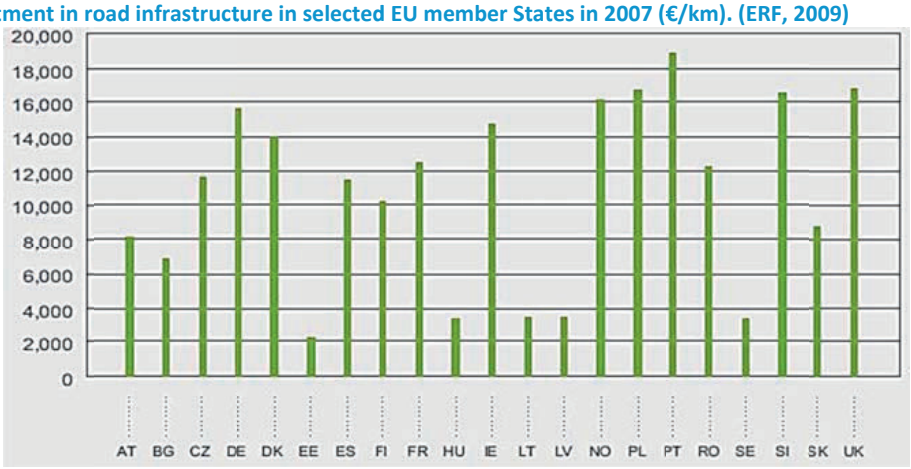


Figure 4 Investment in road infrastructure in selected EU member States in 2007 (€/km). (ERF, 2009)



1.2.4 User charges

User charges are levied for the purchase of specific services. Where transport is concerned, the term usually refers to tolls and tariffs paid directly by transport infrastructure users (car owners and haulers) or shippers. For instance, some European countries use “vignettes”, a flat rate permit that is purchased to allow the right to use an overall public road system, or only a part of it (e.g. motorways and expressways) during a well determined period. Tolls collected constitute a considerable source for road financing in the EU (see Table 4).

There is sometimes a debate about what constitutes a user charge versus a tax. Technically, taxes are not seen to be directly related to consumption of a specific good or service, while a charge is. Thus, taxes on fuel (especially those levied on the top of general taxes, like TVA) could well be transport infrastructure user charges, as the revenues result from the use of transport networks. Indeed, a significant portion of most governments’ revenue comes from taxes and charges levied on transport, vehicles and fuel. Transport infrastructure-related fiscal charges and taxes can be drowned into general government revenues – as is usually the case – or earmarked for use in the road sector (via appropriate road funds).

A road fund differs from general taxation funding in the sense that a special account is created to deposit revenues which can only be spent on road infrastructure. These revenues can come from road related or other taxes as well. So, called „second generation” road funds are based on the

principle that roads are considered a utility. An important characteristic distinguishing them from previous (first generation) road funds is the separation of the utility-charge related to road use and a tax paid into public revenue.

However, road funds are seldom in use in European countries. User charges may be employed with different, and potentially conflicting, objectives in mind. One purpose may be to compensate the infrastructure provider for costs of operation and maintenance (including some part of external costs), plus up-front financing of a project and generate profits, which will inevitably provide the operator with incentives to increase traffic. Alternatively, user charges may be set for demand management purposes, implying a desire to limit the use of infrastructure.

User charges exist also in railways. Infrastructure managers should set the charges using the infrastructure at the costs directly incurred by the train service. Commission Implementing Regulation (EU) 2015/909 on the modalities to calculate direct costs provides details on how infrastructure managers should calculate their direct costs. The regulation provides cost categories that are not eligible. When infrastructure managers receive funds, they do not have to pay back. However, they are not allowed to include any costs derived from such payments into their infrastructure charges. Average direct unit costs can be modulated based on vehicle, operational and infrastructure parameters. Traffic diversions at the instigation of the infrastructure manager should not increase charges. Alternatively, to calculating average unit costs and modulating them, infrastructure managers may use cost modelling in accordance with best available international practice. Regulatory body may determine and apply a simplified control of direct costs if their values remain below certain thresholds[1].

[1] https://ec.europa.eu/transport/modes/rail/infrastructures/charges_en

Table 4 Toll net revenues in EU member States (€ million) (ERF, 2009)

Country	2006	2007	2008
BE	49.06	41.60	49.20
DK	385.00	396.80	437.00
EL	154.00	155.00	170.50
ES	1,677.40	1,821.95	1,992.50
FR	6,406.60	6,849.00	7,383.60(3)
IT	4,071.24	4,333.40	4,473.80(3)
NL	25.40	22.59	24.50
AT	1,192.00	1,250.28(2)	1,4350(4)
PT	639.90	664.80	713.90
HU	97.20(1)	114.80	155.60
SI	139.40	151.96	172.70
NO	362.40	388.10	386.20
HR	198.10	226.94	258.60
PL	n.a.	n.a.	175.50
UK	n.a.	81.00	78
YU	n.a.	176.50	182.80
CZ	n.a.	n.a.	198.50
DE	n.a.	3,078.00	3,359.30
SK	n.a.	n.a.	74.94(5)

Source: ASECAP

(1) The revenue collected by AAK Zrt on all motorways in Hungary
(2) Preliminary value for 2006
(3) Preliminary value
(4) Preliminary value 2007
(5) Revenue from vignette on the whole charged network including motorways, expressways and selected 1st class roads

Tolls are often collected by the entity responsible for either the provision or the maintenance and operation of the road infrastructure. In other instances, different state entities (or dedicated private companies) may collect tolls, which may be specifically earmarked for transfer to the road provider. Where charges are not earmarked, they are applied to general government accounts and thus to non-specific public policy priorities. Technology – either GPRS or satellite-based – is increasingly allowing for road tolling systems that are network or system-wide, aimed at charging users for their exact use of the system.

Distance based tariffs and electronic toll collection is employed for Heavy Goods Vehicles(HGV) user charges on motorways in Europe, most notably in Germany, Austria, Czech Republic, Slovak Republic and Switzerland, which is supported as a matter of policy by the European Union. Other free flow tolling technologies are used at toll gates on motorways in France, Italy, Spain and Greece. London, Oslo, Bergen, Trondheim, Rome and Stockholm apply charges to drivers in the urban area with a view to managing demand. However, for the moment, there is still no proven technology to

effectively price the use of entire road networks for all users at the point of use, although there is much potential in the deployment of satellite-based systems and advances in on-board vehicle equipment.

1.2.5. Non-user funding

The leasing of space for services related to transport infrastructure use can also provide sources of revenues. These could include, among other elements, restaurants, food outlets, stores, parking lots, motels and service stations, in old or main rail stations or alongside roads. This financing source has considerable potential to provide revenues without necessarily adding "new" costs where the transport infrastructure user or taxpayer is concerned.

A further possible source of non-user funding of transport infrastructure development involves taxing increases in property values that a given project may bring about – in other words charging the indirect beneficiary as opposed to the direct user. This creates a motive for the private sector, such as the construction industry or certain business sectors (e.g. supermarkets, warehouses, multimodal terminals, etc.), to pay for having the connecting transport infrastructure built. There are also examples where property developers have paid for parts of the cost of building connecting road infrastructure. More information on that is provided in chapter four.

1.2.6. Borrowing and private sector involvement

Borrowing means that payment is deferred, and thus that future rather than present taxpayers or transport infrastructure users will pay. Transport infrastructure assets typically have huge construction costs and very long-life spans. This may provide an obvious rationale for borrowing to even out payments among beneficiaries over time. In most European countries, public borrowing is, however, not specifically linked to spending on transport.

Sovereign governments should borrow to smooth national consumption or to undertake public investment projects (among them socio-economically efficient transport infrastructure projects) that they could not finance otherwise. The ability of a sovereign government to borrow on international credit markets depends on its perceived ability to repay and on the incentives, it will have to do it. In recent years, the theoretical literature on sovereign borrowing has dealt mainly with the second of these issues: the country's willingness to repay. The question at the heart of the sovereign borrowing literature was why governments have an incentive to repay their debts with foreign creditors within the existing international legal framework. There is no bankruptcy code for sovereign borrowers and lenders cannot take control of a country nor seize a significant amount of its assets in the event of a sovereign default.

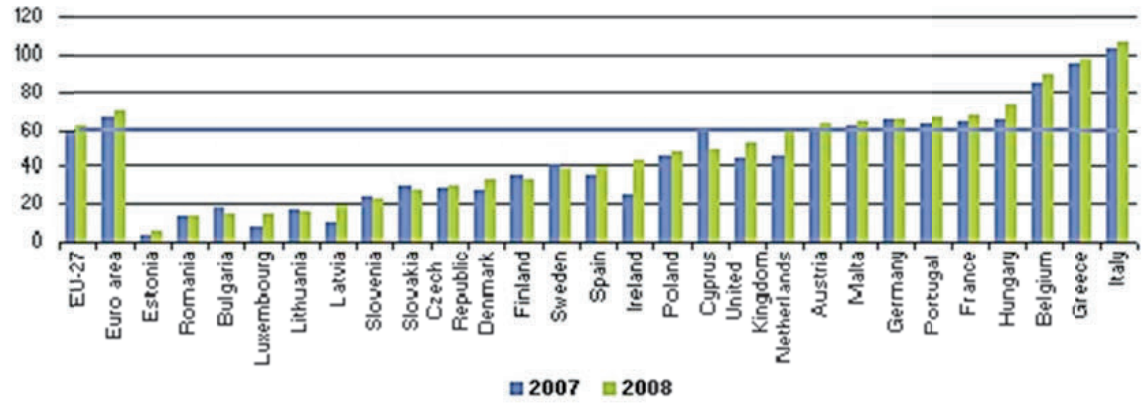
Economists have offered two main explanations for why governments may want to repay: reputation (exclusion from future credit) and direct sanctions. While sovereign governments' willingness to repay is an important factor, lenders will naturally also be concerned about their ability to repay. Here, both issues of long-term solvency and short-term liquidity must be considered and assessed carefully.

Turning to empirical implications, the repudiation models that allow for the existence of lending mostly predict credit rationing in the form of a debt ceiling. This upper bound of the debt a country can incur depends on the costs it must pay in the event of a default. These costs are usually related to the links that a country has with the world (including reputation spillovers): trade and financial

linkages such as FDI are specific examples. The bigger is a country's output, the larger is the punishment that can be imposed through trade sanctions and collateral seizure. Political instability should also negatively affect the amount a country can borrow. The shorter a government can expect to be in office, the higher are its incentives to take advantage of the immediate benefits of higher loans and to discount any future sanctions heavily. Lastly, global factors, the world interest rate, will affect the cost of servicing the debt stock and the temptation to default. Income variability should have a positive effect on creditworthiness: countries that are more prone to shock have a higher interest in maintaining access to credit markets and are therefore less likely to default.

Economic performance varies from state to state. The Growth and Stability Pact governs fiscal policy within the European Union. It applies to all member States, with specific rules which apply to the Eurozone members that stipulate that each state's deficit must not exceed 3per cent of GDP and its public debt must not exceed 60per cent of GDP (Maastricht criteria). However, many larger members have consistently run deficits substantially more than 3per cent, and the Eurozone has a debt percentage exceeding 60per cent (see Figure 5).

Figure 5 General government debt (general government consolidated gross debt as per cent of GDP).

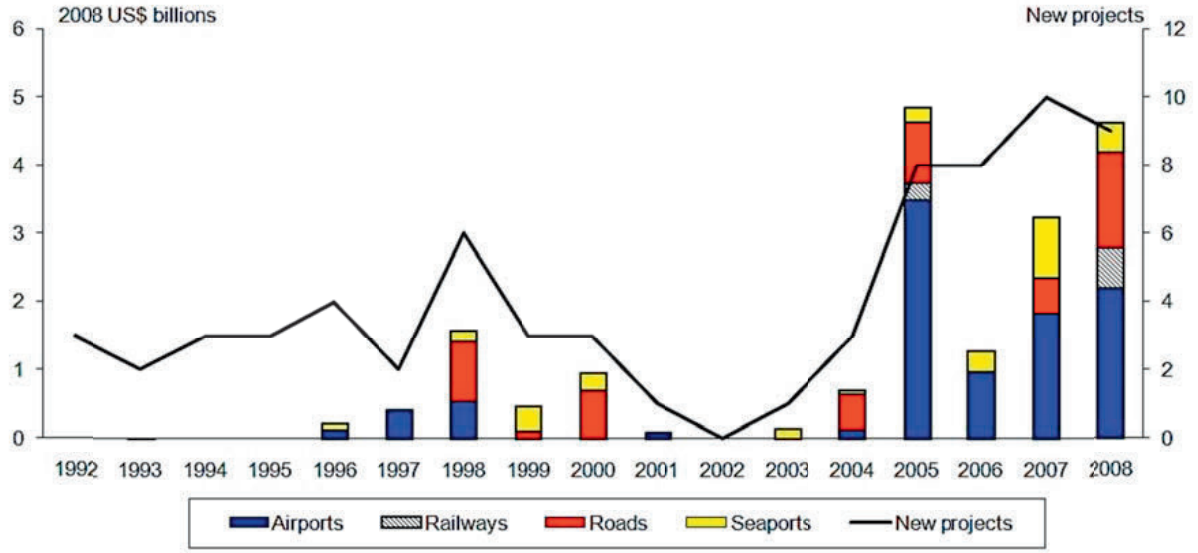


Borrowing can also be undertaken by independent (in some cases private) infrastructure providers. Other than ministries and agencies, the various alternative corporate structures dealing with public transport infrastructure are likely entitled to undertake independent borrowing to finance their development, maintenance and operational needs. In addition, PPP arrangements where financing is the responsibility of the contractor typically involve raising resources by way of a combination of equity and loans. Private borrowing is often not registered on public balance sheets, although it may still create obligations for governments.

Borrowing may affect the costs of transport infrastructure provision and transport services in so far as private entities are typically subject to higher interest rates than sovereign states or sub-national governments. Furthermore, in some instances, such as not-for-profit enterprises, the need to maintain a good credit rating for private borrowing may impose discipline on the transport infrastructure and transport services provider. Apart from public borrowing, the public sector also has the option of creating special financial instruments – such as bonds – dedicated to the development of given infrastructure. This has been particularly employed in the US, where special instruments have been created recently to leverage public sector grants to access financing from capital markets.

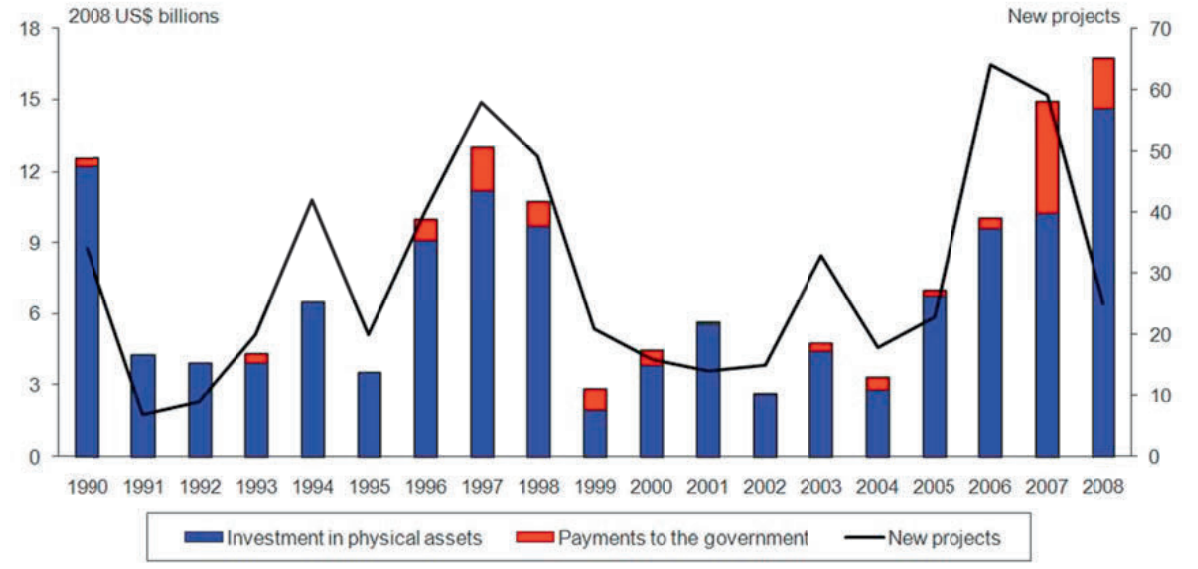
In search for additional resources, some governments made serious efforts to attract private capital into transport infrastructure funding under various public-private partnership schemes (see Figure 6 and Figure 7)

Figure 6 Investment commitments to transport projects with private participation in Europe and Central Asia, by subsector, 1992–2008



Note: The PPI Project Database records no transport projects with private participation or investment commitments to such projects in the region in 1990–91.
Source: World Bank and PPIAF, PPI Project Database.

Figure 7 Investment commitments to road projects with private participation in developing countries, by type of investment, 1990–2008



Source: World Bank and PPIAF, PPI Project Database.

Sources of private finance are equity, the capital held by a project company's shareholders, or debt, the capital provided by lenders. Private investors apply a project finance approach to transport infrastructure investment: their commitments rely on the performance of the project. Revenues to cover the costs of investments can come from direct user charges such as tolls, from shadow tolls (in function of traffic performance) and/or from periodical availability fee payments related to

performance and quality of services provided, paid by the client (public) authority, or a mixture of these sources.

Public-private partnership (PPP) projects are highly leveraged capital-intensive projects. Lenders, which provide the major portion of financing in the form of debt instruments, undertake loan approval processes to examine the various aspects of the projects that could influence the debt servicing capability while making credit decisions. In view of this, project sponsors could also assess beforehand how desirable is the project from the debt financing perspective to facilitate timely arrangement of debt financing and avoid funding problems. More information on PPPs is provided in chapter three.

1.2.7. Criteria for selecting and evaluating funding sources

Each of the sources mentioned above has potential applicability in a variety of settings. Whether a source is of potential use in a social and economic environment depends on a variety of factors, many of which are contextual and unique to individual conditions. Contextual factors requiring review in the search for new funding sources are the following:

(a). State, regional and local governance traditions and philosophies of taxation and public spending,
(b). The types of transport projects and transport services to be funded,
(c). The elements for which funding is being sought (e.g., ongoing transport infrastructure agency development programs or individual transport projects),
(d). The type of source that is desired and that is appropriate (e.g., pay-as-you-go funding or debt financing, and
(e). National, regional and local perspectives on the role of transport in the community now and in the future.

A good understanding of these contextual factors is an important prerequisite in the search for enhanced transport infrastructure network development funding. Once contextual factors are understood, all stakeholders must come to a similar understanding of the general advantages and disadvantages of available alternative funding sources as well as an understanding of how these alternatives satisfy a set of widely used criteria. Among the most important of these criteria are the following:

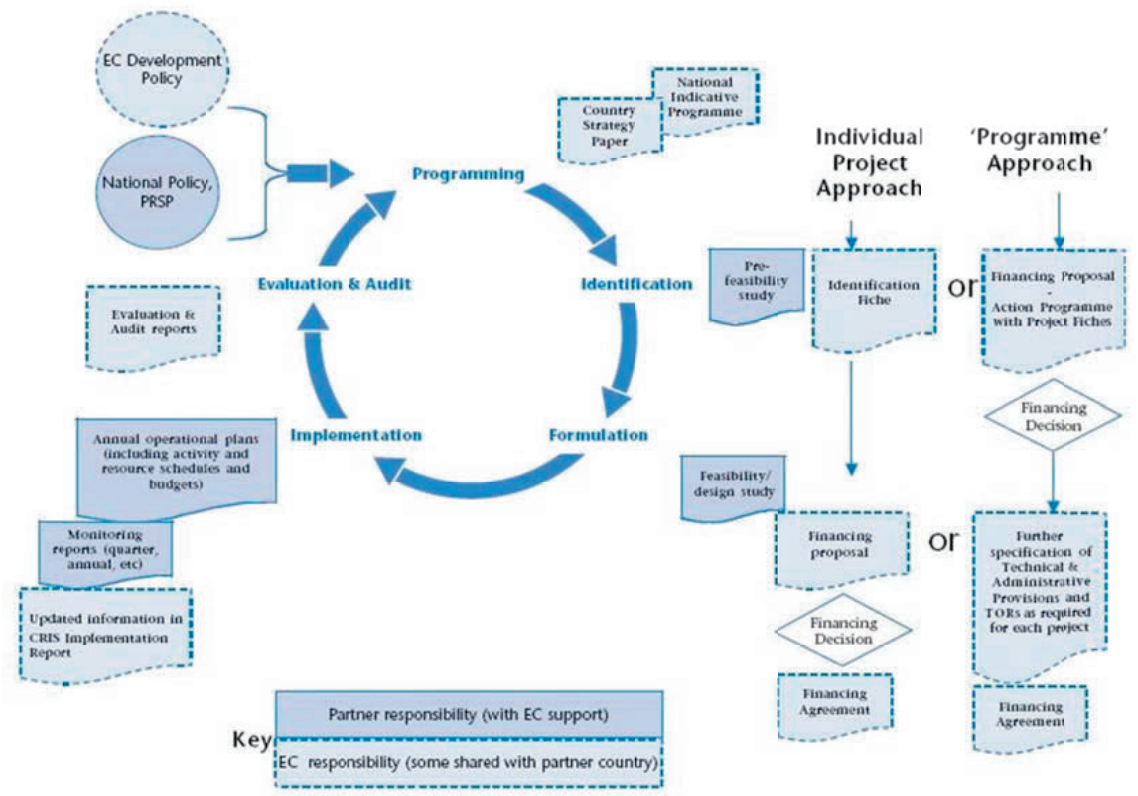
(a). Revenue yield adequacy and stability,
(b). Cost efficiency in the application of sources,
(c). Equity in the application of the alternatives across demographic and income groups as well as jurisdictions involved,
(d). Economic efficiency in balancing „who pays" with „who benefits" from transport infrastructure investments under consideration,
(e). Political and popular acceptability, and
(f). Technical feasibility.

Among these criteria, revenue yield is a principal consideration. An enormous amount of effort is required to enact and sustain funding for any public service, including provision of transport infrastructure and transport services. When these efforts are undertaken, sponsors should be

certain that the resulting flow of funds will be adequate to meet funding requirements, be reliable, and be predictable.

Financing proposals and decisions at programme, or at project level have a crucial position in the life cycle of operations and should be supported by appropriately prepared pre-feasibility or feasibility studies (see Figure 8).

Figure 8 Financial proposals and financial decisions supported by pre-feasibility and feasibility study in the cycle of operations.



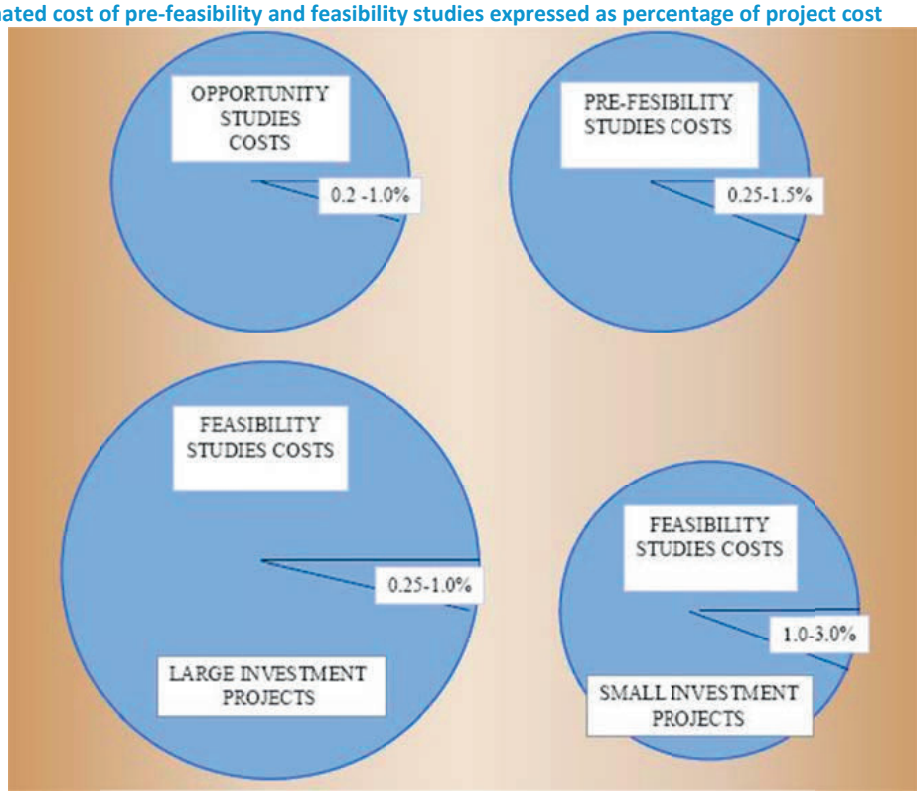
Pre-feasibility and/or feasibility studies are to be prepared at identification and formulation phases of the cycle of operations, supporting financial decision. The aim of a pre-feasibility study is to provide decision makers in the Government with sufficient information to justify the acceptance, modification or rejection of the proposed project idea, and determine the scope of follow-up planning work (i.e. a feasibility/design study). The aim of a feasibility/design study is to provide decision makers in the Government with sufficient information to justify the acceptance, modification or rejection of the project proposal, and if deemed feasible, adequate information on which to proceed to concluding a funding model and/or financing agreement.

Acknowledging that the gestation time of a capital-intensive transport infrastructure project is generally very long (5-12 years) pre-feasibility and/or feasibility studies considered as important tools and support of investment and funding decisions may be launched in an early stage of the operations cycle. The cost of these studies is relatively small (see Figure 9), therefore they can be carried out and financed even in a period of severe budgetary constraints.

The objective of a feasibility study is to find out if an identified project can be done, and if so, how. A feasibility study should tell management: (i) whether the project can be done; (ii) what are alternative solutions; (iii) what are the criteria for choosing among them; (iv) is there a preferred

alternative? On the base of the outcome of a feasibility study, the management in charge makes a go/no-go decision. The main elements of all feasibility studies are the economic and financial cost-benefit analysis and the environmental impact assessment.

Figure 9 Estimated cost of pre-feasibility and feasibility studies expressed as percentage of project cost



1.3 Case studies on financing transport infrastructure

Any international comparison of spending on, and revenue from the use of infrastructure is by nature uncertain. Two main problems are particularly pertinent. One is related to the different tiers – central, regional and local – of government. Differences in responsibilities across these levels make it difficult to know whether all relevant information about spending and/or revenue is available, since the duties given to the respective tiers may differ across countries. The second problem is that countries may differ in their definition of certain concepts. Often, spending on investment is paid for during the year that resources are used, but some countries have an active balance sheet with annual down payments of initial loans.

Furthermore, the distinction between reinvestment and new investment is often imprecise. With these caveats in mind, Table 5 summarizes the proportions of revenue collected from different sources within the road sector in selected European countries. Although there is significant variance among countries, an average of 66per cent of revenue emanated from fuel taxes and 17per cent from taxes on vehicle ownership. Revenues from the roads sector average 3per cent of GDP in these countries.

Similar information from a different source – the International Road Federation's World Road Statistics (IRF, 2004) – is summarized in Table 6, which provides information on the significance of revenue from the roads sector seen in the perspective of aggregate public-sector tax revenue. These taxes on average provide some 7per cent of total revenue, but the spread is substantial, with less

than 1per cent (Luxembourg) being the minimum value and 18per cent (France) the maximum. Notably, there are discrepancies between the data sources of Tables 5 and 6.

In Europe, revenues derived from road users greatly exceed spending in the sector, by 2-to-1 on average in Western Europe and by up to 3-to-1 in some other European countries. The high degree of road funding that is derived from fuel taxes may be one rationale for why most roads are not tolled in several countries. If the public thinks that roads have already been paid for by way of fuel taxes, they will be reluctant to pay again in the form of tolls. A further argument against user charging is that the public road network is perceived as a public good, and that there are efficiency motives for not charging for the use of non-congested roads.

Table 5 Shares of revenue from road related taxes and fees in selected European countries in 1998

Country	Vignettes	Tolls	Fuel Tax	Vehicle Tax	Sale or Registration Fee	Other	Insurance	Road Revenues as % of GDP
Austria	6	5	60	19	9	0	0	3
Belgium	2	0	57	20	5	1	14	3
Denmark	0	1	26	16	53	0	4	3
Finland	0	0	60	28	12	0	0	3
France	0	15	67	18	0	0		3
Germany	1	0	78	21	0	0	0	2
Great Britain	0	1	80	19	0	0	0	4
Greece	0	26	54	5	14	0	0	5
Hungary	0	8	84	2	0	5	0	4
Ireland	0	1	51	16	32	0	0	3
Italy	0	8	75	14	0	0	3	4
Luxembourg	1	0	90	7	0	0	2	2
Netherlands	1	0	53	20	26	0	0	3
Portugal	1	9	61	27	0	2	0	4
Spain	0	8	73	11	8	0	0	3
Switzerland	6	0	67	24	0	3	0	2
Sweden	1	0	82	16	1	0	0	2
Average Share	1	5	66	17	9	1	1	3

Source: The Unite Project, EC (Compiled in Lindberg and Nilsson, 2005).

Note: These numbers emanate from Unite, a project funded by the European Commission. Much effort was spent on eliminating the measurement problems mentioned in the main text.

Many countries finance parts of their road transport infrastructure through tolls. Table 5 indicates that Greece (26per cent), France (15per cent), Portugal (9per cent), Spain (8per cent) and Italy (8per cent) had a substantial share of their road-related revenue from tolls in 1998. The split of revenue sources has been changed later.

Table 6 Road related revenue and its components (percentages)

Country	Year	Tax on purchase	Tax on ownership	Tax on use (fuel)	Toll	Other	Road revenues vs. all tax revenues
Austria	2002	8	24	53	13	2	2.9
Costa Rica	2002	58	12	0	2	28	n/a
Croatia	2002	19	3	13	10	55	5.2
Cypress	2002	7	1	29	0	63	5.9
Denmark	1999	49	19	29	0	3	5.5
Ecuador	2002	45	35	3	17	0	n/a
Ethiopia	2001	0	0	0	0	0	3.5
Finland	2002	20	10	64	0	6	14.5
France	2000	12	13	66	9	0	18.1
Ghana	2001	2.2	2.2	91.3	2.2	0	n/a
Georgia	2002	0	10.5	86	3.5	0	17
Great Britain	1999	15	13	61	0	11	10.6
Greece	1998	73	0	20	7	0	2.5
Hong Kong	1998	28	24	45	0	3	4.7
Iceland	2002	22	21	57	0	0	10.6
Ireland	2001	42	0	58	0	0	n/a
Italy	1999	14	10	16	1	59	n/a
Japan	2002	7	40	53	0	0	8.25
Kyrgyzstan	2002	0	11	89	0	0	2.6
Latvia	2002	0	16.5	83.5	0	0	n/a
Luxembourg	2002	0	100	0	0	0	0.5
Malta	2002	65	0	33.5	0	1.5	4.2
Mongolia	2002	11	0	89	0	0	n/a
Netherlands	1999	26	30	44	0	0	2.2
Norway	2002	28	17	43	9	3	4.9
Slovenia	2002	3	9	88	0	0	10.1
Sweden	2002	0	11	46	0	43	9.2
Switzerland	2002	12	19	66	0	3	6.4
Ukraine	2002	0	28	0	0	72	n/a
USA	2001	1	26	66	7	0	n/a

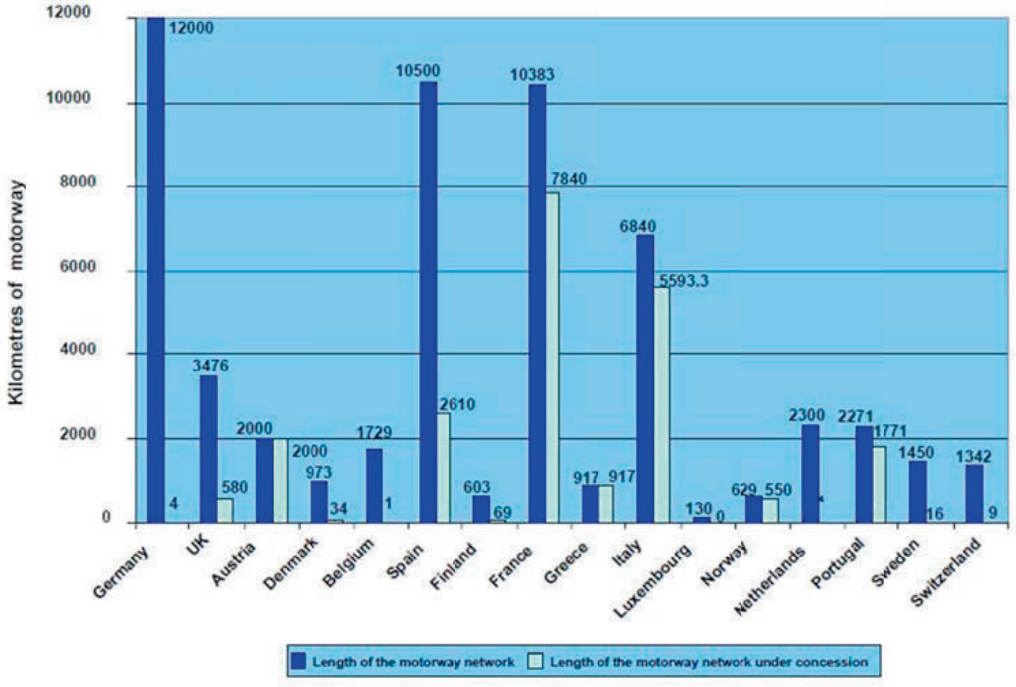
Source: Adapted from IRF (2004), World Road Statistics.

Although European countries supply most of their transport systems by way of ministries or agencies, and pay for them by employing resources from the public budget, there are also many instances where this is not the case. However, most alternative models for providing infrastructure involve transport infrastructure that is high profile, or that provides a particularly high level of service, such as higher speeds (highways or high-speed trains), greater safety, less congestion, greater comfort, etc. In many cases, these are tolled, while in other governments directly fund the infrastructure provider, through such mechanisms as shadow tolls or availability fee. Where routes are tolled, they are very often provided as an alternative to other, publicly provided, freely accessible routes.

Figure 10. and Table 7, focusing on concessioned motorways in Europe, provide an insight into the great variety of practices that exist. Figure 10 shows that, while Belgium, Germany, the Netherlands, Sweden and Switzerland have all or most of their motorways provided directly by the government, Austria, France, Italy and Portugal concession out most of their motorways. The Austrian case, involves concessioning to a state-owned company (Asfinag AG).

The nature of these concessions also varies greatly. Table 7 shows that, in some countries, concessionaire companies are mainly or entirely public, while in others they are private. Italy, Norway and Spain have several different companies operating the concessions, while others, such as France, involve relatively few commercial firms (although several public motorway concession companies had been privatized recently). Other countries (like Hungary and Poland) have only a limited amount of concessioned motorway infrastructure.

Figure 10 Overview of European practices in motorway concessions (with or without toll) (Bousquet- Fayard, 2005)



Source: Fayard (2006).

Various countries have delegated responsibility for major sections of their motorway networks to concessionaires that are, to one extent or another, independent from government. Countries that have led in this field include Austria, France, Italy, Spain and Portugal. In each case, different means are employed for financing the motorway network. The model used in **France** has involved concessions with varying degrees of public intervention, including public ownership of concessionaires, since the motorway system was created in the 1950s. However, it is currently characterized by government divestiture of shares in infrastructure providers, and other measures, such as state-guaranteed loans. The French concessionaire companies collect tolls set as part of five-year agreements with the government. Furthermore, plans for operation and investment, and commitments to safety, environmental and social goals are established every fifth year. As it currently stands, road investment by concessionaire companies in France is greater than overall public investment in roads (Busquet-Fayard, 2005).

Italy's Autostrade was created in the 1950s as a state-owned enterprise. Some shares were first publicly sold in 1987, then the company was fully privatized in 1999. Autostrade currently holds concessions for 3 408 kilometers of road, or about half of the Italian motorway network, with the other half mostly under concession as well. Tolls are capped, based on an agreement with the government.

Portugal employs a range of different concession mechanisms across its primary motorway network and for key bridges, combining both direct tolling and shadow tolls. The organization responsible for oversight of the network and PPP arrangements has also been devolved into a state-owned company.

Austria presents a different model, whereby the primary road network is managed by a 100per cent publicly owned company. This company, ASFINAG (Motorway and Expressway Financing Corporation), is responsible for construction, upgrading, operation, maintenance and tolling, although the right to set the tolls is retained by the Republic of Austria. ASFINAG does not get any grants from the federal budget; its operating income results exclusively from user fees that are legally tied to expenses in the network. ASFINAG is also making selective use of PPPs for elements of the network.

The examples highlight that many models are in use around Europe to provide road network infrastructure in a way that is independent from government control over fundamental operational tasks associated with the provision of road networks, including financing. Furthermore, while these are not likely to account for the majority of road infrastructure in any given country, they usually include very important roads that carry a high proportion of the country's traffic. At the same time, where such networks are tolled, they are often – but not always – accompanied by alternative routes that are not tolled. Concessioning in some European countries is focused on a minimum of projects, while the rest of the motorway network is in public hands. PPPs are obviously an important means for supplying motorways in some countries, as seen by the percentage of the motorway network in the hands of private firms, notably in Italy (64per cent, including the major network concession described above), Portugal (78per cent), Spain (24per cent) and the UK (17per cent). This does not mean that PPPs provide most of the road network in these countries. However, they often provide key routes within that network, in terms of traffic use or strategic importance. This perhaps defines the current role of PPPs under most circumstances, where roads are concerned: they tend to provide high-profile and important, but not most, road infrastructure.

Table 7 Highway concessions in Europe, as of February 2004

Country	Motorway Network (kms)	Network Under Concession (kms and %)	Concessionaire Companies			
			Public* (kms)	Private (kms and %)	No. of public*	No. of private
Austria	2 000	2 000 (100%)	2 000	0	3	0
Belgium	1 729	1.4a (0.1%)	1.4a	0	1	0
Denmark	973	34b (3%)	0	34b (3%)	2b	0
Finland	603	69 (11%)	0	69 (11%)	0	1
France	10 383	7 840 (76%)	6 940	900 (9%)	10c	4
Germany	12 000	4d (0.03%)	0	4d (0.03%)	0	1a
Greece	916.5	916.5 (100%)	916.5	0	1	0
Italy	6 840	5 593.3e (82%)	1 201.6	4 391.7 (64%)	7	17
Luxembourg	130	0	0	0	0	0
Norway	629	550f (87%)	550	0	26	0
Netherlands	2 300	4g (0.6%)	0	4g (0.6%)	0	2g
Portugal	2 271	1 771 (78%)	0	1 771 (78%)	0	11h
Spain	10 500	2 610 (25%)	112.6	2 497.4 (24%)	1	28
Sweden	1 450	16 (1%)	0	16 (1%)	0	1
Switzerland	1 341.9	8.85i (1%)	8.85i	0	1	0
UK	3 476	580 (17%)	0	580 (17%)	0	3

Source: Adapted from Fayard, 2005 (data from PIARC).

* "Public" means controlled by the state and/or a local government.

a. Liefkenshoek Tunnel.

b. Including 18 kilometres of the Great Belt Link Seeland and Funen and 16 kilometres of Oresund Link between Denmark and Sweden.

c. Figures include two international tunnel companies (ATMB and STRF).

d. Rostock Tunnel.

e. Including 30.2 kilometres of tunnels under concession.

f. The term "concession" is used in its broadest sense, as Norwegian companies have an exclusively revenue collection function.

g. Including 2 kilometres of Noord tunnel and 2 kilometres of Wijkertunnel (shadow tolls).

h. Including Lusoponte (operating two 24-kilometre-long bridges).

i. Grand Saint Bernard tunnel.

A final example is provided for contrast, showing that innovative mechanisms can be developed for specific links without private involvement, although this is rare. The Oresund Bridge between Denmark and Sweden, opened in 2000, is a public-public partnership. The bridge, which provides for both road and rail traffic, is operated and maintained by Oresundsbro Konsortiet, which is owned by the Danish and Swedish states, and was established based on a bilateral agreement between the two governments. The bridge's construction cost was financed by loans raised on national and international capital markets, but guaranteed by both states. The company charges tolls to road users, and charges the national railways of both countries based on pre-established rates, with a view to ultimately paying all construction and operating costs.

Chapter 2. Public-Private Partnerships

2.1 Introduction

For present purposes, the term Public Private Partnership (PPP) programme means a framework under which a public authority grants long term contracts (with a duration typically exceeding 20 years) to a private sector partner for the design, financing, construction or refurbishment and operation and maintenance of transport facilities, and the provision of related services.

The term 'public authority' may include a government department or a statutory provider of transport services. Under the terms of these contracts, the private sector partner will raise private capital to pay for the new facilities, which will be repaid by a lease or rental fee or a service concession from the public authority provided that the facilities and services are made available and meet a specified outcome standard.

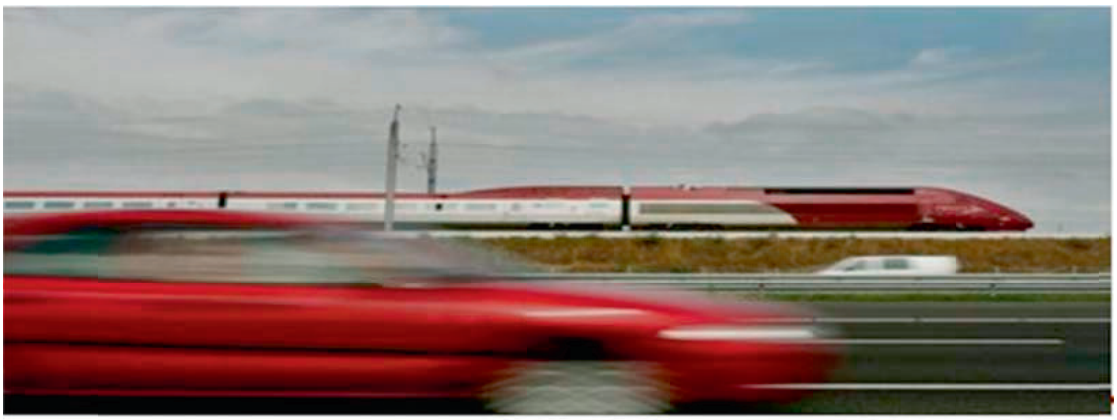
The public-sector partner will usually be required to provide an element of subsidy. This can be provided in many ways including capital grant, contribution of real estate for development, and guarantees of track access charges depending on the scale and nature of railway infrastructure to be developed.

2.2 PPP Models

2.2.1. Types and Examples of Transport Sector PPPs

There are many different examples of PPP in the transport sector worldwide:

- Development of new transport infrastructure (both for heavy and light rail, highways, ring roads etc)
- Refurbishment and enhancement of existing transport facilities,
- Redevelopment of railway stations and adjoining real estate,
- Procurement of rolling stock for railways,
- Operation and maintenance of transport infrastructure,



Support for the adoption of PPP programmes to deliver investment in transport infrastructure is by no means universal, although it can be a condition of finance being made available.

In favour: an advantage of a PPP Programme in the transport sector is that investment in infrastructure and services can be delivered quickly and to specified standards, without resulting in high levels of government capital expenditure. Infrastructure is developed and services are delivered to objective standards, or private providers suffer financial and operational penalties that can lead to contract termination.

Against: the disadvantages of a PPP Programme in the transport sector generally result from contracts that are not well specified or executed. This can include a lack of flexibility or inappropriate transfer of risk, leading to high costs or poor value for money.

2.2.2. Best Practice

There is a considerable amount of guidance that is publicly available setting out the typical characteristics of PPP programmes and what is regarded as best practice in their implementation in the transport sector. UNECE has itself published a Guidebook on Promoting Good Governance in Public-Private Partnerships[2].

Common themes can be grouped under the following headings:

A Policy and Legislative Framework

B Economic Context and Affordability

C Planning, Timing, Objectives, and Business Cases

D Training and Resources

E Market Assessment and Engagement

F Transparent Procurement and Management Processes

2.3 Policy and Legislative Framework

2.3.1. Ensure PPP policy and legislation is robust and consistent with other policies

Governments should have a formal policy for the provision of transport services, and a sustainable long-term strategy for delivering it. They should also prepare a development

[2] http://www.unece.org/index.php?id=2147

programme for the infrastructure that will support them within which a PPP programme may play a part.

The policy and legislative framework for a PPP programme in the transport sector should be consistent with governments' transport, economic and fiscal policy, and other relevant policies such as those governing urban planning and land use.

Governments should enact any legislation necessary to enable the PPP programme, which often includes PPP-specific laws and public procurement regulations.

2.3.2. Prepare an evidence-based delivery plan

In preparing for a PPP programme, governments should draw upon experience from other jurisdictions to develop a robust and evidence-based plan for delivery of the PPP programme.

2.3.3. Obtain formal support for the structure and policy from potential lenders

Before proceeding with a PPP programme, governments should seek formal feedback on their proposals from a representative range of potential funders with experience in the successful project financing of completed projects with similar characteristics to the proposed programme.

2.3.4. Ensure that there is political and civil service support

Before implementing a PPP programme governments should conduct a formal assessment of political and public sector/ civil service support for the programme. The PPP programme should be sponsored at a senior level within the government and civil service, with key individuals identified to act as promoters of the programme across the public and private sectors.

2.3.5. Develop a focussed specialist office to manage the programme3

Governments should consider establishing a specialist unit, team or department to manage the development and implementation of the programme, with support from the finance and transport ministries, and central and local government. The size of the unit should be appropriate to the anticipated volume of projects, but may also be accountable for PPP programmes in other sectors.

The unit should have clear terms of reference and act objectively in managing the programme to maximise value for money for the public. It should be funded by a long-term budget that will sustain it through the delivery phase of the PPP programme and into its operational phase.

[3] Example: The UK Infrastructure and Projects Authority
https://www.gov.uk/government/organisations/infrastructure-and-projects-authority

2.3.6. Establish a suite of standard procurement protocols and documentation[4]

A process framework, built on proven precedent, should be established for the scoping, approval, procurement, delivery and management of the PPP programme. This framework should include:

- Clear terms of reference for the governance and approval of the programme itself and individual projects at each stage, including clear criteria against which approval will be granted;
- Standard forms of business case for each project, objectively setting out their scope, objectives and compliance with predetermined approval criteria;
- Standard processes for the management of procurement including standard forms of procurement documentation, procurement timescales and evaluation criteria and the scope for negotiation following selection of a preferred private partner;
- Standard processes for contract management and monitoring throughout the delivery and operational phase; and
- Standard contract documentation including clear guidelines for its use and the extent to which it can be varied to suit project-specific issues.

2.4. Economic context and affordability

2.4.1 Carry out transparent business case assessments for each project

Governments should develop an overall financial and economic model for the PPP programme that clearly sets out what it will cost, the charging basis and the objective criteria for the financial, social, environmental and economic benefits it will yield. Each project should be costed in outline terms prior to its commencement, and should only proceed to procurement if it is affordable within the context of the model and represents the best value for money of the realistically deliverable options.

2.4.2. Ensure the programme will enable competitive project financing

In planning the PPP programme governments should carry out a formal assessment of potential sources of finance including local and international commercial debt, international financial institutions (including Development Finance Institutions and Export Credit Agencies), government debt and the local and international capital markets.

2.4.3. Develop a standardised 'shadow' cost model against which to compare value

Governments should develop a robust and locally relevant system of capital and operating cost benchmarks. This system should be used to establish transparent evidence that each PPP project represents the best possible value for money as compared to alternative ways of achieving its objectives – particularly the direct delivery of the same projects by the public sector.

[4] Example: Guidelines for Infrastructure Project Delivery published by the Australian Government https://infrastructure.gov.au/infrastructure/ngpd/index.aspx

2.4.4. Offer robust payment security that guarantees investment return and debt repayment

PPP projects represent a long term public sector commitment. Governments should maximise value for money by offering bidders and investors formal instruments that provide long term guarantees that payments will be made, and that a consistent approach will be taken to concession management.

2.4.5. Establish robust long-term governance structures and processes

Governments should ensure that long term budget provision is made for the governance and management of the programme throughout its term.

2.4.6 Develop an economic framework for fiscal commitments

A framework should be established to manage government commitments arising from the PPP programme, including fiscal commitments such as ongoing subsidies or payments, and contingent liabilities such as guarantees.

2.5. Planning, Timing, Objectives, and Business Cases5

2.5.1 Develop a clear planning context for the PPP programme

Before starting a PPP programme, governments should commission traffic forecasts to fully assess current and future supply and demand for rail services.

2.5.2 Establish clear and objective approval processes

There should be a process for stakeholder engagement and formal government approval of each PPP project at key stages in its development.

2.5.3 Establish a robust format for business cases

Projects within the PPP programme should each have a robust business case setting out the project's description, rationale, objectives and measures of success. Business cases should follow a standard format, which is updated at each approval stage in the development of the PPP project.

2.5.4. Use clear and objective output-based specifications

Each business case should feature output-based specifications that set the performance standards for the project. They should be capable of objective measurement, with clear and realistic contractual sanctions on the private sector partner if they are not achieved.

2.5.5. Consider the use of a 'Reference Solution'

Governments should consider the advantages and disadvantages of developing a Reference Solution as part of the development of the business case.

[5] The report "Best Practices for Private Sector Investment in Railways" published by Asian Development Bank and The World Bank Group contains helpful guidance in relation to Planning and Preparation for PPP in the Railway sector at Section 4.7 https://www.ppiaf.org/sites/ppiaf.org/files/.../EAP_BP_Rail_Final_Report.pdf

2.5.6. Incorporate robust business case risk allocation and value for money assessment

Business cases should include a value for money analysis that compares the PPP model against the cost of delivery and operation using alternative means. These should include an objective comparison with the likely cost and risk of delivery using public sector resources, which is externally audited or reviewed.

2.6 Training and Resources[6]

2.6.1 Plan programme management resources and training

Prior to the implementation of a PPP programme, governments should develop a resource plan setting out the people and costs that will be needed to implement it successfully on behalf of the public sector. The timing and key skills needed for each role should be clearly identified, and suitable funding made available for the recruitment and continuing professional development of those staff. The resource plan should cover the development of PPP legislation and policy, the scoping of the programme and production of business cases, the procurement of projects, their delivery and commissioning, and operation.

2.6.2. Build strong, objective commercial understanding into project teams

Project teams should develop a clear understanding of the field of potential private sector firms that will potentially tender for the projects, and the commercial drivers of those firms. This should include their potential interaction to ensure that projects will be realistically deliverable.

2.6.3 Develop a robust induction and support programme for stakeholders

A stakeholder engagement plan should be developed for each project, incorporating plans for engagement with key management and public/civil service stakeholders (and any other stakeholders needing to participate in the development of the project and the preparation of the business case).

2.7 Market Assessment and Engagement

2.7.1 Realistically match capacity

In developing a PPP programme, governments should formally consult with private sector contractors, service providers, investors and advisors, to:

- Assess market capacity to deliver the programme, and develop a programme of capacity building if necessary; and
- Ensure that there is capacity and capability to accurately assess and accept the risks it is proposed will transfer to the private sector.

Consultees should include the following:

[6] Principle 2 – UNECE Guidebook on Promoting Good Governance in Public-Private Partnerships

- Contractors;
- Designers;
- Sponsors / equity investors;
- Legal, financial, technical and insurance advisors;
- Senior lenders and, where appropriate, international financial institutions; and
- Insurance and reinsurance companies.

2.7.2 Draw on proven experience

Governments should carry out a systematic analysis of best practice as it applies to their own needs, and ensure that the scope of the programme and the transfer of risks is consistent with realistic market capacity.

2.7.3. Clearly set out risk transfer proposals

A formal schedule of risks and their allocation should be produced for the whole programme clearly setting out how risks will be allocated between parties.

2.8 Transparent Procurement and Management Processes[7]

2.8.1 Implement robust and transparent programme governance

There should be an institutional and regulatory framework which details the roles of various stakeholders in the procurement process. The framework should be used to ensure that the programme meets best practice in relation to the transparent procurement and management of projects, using independent specialists to review and audit the programme's compliance with national and international transparency and anti-corruption guidance.

2.8.2 Standardise the procurement process and procedures

The procurement process for PPP projects and their governance should guarantee a high degree of objectivity and transparency in the invitation, receipt and evaluation of tenders. Qualitative and quantitative evaluation criteria, and their relative weighting, should be established with stakeholders prior to tenders being issued and should be made transparent to bidders when they are invited to tender.

2.8.3 Evaluate tenders transparently and publish formal evidence of value for money

As part of their review and approval of the Business case prior to signature of contracts, governments should conduct a value for money assessment. This assessment should be published to give the public evidence that delivering the project as a public-private partnership represents the best possible value for money.

Innovation and alternative solutions should be encouraged during the tender stage but their scope and any consequential reallocation of risk against the preferred strategic solution or Reference Solution should be clearly defined before a preferred partner is appointed.

[7] Principle 5 – UNECE Guidebook on Promoting Good Governance in Public-Private Partnerships

Certain objective criteria should be established before procurement begins which represent a pass/fail test in the suitability of a potential partner to deliver projects. The published evaluation criteria should make clear which aspects of tenders are pass/fail and which will be judged against weighted qualitative and quantitative criteria.

An evaluation report should be produced for each tender, objectively scoring tenders against the objective published criteria. The tender evaluation committee should have proven experience and expertise in evaluate similarly complex tenders and feature technical, commercial, financial and legal skills. Their conclusions should be subject to independent review by a specialist audit office or independent agency.

2.8.4 Promote Zero Tolerance to Corruption

Governments should develop standard definitions of corrupt practices in public procurement and management, and ensure they are applied to the PPP programme. They should be published as a matter of policy, and incorporated in the PPP programme. Tenderers for each project should be required to confirm their willingness to comply with anti-corruption policies and should be eliminated from a tender if they are unable to do so, or if there is evidence that they have exhibited corrupt practice. Acceptance of this principle should be a pass/fail tender requirement.

2.8.5 Record and publish procurement and management information

Business cases should have clear and objective measures of value for money, and outputs compared to the base case upon award of a contract. Governments should include measures to encourage the recording and publication of procurement and management information for each project, in the interests of demonstrating long term value for money.

2.9 Sector Specific Issues

There are many issues specific to the transport sector that will need to be addressed when considering whether to use a PPP programme to deliver investment in railway infrastructure.

2.9.1 Regulation

In developing the policy and legislative framework, governments may consider establishing a regulatory framework to govern access to transport infrastructure, and the way its maintenance and operation is remunerated. Governments may also consider establishing an independent regulator to take responsibility for monitoring safety of the transport infrastructure[8].

2.9.2. Patronage

The traffic forecasts prepared when developing the planning context for a PPP programme

[8] http://www.oecd-ilibrary.org/transport/better-economic-regulation_5kg9mq55fpmv-en

should be considered in conjunction with the assessment of potential sources of finance and the need for subsidies, payments or guarantees.

2.9.3 Mixed Economy Infrastructure

When considering the type of infrastructure required, governments should consider whether capacity should be reserved for different categories of services and how priority should be allocated between them. Governments should also have regard to the consequential impact on line speeds (road or railways) and the availability of transport infrastructure.

2.9.4 Cost Overruns

A major issue in the development of new transport infrastructure can be the allocation of liability for cost overruns due to the size and complexity of transport schemes compared to other types of infrastructure. It will be important to provide a credible strategy for addressing this issue when assessing potential sources of finance.

2.9.5 Early Termination Arrangements

The suite of standard forms of contract documentation will include provisions regulating early termination, for example in the event of material failure to perform the contract. An issue for transport infrastructure is finding suitable replacement operators with the necessary competence. Contracts should allow sufficient time pre-termination for satisfactory arrangements to be put in place, including preservation of key sub-contracts to ensure continuity of service.

2.10 Case Studies

2.10.1. Nottingham Express Transit

The city of Nottingham in the UK has recently opened an extension to its existing tram network, effectively doubling the number of lines.

Both the existing network and the extension were developed using a PPP concession model, with finance provided by a combination of capital grant and bank lending. A single concessionaire is responsible for the development, operation and maintenance of the extended network and new trains have been introduced. A key feature of the project is the introduction of a multi-modal ticketing system providing connectivity between trams and buses.

The City Council (the Authority) entered into a thirty-year concession agreement with Arrow Light Rail in 2001 for the development, operation and maintenance of the existing network "Line One" with services commencing operation in 2004. In order to introduce the extension "NET Phase Two", the Authority undertook a fresh procurement using the competitive dialogue process resulting in the termination of the original agreement and the grant of a new concession to Tramlink Nottingham for a period of 22 years in 2011.

When considering options for the procurement of NET Phase Two, the Authority undertook a comprehensive procurement strategy options analysis[9]. An analysis of the potential contractual structures is set out at Annex 1.

In summary, the contractual structures considered by the Authority were:

Option 1 - Design, Build, Finance, Operate and Maintain (DBFO) - Under this option (which was employed for Line One), one contractor would be appointed as the single point of accountability for all aspects of the project.

Option 2 - Design, Build, Operate and Maintain (DBOM) - This structure is the same as Option 1 (DBFO), but without any external private sector project finance.

Option 3 - Design, Build, Finance and Maintain plus Operate (DBFM+O) - Under this structure the DBFM contractor is responsible for providing and maintaining the

[9] http://www.thetram.net/.../Nottingham%20Express%20Transit%20Phase%20Two%20Full%

infrastructure based on availability payments and a separate operating concession agreement is awarded.

Option 4 - Design and Build plus Operate and Maintain (DB+OM) - Under this option, an operating and maintenance concession and separate turnkey design and build contract would be awarded.

Following detailed analysis of each of these options, the Authority reached the following conclusions:

1. Option 2 (DBOM) did not, in this instance, offer any advantages when compared with Option 1 (DBFO). However, the structure did have significant disadvantages (for example, in terms of not incentivising whole life costing and the achievement of passenger focused outputs through a performance regime and payment mechanism) and was therefore dismissed;

2. Option 3 (DBFM+O) was dismissed because it was impractical in the context of NET Phase Two, given the interface problems that would arise from the division of operations on the one hand and design, construction and maintenance on the other;

3. Option 4 (DB+OM) was dismissed because it did not deliver optimal whole life costing or transfer significant long-term risk to the private sector. It also did not achieve a clear and full transfer of integration risk between the build contract and the operation and maintenance concession. Furthermore, because the operator would not receive ongoing unitary charge payments in respect of which performance deductions could be made, the operator would be less incentivised to achieve passenger focussed outputs.

Accordingly, for the following reasons, the Authority's preferred procurement route which was adopted for the project was Option 1 (DBFO).

- Full transfer of system integration risk - the concessionaire would be required to deal with any system integration problems (e.g. inability of the operating sub-contractor to meet timetable requirements due to design failure), for which the Authority would be entitled to reduce the unitary charge. The experience of construction and commissioning of Line One was that there were significant system integration issues, for example the rail/wheel interface, which had to be resolved before Line One could be brought into operation. As a result of the DBFO structure employed for Line One, the Authority was held harmless from the effects of this risk.

- Whole life costing optimisation - the concessionaire would be incentivised to ensure that the system would be designed to optimise whole life cost over the life of the project and to satisfy handback requirements.

- Achievement of passenger focussed outputs - the performance regime and payment mechanism would provide greater incentives than under any other procurement option to achieve passenger focussed outputs (e.g. service frequency and ride quality) because failure to achieve performance standards would result in the concessionaire suffering deductions from the unitary charge.

- Network flexibility - future extensions could be included within the scope of the procurement, which would enable future extensions to be implemented without terminating the concession for NET Phase Two.

- Revenue risk - the concessionaire would have overall control in respect of design, construction, maintenance, life cycle replacement and operation allowing the concessionaire to have greater influence on patronage revenue and take farebox revenue risk. The NET Line One concession agreement transferred full revenue risk to the concessionaire. The Authority did not have the budgetary flexibility to prudently retain substantial revenue risk and therefore its preference was for there to be no revenue risk share on NET Phase Two either.

2.10.2. Railway Infrastructure Enhancements

This is an example of a project where many key enhancements to an existing operational railway line were delivered using a project finance structure. For reasons of confidentiality it has not been possible to identify the project upon which this case study is based.

Examples of the enhancements that were delivered are:

(a) track replacement and renewal;

(b) improvements to the alignment of the permanent way to allow faster line speeds;

(c) construction of additional platforms at stations on the line; and

(d) installation of a new signalling system.

The key features of the project were that the train operator would procure the design, build and financing of the project and once the works had been completed and "taken into use" they would be purchased by and transferred to the infrastructure manager. The project was not exposed to operating risk.

The project structure that was used assumed that:

(a). all risks associated with the implementation of the project would be borne by the project company;
(b). design and build of the works would be sub-contracted to the construction contractor;
(c). the project company would use bank finance to fund the cost of implementation of the project;
(d). the infrastructure manager would be under an absolute obligation to purchase the works from the project company once the project has been "taken into use";

(e). the train operator would pay increased track access charges to the infrastructure manager and the train operator's franchise would be extended.

There were various contracts required to implement the arrangements:

Enhancement Agreement

This is the agreement whereby the project company undertook to implement the Project for the train operator. The project company was responsible for carrying out the works in accordance with the project specification and was obliged to achieve acceptance of the project on or before the specified completion date with liquidated damages flowing from any delay. Relief and compensation (as applicable) was provided for the occurrence of specified events, and there was a mechanism for calculating the transfer price for the works considering agreed variations.

Construction Contract

This was the agreement by which the project company's construction obligations pursuant to the Enhancement Agreement were sub-contracted to the construction contractor.

Project Interface Agreement

This agreement covered the protection, safety and security of the rail network, as well as the design review, approval, monitoring and inspection of the works, compliance with applicable standards and utilisation of possessions, and the process for obtaining necessary consents.

Facilities Agreement

This was the agreement between the project company and the funders providing finance for the implementation of the project.

Asset Purchase Agreement

This agreement contained the procedure for taking into use and acceptance of the works. It also provided for payment of the transfer price (calculated in accordance with the Enhancement Agreement). The infrastructure manager was required to pay the agreed transfer price to the project company within a specified period from the date of acceptance.

Track Access Agreement

There was a variation of the existing agreement between the infrastructure manager and the train operator to increase the track access charges payable by the train operator.

Franchise Agreement

There was a variation of the existing agreement between the Transport Ministry and the train operator to increase the duration of the existing franchise.

The project included many risks and was structured to mitigate or allocate them to the parties best able to manage them. Key areas of risk and their mitigants are addressed below.

Table 8 Key areas of franchise agreement risk and their mitigants

Risk	Mitigant
Technical	
Delivery of the project on time and on budget	The construction contractor - experience of delivering similar rail enhancements and built-in time and cost contingency
Co-operation with infrastructure manager	The process of design and the practical aspects of working on the operational railway was governed by the Project Interface Agreement
Taking into Use	As packages were completed they were taken into use based on a defined and documented process
Acceptance	When all the enhancements were completed and taken into use, acceptance was certified based on a defined and documented process
Financial	
Payment of transfer price	Banks would evaluate adequacy of infrastructure manager's covenant to pay
Payment of increased track access charges	Transport Ministry support for franchisee
Insurance	
Adequacy of insurance	The construction contractor was required to maintain a package of project insurances – there was a regime to cover unavailability of insurance
Operational	
The Project has no operating phase	All costs relating to design and build were passed down to the construction contractor - cost increases due to variations would be added to the transfer price

2.10.3. Rolling Stock Procurement

The Intercity Express Programme is the programme to replace the older intercity trains currently running on the domestic rail network in the UK with new trains using a PPP arrangement.

The UK government has entered into a contract for the supply and maintenance of the replacement rolling stock with Agility Trains, a consortium consisting of Hitachi Rail Europe and John Laing Investments. The rolling stock is known as the Hitachi Super Express Train and will initially be built and assembled by Hitachi in Japan with subsequent trainsets being assembled at a new facility to be constructed for the project at Darlington in the UK.

Given the size of the overall programme, the procurement was split in two: an initial funding for the Great Western Mainline (GWML) fleet, and a second financing for the East Coast Mainline (ECML) fleet.

The main scope of the GWML procurement is the design, manufacture, commissioning and bringing into service of the new trainsets alongside the construction and maintenance of new depot facilities at Bristol and Swansea, and refurbishment of the existing North Pole depot in West London. The ECML procurement involves the construction of a large new depot at Doncaster.

The trainsets are based on the Javelin Trains used on the High Speed 1 line, and will consist of both electric and bi-mode units (which are able to power themselves and to use electric power when available). They are to be fully in service by 2018.

Agility Trains is responsible for making the trainsets available and delivering related services including transfer of train and depot delivery, and train operation and maintenance. In the

case of GWML, 57 trainsets are to be supplied along with supporting maintenance and depot facilities.

Payment is based on availability, with Agility Trains being responsible for providing the trainsets for service daily. Deductions can be levied if Agility Trains does not meet the performance regime relating to availability, reliability and standards of cleanliness and presentation.

The total project financing requirement was approximately £2.5 billion, consisting of £2.2 billion long-term project financing plus a £280 million mix of share capital and shareholder loans provided over 30 years.

Key features of the project are:

- Pathfinder: This was the first time a PPP structure had been used for the procurement of rolling stock.
- Innovative: The train availability-based structure is the first time a "no train no pay" structure has been used in the heavy rail market.
- Flexible "change" regime: Trains are mobile assets providing a key public service and considerable flexibility is required in respect of their deployment ranging from amendments to the passenger timetable to redeployment of trains to different routes and use of new depots.

2.10.4. Analysis of contractual structures for procurement of net phase two

Contractual Structure	Description	Advantages	Disadvantages
Option 1 - Design, Build, Finance, Operate and Maintain (DBFO) *Example - Line One*	Under this option a single concessionaire would be appointed as the sole point of accountability for all aspects of the project, including design, build, funding, operation, maintenance and integration with the existing Line One. The concessionaire would be paid by reference to service based outputs, such	• Integration risk is fully transferred. NET Phase Two differs from tramway refurbishment or entirely new systems because of the requirement to integrate Phase Two with Line One, both in terms of the minimisation of disruption to Line One services and inter-operability of infrastructure and vehicles. • This structure incentivises whole life costing more than any other, as the	• The experience from Leeds Super tram and the South Hampshire Rapid Transit has shown that long-term revenue risk transfer may be unattractive to funders. However, this can be mitigated through the use of a revenue share mechanism (if required) or appropriate ratios between debt service, unitary

Contractual Structure	Description	Advantages	Disadvantages
	as timetable and ride quality and not by reference to availability of infrastructure. DBFO is the basis of Line One. There is a single point of accountability for all services and all key risks are transferred (although it is recognised that in today's market, better value for money may be achieved if certain risks are shared between the public and private sectors).	concessionaire is responsible for all aspects of the project from design through to operation, for the duration of the contract period. • The payment mechanism provides greater incentive than under any other procurement option to achieve passenger focused outputs (e.g service frequency and ride quality). • This structure does not require upfront public-sector capital funding and therefore, should be more affordable. • Potential to achieve off balance sheet treatment.	charge and farebox revenue. Furthermore, there is a degree of certainty in respect of patronage figures as a result of performance data from Line One.
Option 2 - Design, Build, Operate and Maintain (DBOM) *Example - Midland Metro*	This is the same structure as for DBFO, but without any external private sector project finance.	As for Option 1 (DBFO).	As for Option 1 (DBFO), plus: • Requires upfront public sector capital funding. • This structure does not deliver optimal whole life cost or transfer significant long-term risk to the private sector. For example, despite contractual transfer of risks, much of latent defect risk and life cycle risk effectively sits with the public sector because there is no bank funding at

Contractual Structure	Description	Advantages	Disadvantages
			stake. • No requirement for substantial bank due diligence which would otherwise help identify and manage risk and ensure the delivery of the final project. • Unlike Option 1 (DBFO), because the concessionaire does not receive ongoing unitary charge payments in respect of which performance deductions may be made, this structure does not incentivise the achievement of passenger focused outputs.
Option 3 - Design, Build, Finance and Maintain *plus* Operate (DBFM+O) *Example - Docklands Light Rail ("DLR")*	DBFM + O is the contractual structure used on DLR. A DBFM contractor is responsible for providing the infrastructure and vehicles under a long-term contract and is paid based on availability of infrastructure rather than based on service based outputs. A separate operating company is awarded a short term operating concession.	• This structure facilitates the procurement of future unforeseen extensions because there can be more than one infrastructure provider, meaning that the existing DBFM arrangements do not need to be terminated. The relatively short duration of the operating contract allows for regular re-letting of the operating contract in respect of the entire system. This can also be achieved under the DBFO structure. • This structure does not	• While this model is proving successful in an "off-street environment", in the case of NET there are clear interfaces with third parties and disputes at these interfaces are likely to result in additional cost for the public sector. • The level of complexity associated with this structure to deal with the interfaces between the operator and the DBFM contractor is not proportionate for

Contractual Structure	Description	Advantages	Disadvantages
		require upfront public-sector capital funding. • Whole life costing benefits in that the same entity is responsible for design, construction and maintenance (though not operation).	Phase Two. • May not achieve off balance sheet treatment. • Retention of long term revenue risk due to short operating contract. • Less effective transfer of risk to operator because no financing is at stake under the operating concession. • A payment mechanism based on availability of infrastructure rather than matters such as reliability, punctuality and ride quality does not incentivise customer focused outputs.
Option 4 - Design and Build *plus* Operate and Maintain (DB+OM) *Example - Sheffield Super tram*	A turnkey design and build contract and a separate operating and maintenance contract would be awarded to two different entities. This is the model used on Sheffield Super tram.	• This structure allows new infrastructure for system extensions to be procured directly by the public sector and the operating/maintenance contract to be extended to cover the entire system. However, as detailed above, the same effect could be achieved through a DBFO structure. • As with DBFO, responsibility for operation and maintenance rests with the same entity, avoiding some	• This structure does not deliver optimal whole life cost or transfer significant long-term risk to the private sector. For example, despite contractual transfer of risks, much of latent defect risk and life cycle risk effectively sits with the public sector because there is no bank funding at stake. • Unlike Option 1 (DBFO), because the

Contractual Structure	Description	Advantages	Disadvantages
		of the problems associated with the DBFM+O structure.	concessionaire does not receive ongoing unitary charge payments in respect of which performance deductions may be made, this structure does not incentivise the achievement of passenger focused outputs. • Will not achieve off balance sheet treatment. • Integration risk between D&B and O&M elements is not transferred and remains with the Promoters. • No requirement for substantial bank due diligence which would otherwise help identify and manage risk and ensure the delivery of the final project.

Polarized opinions on PPPs

Public-private partnerships have been touted as highly efficient alternatives to the public sector, benefiting from more efficient construction, lower cost overruns, more innovation, and an optimization of full life-cycle cost. They have also been criticized as being a waste of public money; they may provide 10 to 15 percent returns on private capital when public debt is available at below 1 percent. They may be lightning rods for strong opinions, but black-and-white assessments miss many of the nuances associated with these deals.

First, the cost of public capital is much higher than debt rates would indicate. When a publicly funded project is launched, many risks are not priced into the initial public borrowing costs—but for a fair comparison, they should be. In a PPP, the private partner may take on construction risk, for example, shielding the public sector from claims and overruns. But a publicly funded project puts these risks onto taxpayers, who often receive sizable bills for overruns well after the fact. In principle, higher private-sector capital charges

can thus be in line with the risk that the private partner assumes. In addition to the risks borne by taxpayers in publicly funded projects, it is important to consider the opportunity costs of directing tax and public debt funding to a given project when many priorities are competing for scarce resources.

Second, private-sector projects tend to be more efficient, with more discipline applied to project preparation, fewer overruns, and greater propensity to innovate. It is important to note, though, that some of these advantages can also be captured via contractual structures (such as the "design-build-operate-transfer" model) without private financing.

In practice, PPPs do sometimes turn out to be a waste of money. Many factors skew rational value-for-money considerations toward or against the use of PPP structures.

PPPs can often go wrong in the following circumstances:

a) When they are used as a vehicle to circumvent budget constraints and as off-balance-sheet finance. Some governments address this by treating PPPs like publicly funding projects in budgetary terms. Accounting standards have improved, but in many cases, the door is still open for abuses.

b) When a lack of transparency or competition allows private partners to reap windfall profit margins.

c) When inappropriate risk transfers to the private sector (such as regulatory changes, land access, and traffic volumes) increase capital costs.

d) When projects are too small or non-standardized, increasing their administrative costs.

Source: McKinsey Global Institute 2016, https://www.un.org/pga/71/wp-content/uploads/sites/40/2017/06/Bridging-Global-Infrastructure-Gaps-Full-report-June-2016.pdf

Limits of PPP financing

Cost of PPP financing

One of the perennial objections to PPPs is that private sector financing costs are higher than the government's cost of debt, and hence PPPs are more expensive to finance than traditional public procurement. Thus, the argument goes, PPPs will deliver overall cost benefits only where the private sector is able to generate substantial efficiencies in operations.

Transaction costs

One means of overcoming the problems created by uncertainty around future outcomes is to build other outcome - dependent terms and risk - sharing mechanisms into the contracts. However, this can make the contract increasingly complex and has led to the criticism that the transaction costs associated with PPP contracts (including costs of specification, tendering and agreeing contracts) have been high.

Problems with the bidding process

PPPs have failed to overcome some of the problems of bidding that are associated with

traditional procurement methods. A criticism of transport infrastructure projects has been that private sector companies have systematically underestimated the costs that will be involved in delivering these projects, or overestimated the demand for the finished product. In PPPs, this has led to overbidding in the form of inflated traffic and revenue forecasts.

Flexibility and incompleteness of PPPs

PPPs are partly designed to mitigate the time - inconsistency problem inherent in infrastructure investment. This necessarily means that contracts between the private and the public sectors must be sufficiently concrete and well - specified to deter each party from behaving in an opportunistic manner. The unwanted consequence of this is that PPPs tend to be inflexible. The lack of flexibility may be a problem if terms under initial contracts are miss-specified, which is likely in the case where future demand is highly uncertain. For example, the inflexibility of PPPs might not allow the parties to consider exogenous, unexpected cost shocks. As argued earlier, however, PPPs needs to be sufficiently concrete to mitigate the time- inconsistency problem. Thus, a successful PPP must provide a good balance between adequate flexibility following an unexpected, exogenous event while ensuring sufficient investor protection.

Efficiency gains

One of the motives behind PPPs has been to capture the profit - maximising motive of the private sector to drive technical efficiency. However, not all PPPs have been conducted with the secure knowledge that the private sector will be more efficient than the public sector. For example, when the UK began its PPP initiative — the Private Finance Initiative (PFI) — lack of interest in PPPs from the private sector meant that the government was forced to make the scheme more attractive, which ultimately led to the abolition of universal testing of projects for private finance. In 1992, rules relating to the use of private funds by the public sector were revised such that privately financed projects would be allowed to go ahead without any need to compare them with a similar project in the public sector.

Source: Mr. Andrew Meaney and Mr. Peter Hope Alternative Ways of Financing Infrastructure Investment: Potential for 'Novel' financing Models, Discussion Paper 2012, ITF, OECD. http://www.oecd-ilibrary.org/docserver/download/5k8zvv4vqj9s-en.pdf?expires=1516105199&id=id&accname=guest&checksum=0AB362299D04ABF49BA09FE2A90E914C

Institutional investment

The City of Chicago recently set up the Chicago Infrastructure Trust (CIT). The US$7 billion trust aims to facilitate private sector investment from institutional investors such as pension funds, insurers, endowments, sovereigns and private equity. Washington, Oregon and California are currently attempting a similar initiative called the West Coast Infrastructure Exchange (WCI) which should be available in the next six months. WCI has appointed an experienced infrastructure advisory firm to advise on potential investments. While several large pension funds in the US have been actively investing in infrastructure (egg CalPERS has committed to invest up to US$800m in California infrastructure and

Clasts is investing US$500m in Industry Funds Management, an Australian infrastructure fund), smaller funds find it difficult to invest directly in projects due to the specialised skill sets required and so need an investment platform that undertakes project identification and management on their behalf. The first investment by the CIT is to be used to facilitate US$1 billion in energy efficiency investments, with funding coming from Citibank, Macquarie, JP Morgan and Allice.

Source: Alternative financing for infrastructure development, April 2013, Deloitte, https://www2.deloitte.com/content/dam/Deloitte/au/Documents/public-sector/deloitte-au-ps-funding-options-alternative-financing-infrastructure-development-170914.pdf

2.11 Conclusions

It is generally recognised that successful PPP programmes in the transport sector have the following characteristics:

- They are well governed;
- They represent the best value for money of the realistic options available;
- They exhibit a high degree of transparency and public accountability;
- They learn lessons effectively from project to project;
- They can adapt well to changing technology and circumstances.

Conversely, unsuccessful PPP programmes in the transport sector can be characterised by poor governance and value for money, a lack of transparency and a rigid, inflexible approach.

Chapter 3 Electronic Tolls

3.1. Introduction

Various countries had been using tolls collection systems for decades. Such had been introduced by governments having different motivations in this regard. Often, they offered an additional source of funding for maintenance and construction of new infrastructure adding to the primary funding source being taxes on gas.

With the technology progress, and rapidly increasing vehicle electrification, the gas tax revenue would decrease and may become within next 15-20 years quite negligible, hence would not offer the necessary revenue to support existing infrastructure let alone construction of new one. On the other hand, taxing electricity in comparable ways to taxing gas may be difficult to achieve. For this reason, toll collection systems may become the future primary source of funding for maintenance of existing road network as well as for building new infrastructure.

While the past and presence at the time when this report was written saw application of mainly manual toll collection system, whether such were distance or time based, these have disadvantages which limit their deployment. Therefore, emphasis should be on electronic toll collection systems. These new systems, enabled by technology progress, have important advantages due to which these systems may become primary source of revenue from transport in the future:

- Vehicle throughput: an electronic toll collection system achieves a vehicle throughput of 1800 to 2400 vehicles per hour per lane, some seven times more than manual systems;

- Environmental protection: due to the higher vehicle throughput, and less stop and go traffic, vehicles driving on roads with electronic toll collection systems emit less pollutants and consume less fuel than on manual toll collection systems;

- Scalability: Electronic toll collection systems are scalable, although they do require additional roadside infrastructure for covering new toll roads while;

- Implementation time: Electronic toll collection systems require less time for implementation - less land needs to be acquired and less construction works needs to be performed.

Figure 11 Installation of a toll plaza for a manual toll collection system

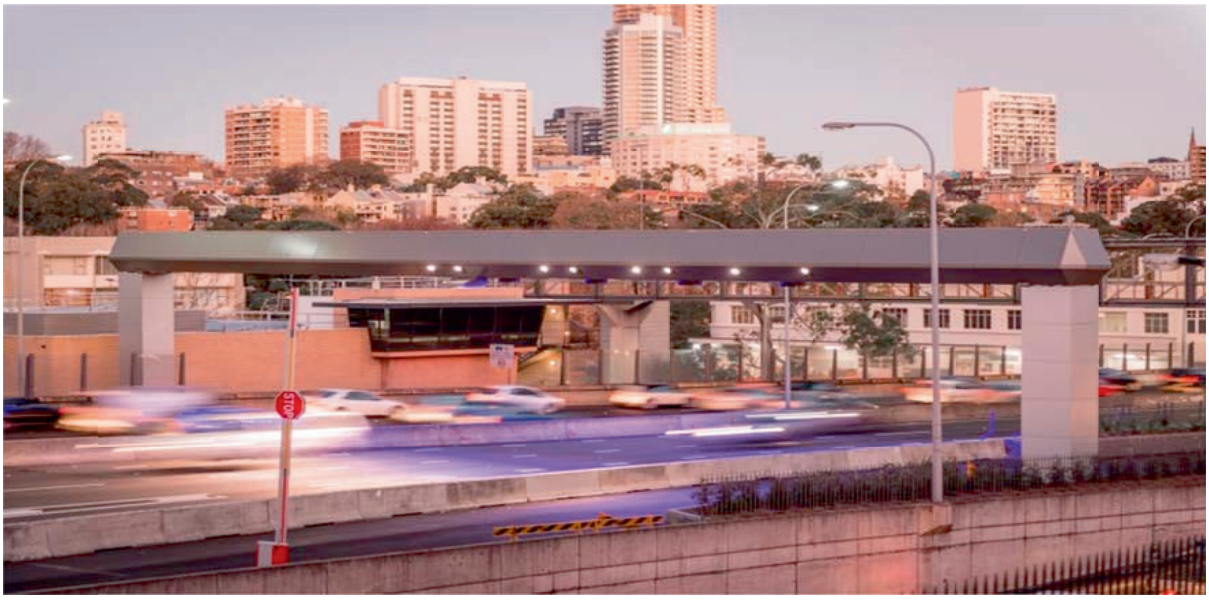


Figure 12 Installation of a gantry for an electronic toll collection system

Introducing a toll collection system is a major task that needs thorough preparation if it is to fulfill its objective. Therefore, governments need to be aware of what these systems are, what are their dependencies and which are the key factors for successfully introduction and operation of a toll collection system. This chapter discusses therefore the electronic toll collections systems as well as the necessary factors for successful deployment of these systems.

3.2. Main technologies for electronic toll collection systems

3.2.1. Electronic vignette

Electronic vignette was a modern equivalent at the time this report was written of a time-based toll collection system based on stickers. Whilst the sticker had to be purchased and mounted on the vehicle's windscreen for the time of its validity, the electronic vignette corresponds to the vehicle's license plate number and is registered electronically wherefore

nothing needs to be mounted on the vehicle's windscreen anymore. This reduces the related distribution costs and the burden on the road user. The use of on-board units as electronic vignettes has been discussed in multiple countries but did not succeed so far. The main advantage of utilizing on-board units is that they might be used for other toll collection, traffic management or payment schemes as well.

The electronic vignettes required Automatic number-plate recognition (ANPR) cameras that read out the vehicles' license plate numbers and compare them to a white list which contains the license plate numbers of all vehicles that have purchased a valid vignette.

The ANPR cameras are mounted on overhead gantries or poles next to the road. As of the time this report was written, one ANPR camera was installed per lane, but ongoing innovations and the rise of high-definition cameras with higher resolutions was expected to allow the coverage of two lanes per ANPR camera.

When a vehicle passes the roadside infrastructure, the ANPR cameras take one or multiple images of the vehicle's front and or rear license plate number. The ANPR cameras may be capable of detecting the passage of vehicles themselves or require external sensors that trigger the image generation of the respective ANPR camera. The legal constraints need to be considered when taking and processing images. In some countries, it might be prohibited to take front or rear images. In other countries it might be prohibited or required to take images displaying the driver. For protection of the drivers' privacy, images that are not required for toll collection or enforcement purposes must be deleted immediately.

Figure 13 Exemplary figure of an ANPR camera

After the image has been taken, optical character recognition (OCR) algorithms (often referred to as ANPR algorithm) are utilized for automatically validating the license plate number of the image. Often, multiple ANPR algorithms are utilized in order to increase the automatic image validation rate. In addition, so called fingerprinting algorithms may be utilized for improving the automatic image validation rate even further. These fingerprinting algorithms create a 'fingerprint' pattern of an image and compare this pattern to fingerprint patterns that have been created and stored in the past. Thereby, the license plate number can be automatically validated even though the license plate number might not be readable by the ANPR algorithms. Depending on the quality of the license plates, presence of foreign license plates, image quality, and availability of front and rear images, the accomplished

automatic validation rates may vary a lot. In Europe, automatic validation rates of around 90 to 95 per cent were achieved at the time this report was prepared.

The missing 5 to 10 per cent of the images still needed to be validated by human operators. Depending on the number of images taken, this can be a huge cost factor. In addition, about 2 per cent of all images can neither be read by human operators because the license plates might be covered by dirt or snow, the images have too high exposure, the license plates are damaged or vehicles are tailgating. Therefore, about 2 per cent of the possible revenues may be lost. False positive results (i.e. the wrong identification of a license plate number with a high confidence) are another problematic issue that lead to high costs and unsatisfied road users as unconcerned road users are wrongly invoiced.

3.2.2 Electronic distance-based systems

3.2.2.1 8 GHz microwave technology (DSRC)

The 5,8 GHz microwave technology was commonly referred to as dedicated short-range communication (DSRC). There were two underlying DSRC standards that were allowed by the directive 2004/52/EC: of European Committee for Standardization (CEN) and of Italian Standards Organization (Ente Nazionale Italiano di Unificazione, UNI). The CEN DSRC standard was utilized in tolling projects all over the world (Africa, Australia, Europe, South America), while the UNI standard has so far only been applied in the Italian toll collection systems.

The main principle of DSRC foresees a microwave communication between an on-board unit installed on the vehicle's windscreen (with adhesive tape) and a roadside antenna installed on overhead gantry within a range of about 15 to 20 meters. The roadside antennas are arranged as such that they identify passing vehicles equipped with on-board units independent of the vehicle's speed and lane, supporting stop & go traffic in equal measure as passages with more than 160 km/h. The localization of the roadside antennas allows a correlation of DSRC transactions with the images of the ANPR cameras which might be deleted right away or used for enforcement purposes in case of false or non-payment.

The on-board units had about the size of a cigarette packet and were reported to cost about 10 to 15 euros. On-board units allowed the secure storage of multiple attributes (e.g. license plate number, vehicle class) that might not only be used for tolling, but also other traffic or payment related activities (e.g. payment of gas or parking). The roadside antennas accessed the on-board units securely over read and/or write commands. DSRC technology foresaw that the on-board units needed a battery for communicating with the roadside antennas. The use of batteries limited the on-board unit's lifetime to about seven years on the one hand, but on the other hand allowed to provide audible feedback when passing a tolling station or when the account's pre-payment balance was low. Some on-board units were equipped with buttons and LEDs that provide the driver with the possibility to identify the currently set number of axles and change it if needed.

Figure 14 Exemplary figure of a DSRC on-board unit that is mounted on a vehicle's windscreen

Toll collection systems utilizing DSRC achieved very high automatic vehicle identification rates of more than 99 per cent and did not limit the vehicle throughput at all. Existing DSRC toll collection systems at the time of this report's preparation often required the mandatory use of on-board units on the toll road network for toll liable vehicles. If no mandatory use of on-board units was required, ANPR cameras were not only used for enforcement purposes but also as secondary means of vehicle identification. In such implementation, each roadside infrastructure needed to be equipped with ANPR cameras increasing the system's overall cost.

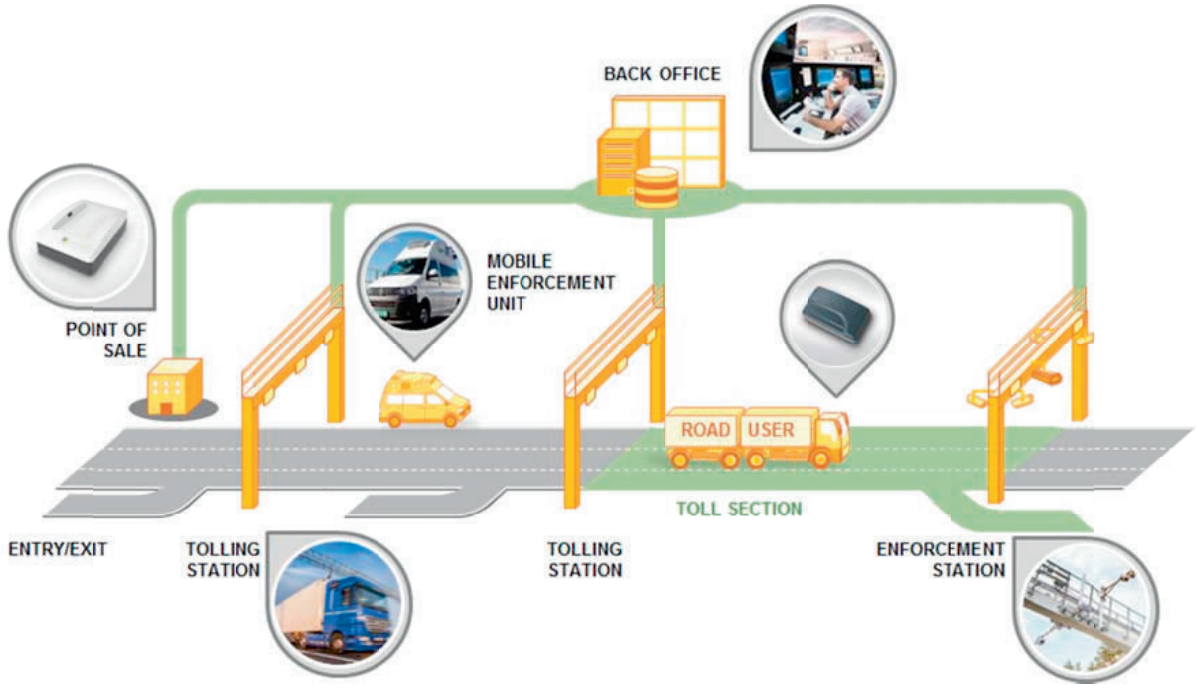


Figure 15 System architecture of DSRC based electronic toll collection system

The necessity for roadside infrastructure, even without ANPR cameras installed on each gantry, was the main cost driver of DSRC technology as those gantries need to be erected and maintained along the toll road network. Therefore, the use of DSRC was most effective for toll collection systems with high number of users and small toll road network. Vice versa, DSRC would be costly if there was only a small number of users to be equipped with on-

board units on a huge toll road network. However, looking at countries such as Poland or Belarus which had introduced nationwide toll collection systems based on DSRC technology, it became clear that this was only a rough rule of thumb and that the choice of technology depended mainly on the fulfillment of the government's objectives, key success factors and the surrounding conditions.

3.2.2.2 . Satellite positioning

The functional principle of satellite positioning was based upon the use of dedicated GNSS (Global Navigation Satellite Systems) on-board units which collect signals from satellites travelling in the medium earth orbit (e.g. geographical positioning systems (GPS) or global satellite navigation systems (GLONASS) satellites). The GNSS on-board unit required communication with at least four satellites for an accurate determination of the position. A combination of multiple satellite navigation systems (e.g. GPS and GLONASS) improved the positioning accuracy due to the increased availability of visible satellites. The most challenging environment for GNSS on-board units were street canyons where reflections cause multipath effects that delay the signal run-time and lead to position errors.

Once the positions are collected by the GNSS on-board units, they are either directly processed by the on-board unit (referred to as 'thick client') or transmitted via cellular networks to the central system for further processing (referred to as 'thin client'). Processing in this context refers to the identification of the segments driven on the toll road network based on the collected positions. For this purpose, virtual gantry or map-matching algorithms that are capable of mapping the positions collected to the toll road network's segments are utilized. Both approaches have their pro and cons: virtual gantry detection would not work well in case of very imprecise positions while map-matching requires very precise and up-to-date map data. Both algorithms had been successfully implemented in available toll collection systems and achieved vehicle identification rates similar to DSRC.

'Thick clients' required less data communication to the central system, but all deployed devices always needed to be updated to the latest release of the virtual gantries, map data or toll rates for avoiding incorrect rating of the vehicle passages. 'Thin clients', on the other hand, require more data communication to the central system, but had the advantage that all processing was performed centrally based upon the same virtual gantries, map data or toll rates.

Figure 16 Exemplary figure of a GNSS on-board unit that is mounted on a vehicle's windscreen in comparison to a smaller DSRC on-board unit

Apart from GNSS modules, GNSS on-board units were typically equipped with accelerometer and gyros, and a cellular networks module (GPRS, UMTS, etc.) for communication with the central system. The most recent GNSS on-board units at the time of the writing of this report were all mounted on the vehicle's windscreen, but need a permanent connection to the cigarette lighter for electricity due to the high power consumption of the GNSS module. Due to the additional modules and sensors compared to a DSRC on-board unit, the costs of GNSS on-board units were about tenfold.

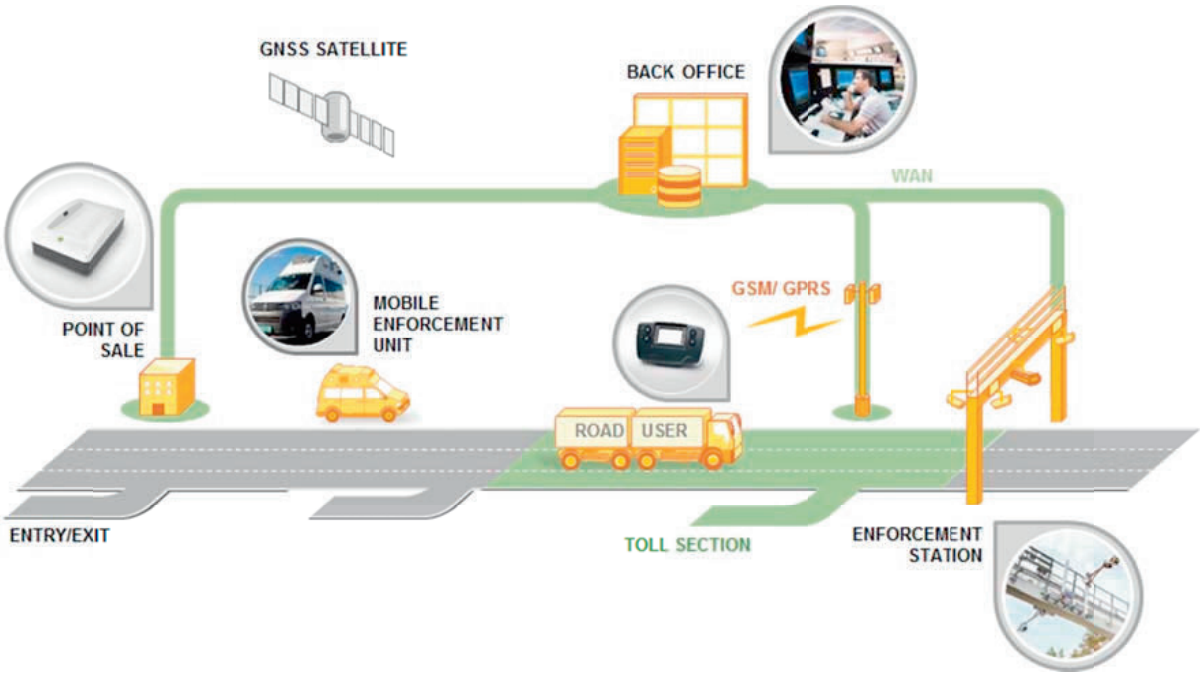


Figure 17 System architecture of satellite based electronic toll collection system

Toll collection systems based on satellite positioning required roadside infrastructure only for enforcement purposes. Therefore, this technology requires less roadside infrastructure than DSRC and can be extended to further roads in a faster and more cost-efficient manner. However, the on-board units are more expensive than those utilized for DSRC. As a result, and on the contrary to DSRC, toll collection systems based on satellite positioning are most efficient if there is a low number of road users to be equipped with on-board units driving on a huge toll road network.

3.2.2.3. Mobile communications using the GSM-GPRS standard

According to directive 2004/52/EC, mobile communications using the global system for mobile communications (GSM)- General Packet Radio Service (GPRS) standard may be used for toll collection as well. However, toll collection systems had only been relying on mobile communications for the transmission of positions or transactions from GNSS on-board units to the central system. Theoretically, positioning via base stations from mobile network operators only was possible, but had not proven to achieve a sufficiently high positioning accuracy for toll collection purposes. Consequently, no toll collection system utilized only the mobile communications network for positioning.

However, the rise of smartphones and mobile applications in the second decade of 21st century had not passed toll collection systems without a trace. First proof of concepts utilizing smartphones as tolling device were under way. As of late 2017, smartphones did not seem to be ready for the purpose of toll collection in nationwide tolling systems since on-board units typically required dedicated certifications and because of the mere fact that not everyone owned a smartphone. In addition, the massive battery drain when utilizing GPS was still not resolved and due the device diversity of the Android operating system no performance levels could be guaranteed. Therefore, smartphones might provide a good opportunity for some user groups, but were not yet ready to replace on-board units.

On the other hand, in toll collection systems based on ANPR cameras, the additional use of smartphones that generate virtual gantry transactions when passing a physical toll gantry allowed the correlation of smartphone and ANPR transactions. This correlation reduced the need for manual image validation and reduced the loss of toll revenue caused by unreadable license plate images.

In conclusion, standalone mobile communications were not utilized for vehicle identification but the use of smartphones in the context of electronic toll collection systems had already started and was expected to assist or even replace existing toll collection methods in the near future.

3.2.2.4 Manual toll declaration system

Manual toll declaration systems allowed road users to purchase tickets prior or after their trip. These processes were also referred to as pre- and post-declarations. For purchasing the ticket, the road user declared his personal and vehicle data as well as the route where and the date when he would be driving. This data could be entered at customer service points, self-care automats, or through a web or mobile application. The enforcement entity compared the data recorded by the enforcement equipment on the toll road network with all purchased tickets that were valid at the time of the recording.

This solution was, for instance, offered as alternative solution for occasional users in toll collection systems based on satellite positioning as it did not require the use of on-board units, but only a sufficiently high enforcement density to keep the violation rate low. However, if the enforcement was not performed efficiently, road users might capitalized this shortcoming and drive without the convenience of OBUs on purpose.

Manual toll declaration systems were also used for supplementary toll payments when the OBU broke down while driving on the toll road network. In this case, the road user typically needed to drive to the closest customer service center on the route and create a ticket for the past transactions before receiving a new OBU. Any pending enforcement records were deleted if the ticket was purchased within a defined grace period.

3.2.2.5. 915 MHz RFID (Radio-frequency Identification)

915 MHz RFID was a technology frequently used by toll collection systems in North America, but not foreseen by the directive 2004/52/EC and the European Electronic Toll Service (EETS) decision 2009/750/EC. The functional principle of 915 MHz RFID was closely related to 5,8 GHz microwave technology. The major differences to 5,8 GHz microwave technology were:

- Availability of sticker tags: Apart from semi-active battery-powered on board units (OBUs) working at 915 MHz, there existed also passive sticker tags that did not require any battery for the 915 MHz communication with the roadside antennas. These sticker tags could be purchased at a very low cost but did not reach the same performance levels as battery powered tags in multi-lane free-flow environment leading to higher operational costs. In addition, the performance may further decline over the lifetime of the sticker tag due to its delicate nature – sticker tags were more receptive to damage during manufacturing, shipping, installation and operation. Sticker tags could not provide audible feedback to the road users when passing a toll gantry or when it was malfunctioning.

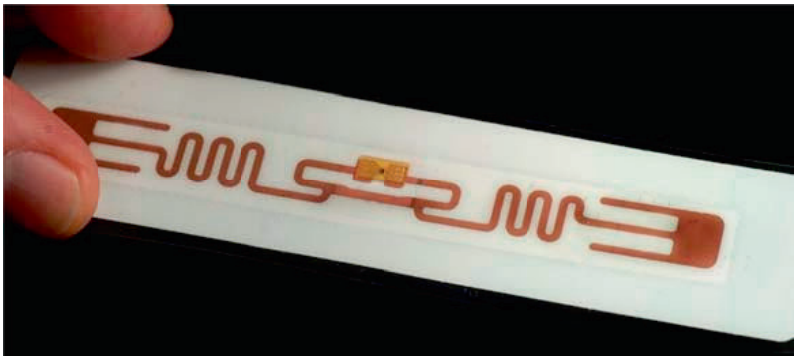


Figure 18 Exemplary figure of a sticker tag that is mounted on a vehicle's windscreen

- Standardization: the industry in North America, where this technology was mainly used, has not agreed on one particular 915 MHz RFID standard that was to be used for toll collection. At the time of writing of this report, multiple protocols were in use in parallel. Most of these protocols have originally been standardized for logistics and not for toll collection or traffic telematics. According to directive 2004/52/EC, the use 915 MHz RFID was not foreseen for toll collection systems in Europe.

- Frequency band & transmission power: the frequency band around 915 MHz was utilized for different applications all over the world wherefore there might have been interference issues in some countries. The transmission power required for communication between OBU and roadside antennas was quite high wherefore the roadside antennas needed to be mounted at low heights of about 5 to 5,5 meters. Due to this low mounting height and the large size of the antennas (more than twice as large as for 5,8 GHz microwave technology), the antennas might impact the streetscape negatively.

3.3. Necessary factors for successful deployment of electronic toll system

3.3.1. Legislation, some specificity for electronic toll system

The deployment of an electronic toll collection system requires relevant legislation in place. Such needs to introduce the obligation for road users to pay for the use of infrastructure. It further needs to define among others which road users and roads are subject to toll or exempted, the respective toll tariffs and penalties, which traffic signs are needed or who is responsible for performing enforcement. Such also needs to define set of technologies for deployment.

References for necessary pieces of legislative framework are the main European directives influencing the introduction of a toll collection. The Directive 2006/38/EC amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures promotes, among others, the “polluter pays” principle (favoring distance-based charging, and differentiated toll rates for less polluting vehicles). If further prevents discriminatory fees and regulates the level of toll rates that may be set.

The Directive 2004/52/EC on the interoperability of electronic road toll systems in the Community defines a set of technologies that may be applied in electronic toll collection systems. These technologies are

- Satellite positioning
- Mobile communications using the GSM-GPRS standard
- 5,8 GHz microwave technology

In addition, for all data processed within the toll collection system legislation on personal data protection also needs to be in place. References is this regard are the directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free transfer of such data and directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector.

The time needed for adapting an existing or creating a new toll act (or related regulations) varies from country to country but usually takes several months and consequently must not be underestimated when implementing a new toll collection system.

3.3.2. Enforcement

The key operational philosophy is to influence toll road user behavior regarding the payment of toll fees, with the overarching operational aim of maximizing toll revenue and minimizing the amount of toll violators. While some of the toll liable road users will already pay their tolls without any enforcement in place, a 100 per cent compliancy to the toll collection system can only be assured by a closed system which requires high costs and does not allow free flow anymore. Consequently, the goal of enforcement is to ensure the best cost-performance ratio by selecting the right enforcement measures. As a prerequisite, all enforcement procedures are setup in a way that guarantees fair and equal treatment of all road users.

The following list states the key factors for steering the user behavior towards a minimum toll violation rate as well as the acceptance of the tolling system:

- Legal framework and toll regulations
- Rate of fines and penalties for toll violators in relation to the toll rates
- Enforcement density and as a consequence the ratio of controlled passages

While the first two items have to be setup by the respective authorities, the third key factor is part of the system design. Consequently, the locations for roadside equipment for enforcement purposes (further on referred to as stationary enforcement stations) need to be selected in a way to detect and check as many different toll liable vehicles as possible at a low enforcement density (i.e. stationary enforcement stations are placed on strategic locations with high traffic amount). The enforcement density is defined as a ratio between stationary enforcement stations and the total number of tolled sections. Looking at toll collection systems in Europe, the density of stationary enforcement stations varied at the time this report was written between 10per cent and 15per cent. The larger the road network the lower was the enforcement density mainly because of economic aspects. As an example, the stationary enforcement stations density of the Czech Republic toll collection system was around 15per cent, the one of the Austrian toll collection system was around 12.5per cent and the one on the German highways was around 10per cent due to the larger tolled road network. In addition, portable enforcement stations and mobile enforcement vehicles are used to close gaps in the control area in order to avoid that road users try to violate against the toll collection system at sections without stationary enforcement roadside infrastructure.

Taking into account the experience from the Austrian or Czech toll collection systems, around 80per cent of the vehicle journeys on the tolled road network were detected and checked by at least one stationary enforcement station. This number depends on the size of the tolled road network and the frequency of passages of one and the same vehicle. However, such a high number could not be achieved by utilizing mobile enforcement vehicles only as they are typically operating on a limited stretch of around 100 kilometers and only controlling a certain amount of all passing vehicles. In addition, these mobile enforcement vehicles are typically not operating 24/7 and are busy dealing with captured violators a great deal of their time. Thus, while they are affecting the road users' behavior due to their presence on the one hand, they are only contributing to a certain extent to the ratio of controlled passages on the other hand.

The legal framework needs to define the entitled body responsible for enforcing toll violators and give this enforcement body the necessary rights such as accessing the vehicle register database or stopping vehicles on the road. The latter is particularly important in case there are no arrangements with neighboring countries for cross-border enforcement. Such a lack of cross-border enforcement was one of major challenges in toll collection systems at the time of preparation of this report that had a high number of transiting road users. The EUCARIS project (European car and driving license information system) which aimed to improve co-operation among national registration authorities had started addressing this issue but included toll collection only to a limited extent as one of their use cases.

ANPR cameras were of key importance for enforcement since images were taken independent of the presence of an in-vehicle device. Apart from ANPR cameras, automatic vehicle classification sensors for determining the class of the vehicle were an important part of enforcement systems. There were automatic vehicle classification sensors such as inductive loops that are installed in the pavement and sensors based on laser or stereoscopic cameras that could be mounted overhead on the roadside infrastructure. By determining the vehicle class, mismatches between the declared and the actual vehicle class were detected.

The use of DSRC improved the efficiency of the enforcement process as only images of (a) vehicles without OBU and (b) vehicles with class mismatches needed to be further validated. The additional communication through DSRC reduced the possibility of fraud by the enforcement body as well. In addition, the use of DSRC modules in OBUs removed the possibility of device cloning.

The enforcement equipment consisting of ANPR cameras, classification sensors and DSRC antennas was not only utilized by stationary enforcement stations, but also by portable enforcement stations and mobile enforcement vehicles.

3.3.3. Public acceptance

Studies about congestion charging systems in European cities indicate that the public support for introducing a toll collection system is quite high initially but declines once more details are published and reaches its absolute low shortly prior to the go live – the public acceptance starts increasing only after the introduction again, once the positive effects are visible to the public. The figure below displays how the public support might change over time and highlights the dynamics of public support that should be considered when communicating to the public.

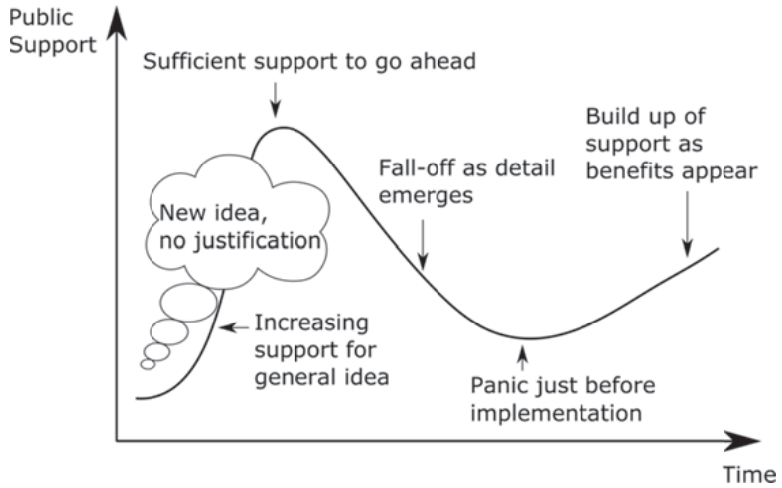


Figure 19 Public acceptance for the introduction of toll collection systems10

[10] GOODWIN, Phil: The gestation process for road pricing schemes. In: Local Transport Today (2006), Nr. 444

3.3.4. Users of roads

It is a core requirement to have a good understanding about who is using the roads before defining the system concept. One needs to differentiate between type of users and type of vehicles when looking at traffic statistics. Road users may be classified according to their travel behavior:

- Frequent users: they drive multiple times per week. Typically, they are domestic road users and professional drivers.
- Occasional users: they drive one to two times per month or even less. These users are often foreign road users, rental car drivers, or motorcyclists.

In addition, road users may also be classified according to their origin:

- Domestic users: they are typically well informed about what is happening on the road network and are familiar with all road signs.
- Transit users: they are often used to different kinds of toll collection systems from other countries. They may drive through some countries on a very irregular basis and might not understand the local language.

The above classification will look different at every road, but it is important to understand that each of these user groups has completely different needs when driving on toll roads. A frequent driver will look for a way to minimize his costs as much as possible while occasional drivers may look for the easiest way to pay their toll. However, all road users share the key interest of having an easy and secure access to the toll collection system.

Apart from the type of users, the type of vehicles may be classified in the following way:

- Motorcycles
- Light vehicles
- Heavy good vehicles
- Busses

These types of vehicles are often broken down into further details according to the number of axles, gross vehicle weight, vehicle dimensions, or the EURO emission class in order to target specific vehicles types even more accurately. This is, for instance, beneficial when aiming to improve the environmental protection and consequently targeting the major polluters on the road. Identical to the different types of users, it is important to understand that the drivers of the different types of vehicles have completely different needs when

driving on toll roads. For instance, heavy good vehicle users, typically, spend several hours driving per day while motorcyclists in Europe often drive on the summer weekends only.

While the general number of drivers on roads provides a good first indication for the system concept, knowledge about traffic volumes per type of users and type of vehicles allows to tailor the toll collection system to fulfill the defined objectives in the most efficient way. For instance, introducing a toll rate for heavy good vehicles only in order to improve the environmental protection makes only sense if the number of heavy good vehicles is sufficiently high.

3.3.5. Road network

Toll collection system can either be implemented as an open or closed system. That is, roadside infrastructure is either placed at entries and exits of the tolled road network ("closed system") or in between entries and exits of the tolled road network ("open system"). This classification can be applied to all types of roads, but in some instances an open system will be more favorable over a closed system and vice versa. The main disadvantage of closed systems is the higher amount of roadside infrastructure required while open systems need to have proper enforcement strategies in place in order to keep fraudulent use at a minimum.

Toll collection systems have been introduced for the following types of roads or a combination thereof:

- Bridges and tunnels
- Highways
- Secondary roads
- All roads
- City access

Before deciding on a system concept, the network size as well as the traffic volumes for the types of roads need to be well understood. Most toll collection systems have been implemented on highways due to the high traffic volumes at a limited network size. In a second phase, toll collection systems are, then, often extended towards secondary roads. This approach reduces the complexity at the beginning and allows to incorporate initial findings in any upcoming extensions.

The network size and the segment length (which is defined as distance between each entry and exit) are major parameters which influence the overall costs of a toll collection system as they directly impact the number of required roadside infrastructure, enforcement density (presence through stationary, portable or mobile enforcement equipment), and customer service centers.

The road conditions might impact the system concept as well. In some cases, for instance, the construction of roadside infrastructure might not be possible or extremely expensive due to the existing terrain. In other cases, the required communication infrastructure (wireless area network or cellular networks) might not be available yet which leads to additional costs as well.

3.4 Life cycle overview

Every toll collection system follows a certain life cycle. This section provides an overview about the main phases of the life cycle and explains the required actions within each of the phases. The government is heavily involved during all phases and therefore to a good part responsible for the successful introduction of a toll collection system.

The following figure displays the complete life cycle of a toll collection system from the definition of a transport policy to the toll collection system's extension, renewal, migration or elimination. The figure also provides rough indications on the duration of the individual phases. These durations depend to a good part on the status quo as well as the complexity and size of the project. The following sub-sections describe the required actions within each of the phases in more detail.

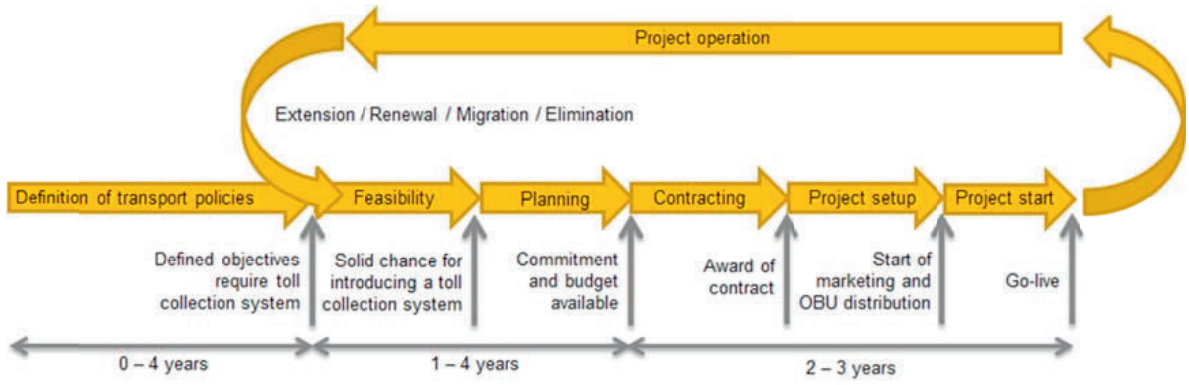


Figure 20 Life cycle overview of a toll collection system

3.4.1. Definition of transport policies

It is within the government's responsibility to define transport policies covering the state's vision and strategy regarding traffic and transportation for the upcoming years. If the objectives stated within these policies can be fulfilled by toll collection systems, then this is the signal for starting to investigate the potential introduction of a toll collection system. Already at this stage, it should be clear how the toll revenues will be allocated. The sponsors need to define the key resources driving the project and to identify the main stakeholders supporting the core team over the duration of the upcoming phases.

3.4.2. Feasibility

During the feasibility phase, all preconditions for the introduction of a toll collection system are analyzed. Only if the feasibility study shows that there is a solid chance for introducing a toll collection system, a more detailed planning phase shall be initiated. Among others, the following topics need to be analyzed during this phase:

- Traffic analysis: what is the existing capacity on the road network, what is the existing and expected traffic volume, which vehicles are driving on the road network,
- Road user analysis: who is driving on the road network, how do they perceive the existing traffic situation.
- Legal analysis: which road users and roads might be tolled, who will be the entity in charge for operating and enforcing the toll collection system, who is allowed to enforce violators, is it allowed to take license plate images of vehicles, is it allowed to stop road users, is there a process in place to penalize road users, is there a vehicle register database that can be utilized, which standards and regulations apply to the toll collection system.
- Infrastructure analysis: how does the existing and planned road network look like, in which condition is the road network, how is the availability of wireless area and cellular networks.
- Interoperability: which tolling technology is utilized by the neighboring countries, did they have similar objectives and how did they solve them.

3.4.3. Planning

In the planning phase, further information is collected based on the findings from the feasibility phase, the collected information is summed up in a high-level system concept (technology-independent), and the commercial feasibility is verified. If the introduction of a toll collection system is commercially feasible, a contracting period may start in order to find the most appropriate supplier(s). It is a prerequisite that, at the end of this phase, the government shows commitment to the introduction of a toll collection system, provides the budget required for contracting and plans budget for implementation and operation of the system. The following bulletin points list some of the most important actions during this phase:

- Interviews with industry experts
- Environmental analysis
- Public acceptance

- Time line
- Revenue forecast
- Business case calculation
- Contracting method
- Financing method
- System concept (independent of technology choice)
- Nomination of bodies in charge of toll collection and enforcement

3.4.4. Contracting

In this phase the contracting plan is executed. It may start with a pre-qualification questionnaire in order to limit the number of contestants. The government may tender or accept a direct investment for the introduction of a toll collection system. In any case, a requirements specification incorporating the findings from the investigation and planning phase needs to be created and distributed to the contestants. In addition, the assessment and acceptance criteria need to be well-defined in order to allow the final award of contract.

3.4.5. Project setup

Once the project has been awarded to one of the contestants, it is time to finalize the legislation and start obtaining the necessary permits for starting the development and construction works. The entity in charge of the commercial operation needs to be adequately staffed and trained prior to the project start. In addition, the marketing campaign and material need to be prepared – this might also include the setup of new traffic signs along the toll road network.

3.4.6. Project start

The project start phase starts prior to the actual go-live and ends with the go-live of the project. The reason for this early project start is to prepare and inform the public via the defined communication channels and to kick-off road user registration in order to distribute the registration peaks which require a certain level of customer care over a longer time period.

3.4.7. Project operation

Finally, the project goes live and needs to be taken care of on a regular basis. For this very reason, real-time monitoring and reporting of the defined KPIs is a necessity in order to identify whether the project is fulfilling the original business goals and transport policies. In addition, predictive and corrective maintenance including defined replacement cycles for the equipment is taken care of. Apart from the technical operation, the commercial operation ensures road user satisfaction and enforcement of violators. The commercial

operation also guarantees that road user feedback is incorporated into updated designs of the toll collection system. The collected revenues can be used as planned.

3.4.8. Extension / Renewal / Migration / Elimination

After a certain time of project operation, the life cycle starts again in order to trigger an extension (towards additional roads or users), renewal, migration of elimination of the toll collection system. This may be triggered by an updated transport policy, road user feedback, new legislation, end of contract or similar action.

3.9. Case studies

3.9.1. BelToll – Belarus' electronic toll collection system

Built and operated by Kapsch, the Belarusian toll collection system boosts the country's attractiveness for international transit

The Magistrale no. 1 (M1) is the strategically most important road in the country of Belarus. As part of the E30 expressway, the stretch – of approximately 560 kilometres between Brest in the western part of the country and Orscha in the east – has been expanded into a highway. M1 links two key economic areas: the European Union and the Russian Federation. The fully electronic toll collection system of M1 enables smooth traffic flow along the route – and subsequently on other Belarusian roads. The toll collection is entirely automatic, and functions without any disruption of traffic or stopping of vehicles. Moreover, the collected revenues can be used for maintenance, modernization and expansion of the road network.

The most attractive route between Europe and the Russian Federation

The transit road through Belarus has become the most attractive route for transport between Europe and Russian Federation. With alternative routes being approximately 1,000 kilometers longer, the passage through Belarus saves time and contributes to a reduction in CO2 emissions. Since Belarus is a member of a customs union with the Russian Federation and Kazakhstan, there are further logistical advantages. The reduction in transit time and fuel costs underscores the attractiveness of M1 in comparison to alternative routes – on which tolls are also collected. These advantages are also reflected in the road's utilization. Around half of the traffic on the M1 is attributed to transit. The largest share of the vehicles comes from the Russian Federation (12 per cent), Ukraine (10 per cent), Poland (10 per cent) and Lithuania (7 per cent). Around 80 per cent of all vehicles have a total weight of more than 3.5 tons and only around 16 per cent weigh less than 3.5 tons. Five per cent of the tolls collected are attributable to buses. In summary, more than 200,000 vehicles have been registered by BelToll since its launch in July 2013.

A proven system

The BelToll system is based on a proven technology that is used in countries all over the world. In Europe alone, eight of the national "multi-lane free-flow" (MLFF) toll collection systems are already in daily use. The system consists of an On-Board Unit (OBU) placed inside the vehicle which provides

communications with the road-side infrastructure via DSRC (Dedicated Short-Range Communication, or "microwaves" as commonly called). The vehicles pass through the toll collection points, and fees are calculated and charged automatically. Ninety such check points already exist in Belarus alone – found along its most important highways. Including M1, the network has a total length of 1,189 kilometers. Fifty-two customer service centers throughout the country provide road use contracts, lease out OBUs in return for deposits, and top up customer's credits. In Belarus, the launch was accompanied by a major information campaign, which is partly responsible for BelToll's high acceptance level in the country.

Financing and additional jobs

The BelToll system was commissioned in July 2013. The majority of the revenues flow into modernization and safety measures for the toll roads. This has an immediately visible impact. What is less obvious, but of great significance for the economic development of the country, is the fact that BelToll has created new jobs in Belarus. All of the approximately 150 employees are Belarusian citizens.

3.9.2. Chile

Over the last two decades, the Chilean government has developed a plan of concessions under the Build, Operate and Transfer (BOT) model and has transferred the role of the investor in the construction of public infrastructure (particularly on the main road network) to the private sector. Private groups are accountable for the investments to build, equip the roads, operate and maintain them. Investment and maintenance costs are recovered by applying a 'user pays' approach and collecting toll fees for the concession period.

In 2005, the capital city of Chile, Santiago pioneered the development of concession-interoperable and multi-lane free-flow urban highways. This network crosses the city from North to South (Autopista Central), from East to West (Costanera Norte), while also covering the North-western (Vespucio Norte) and Southern (Vespucio Sur) ring road surrounding the busy metropolitan area of 7 million people. The urban highway network was also extended to the San Cristobal Tunnel connecting the downtown and the Northern areas of the city. Another concession (AMB) was awarded operation of a fast route to the Santiago International Airport. In 2014, the Ministry of Public Works contracted the Spanish group OHL for the Vespucio Oriente motorway completing a ring road linking Vespucio Norte and Vespucio Sur.

In this context, interoperability enables any customer of one of these concessions to use one single electronic identification On Board Unit (OBU) for all electronically operated concessions, and to receive only one single invoice at the end of the month with the accumulated toll fees (1 provider/1 contract/1 invoice principle). Interoperability further enables access to newly installed multi-lane free-flow networks and to new developments, such as parking or traffic management.

The Ministry of Public Works ensured interoperability by establishing a well-structured legal and technical framework and a central database for the National Record of OBU Users (RNUT) as well as by using the DSRC CEN-278 standard as common electronic transaction protocol based on the Chilean ST1 norm.

Between 2003 and 2013, the applied scheme for the Metropolitan Area of the city could manage a near doubling of the population from 925,000 to 1,695,000 vehicles. The initial investment of 1,500 million US dollars by road concessionaires had an important impact on the local economy and proved attractive for further investments. The multi-lane free-flow system— implemented and technically maintained by the Austrian company Kapsch—has not only increased user convenience with many add-on services, but has also freed the urban space of the previous infrastructure toll plazas. The changes contributed to road safety and to travel time savings of up to 50 per cent, as well as considerable reductions in petrol consumption and negative externalities such as air pollution and noise.

3.9.3. viaTOLL – Poland's electronic toll collection system

viaTOLL is a modern tool used for collecting money from drivers travelling on the tolled road network in Poland. The system has been operating since July 2011, and by the end of December 2014 it generated incomes of nearly 4 billion PLN. The viaTOLL system is also an important source of numerous statistics regarding current trends in transport.

The number of vehicles registered within the system is steadily increasing - from about 766.000 in January 2014 to over 843.000 in January 2015. At the same time, drivers and fleet managers continue to replace old vehicles with new modern and more ecological cars.

Income

Since July 2011 the National Road Fund (NRF) has been credited with nearly 4 billion PLN from viaTOLL. The year 2014 was marked by further stable growth of the system's revenues, resulting from the maintenance of the previous transport volume and further extensions of toll road network in Poland. In 2014, total revenues of the viaTOLL system amounted to 1,42 billion PLN. The toll income has increased by nearly 20per cent (which is 230 million PLN) on an annual basis.

Users and payments structure (HVs)

Polish haulers are still the largest group registered within the viaTOLL system. The most frequent group of foreign drivers are Germans (51,980), Lithuanians (32,079) and Czech (28,544). What's interesting, in spite of the escalation of political conflict in Western Europe and economic sanctions, are the increases in the number of registered vehicles from Russia (increase to 26,363) and the Ukraine (increase to 26,438).

Fleet structure – economically and ecologically

While analyzing the viaTOLL data it is easy to notice the occasional increase in the number of vehicles in the most rigorous EURO 6 emission class. At the very beginning of the year 2014 EURO 6 HVs constituted about 0.5per cent (about 3,600), and by the end of the same year their number grew to 3.2per cent (28,457) of all registrations. This is quite a significant change – an increase of 790per cent within one year. EURO 5 vehicles also noted an important increase – from 272,189 to 319,601 (by 17.4per cent).

With regards to lower emission classes, a decreasing number of EURO 1,2,3 is still visible. At the same time, the number of EURO 0 vehicles remains stable. Most probably, this is caused by farm machines and very old HVs used by individual users on short-distance routes.

Light vehicles – electronic and manual toll collection

The drivers of motor vehicles and combination vehicles with maximum permissible weight ≤ 3.5 tons are liable to settle toll for the use of toll sections of A2 and A4 motorways managed by GDDKiA. They can choose two payment options: manual or electronic (using viaAUTO service). In 2014, the National Road Fund (NRF) was credited with over 196 million PLN paid by drivers of light vehicles. 191,5 million PLN were paid manually.

viaAUTO service has been operating from 1st June of 2012. On 15th July of 2014 GDDKiA indicated special fast lanes for its users. The introduction of viaAUTO lanes and the promotion of OBUs resulted in the number of viaAUTO users increasing to nearly 20,000 and the percentage share of tolls paid with the use of viaAUTO service amounted to 2.4per cent. The income statistics show that since the beginning of the viaAUTO sales promotion, the total number of electronic tolls paid by passenger vehicles has significantly grown.

Chapter 4 Alternative Ways to finance transport infrastructure

4.1 Land Value Taxation

Land Value Taxation is a method of raising public revenue by means of an annual charge on the rental value of land.

Although described as a tax, it is not really a tax at all, but a payment for benefits received. It would replace, not add to, existing taxes. Properly applied, Land Value Tax would support a whole range of social and economic initiatives, including housing, transport and other infrastructural investments. It is an elementary fiscal measure that would go far towards correcting fundamental economic and social ills.

Land value taxation (LVT) is so beloved of economists because, in theory, it does not distort decision making. Suppose a land value tax of one per cent on land value is introduced tomorrow. There can be no supply response: there would still be as much land as there is today. Neither would consumers' preferences change, as land would be no more useful, either. So, if the market for land is competitive, no transactions would be deterred or encouraged. All that changes are the price, which falls until it exactly offsets the discounted cost of paying the tax forever. The buyer assumes the burden of paying the tax, so all things considered is no better or worse off. Landlords are unable to pass the tax on to tenants, because the supply and demand of rented land is unchanged too. Furthermore, if LVTs replaced property taxes, incentives against improving homes and developing land would be removed. Yet LVT would continue to account for "undeserved" gains landowners make on the investment of others, such as the government improving nearby transport links.

But if LVTs are so great, why are they so rare? One explanation is that it is too difficult to value land separately from what sits on it. There is not much of a market, for example, for undeveloped land in central London. However, some think this can be overcome. The 2010 Mirrlees Review of British taxation argued that bean-counters could compare the price of similar buildings in different locations, for instance. In any case, the efficiency of the tax does not depend on accurate valuations. The bigger barrier is political. LVTs would impose concentrated costs on today's landowners, who face a new tax bill and a reduced sale price. The benefit, by contrast, is spread equally over today's population and future generations. This problem is unlikely to be overcome. Economists will continue to advocate LVTs, and politicians will continue to ignore them[11].

[11] The Economist "Why land value taxes are so popular, yet so rare", http://www.economist.com/blogs/economist-explains/2014/11/economist-explains-0

4.1.1 The advantages of Land Value Tax

A natural source of public revenue: All land makes its full contribution to the Exchequer, allowing reductions in existing taxes on labor and enterprise.

A stronger economy: If we tax labor, buildings or machinery and plant, we discourage people from constructive and beneficial activities and penalize enterprise and efficiency. The reverse is the case with a tax on land values, which is payable regardless of whether or how well the land is used. It is a payment, based on current market value, for the exclusive occupation of a piece of land. In the longer term, this fundamentally new and different approach to revenue raising will stimulate new business and new employment, reducing the need for costly government welfare.

Marginal areas revitalized. Economic activities are handicapped by distance from the major centers of population. Conventional taxes such as VAT and those on transport fuels cause damage to the remoter areas of the country. Land Value Tax, by definition, bears lightly or not at all where land has little or no value, thereby stimulating economic activity away from the center - it creates what are in effect tax havens exactly where they are most needed.

A more efficient land market. The necessity to pay the tax obliges landowners to develop vacant and under-used land properly or to make way for others who will.

Less urban sprawl: Land Value Taxation deters speculative land holding. Thus, dilapidated inner-city areas are returned to good use, reducing the pressure for building on green-field sites.

Less bureaucracy. The complexities of Income Tax, Inheritance Tax, Capital Gains Tax and VAT are well known. By contrast, Land Value Tax is straightforward. Once the system has settled down, landholders will not be faced with complicated forms and demands for information. Revaluation will become relatively simple.

No avoidance or evasion. Land cannot be hidden, removed to a tax haven or concealed in an electronic data system.

An end to boom slump cycles. Speculation in land value - frequently misrepresented and disguised as "property" or "asset" speculation - is the root cause of unsustainable booms which result periodically in damaging corrective slumps. Land Value Taxation, fully and properly applied, knocks the speculative element out of land pricing.

Impossible to pass on in higher prices, lower wages or higher rents. Competition makes it impossible for a business producing goods on a valuable site to charge more per item than one producing similar goods on less valuable land - after all, producers and traders at different locations are paying different rents to landlords now, yet like goods generally sell for much the same price and employers pay their workers comparable wages. The tax cannot be passed on to a tenant who is already paying the full market rent.

An established and proven system. Local government variants of Land Value Taxation, known as Site Value Rating, are accepted practice in, for example, Denmark and Australia.

Compared to taxes on buildings Land Value Taxation provides a broad tax base because it would include all empty properties and empty sites.

LVT would encourage new capital investment rather than sterile land speculation as it would encourage a shift of private investment from land speculation (which creates no extra land but only higher land prices) to productive enterprises.

LVT would encourage the use of empty sites zoned for development, creating more job opportunities and wealth.

LVT would help avoid urban sprawl. As brown field sites would be developed within towns and cities it would be unnecessary to permit urban sprawl. Compact towns are also more efficient in their use of resources for transport and other services.

LVT could not be avoided. (Unlike income tax and business taxes where tax avoidance experts are in great demand and the 'shadow economy' flourishes to evade taxes.) Every landowner would be required to register their land and to pay LVT on all their land holdings. With LVT any site with no registered owner would be sold by auction for the benefit of the Government.

LVT would provide automatic compensation for those sites which are disadvantaged by a new development. For example: with a new railway line most sites (especially those near stations) benefit from big increases in land values but some sites (maybe housing close to the track and suffering from its noise and vibration) would lose some value. These sites would pay a lower Land Value Tax, providing automatic compensation without any complicated appeals system.

Lower interest rates. The Bank of England tries to control land price and hence property inflation with a higher base rate. LVT would act as a damper on escalating land prices, allowing the Bank to lower interest rates for the benefit of homeowners, industry and small firms.

4.1.2 LVT Finances transport infrastructure

Whenever a new road is built land prices in the catchment area, especially around the junctions - will rise. But also, existing roads add to local land values. These phenomena of providing landowners with a gift from road building do not only apply to roads it applies to ALL new and existing infrastructure including public transport.

CANARY WHARF in London's disused Docklands in the 1980s

Over 60,000 workers can access these offices every day because of the public investment in new roads, the Jubilee Line Extension and the Docklands Light Railway. The drop-in value of this land would be huge, if this massive public investment in transport infrastructure had not been provided, and less than 6,000 people were able to access the site daily. The London Underground Jubilee Line extension, which cost taxpayers £3.5 billion, could have been financed in this way. At the time, it was estimated that because of the extension, land values near just two of the stations, Canary Wharf and Southward, increased by £2.8 billion, and, over the whole extension, by some £13 billion. In other words, had LVT already been established, the public would have been the beneficiaries from the higher land values created, instead of the private owners of land in those areas, who had contributed nothing to the project.

Source: Mr. Dave WETZEL FCILT, Chair International Union for Land Value Tax

How Harrisburg in the US was transformed through a land value tax.

In the United States, many local authorities, including Harrisburg, the capital of Pennsylvania, operate a so-called split-rate tax system, in which buildings and land are taxed separately. Some bias it towards buildings and others towards land. The evidence is that the more it is biased towards land, the more this benefits the local economy – which is what would be predicted by the theory of land value tax – because the more that land is taxed the more this provides an incentive to invest capital on the land in the form of buildings and other economic activities. That is precisely what happened in Harrisburg after the city authorities more than doubled the tax rate on land, while reducing the rate on buildings, such that the rate for land was three times that for buildings.

In 1982, before the change, Harrisburg, with a population of 52,000, was listed as the second most run-down city in the US. Since then, following the change, empty sites and buildings have been re-developed, with the number of vacant sites by 2004 down by 85 per cent. The city authorities have issued over 32,000 building permits, representing nearly $4 billion of new investment – nearly 2,000 were issued in 2004 alone. Over 5,000 housing units have been newly constructed or rehabilitated, and the number of businesses has jumped from 1,908 to 8,864, with unemployment down by 19 per cent. Furthermore, crime has fallen by 58 per cent, and the number of fires has been reduced by 76 per cent, which the authorities say is due to more employment opportunities, and the elimination of derelict sites, making vandalism less likely. They list 40 other positive benefits, including much improved public amenities. More recently, the bias towards tax on land is now six to one compared with three to one originally. This will likely further enhance the trends from which the city has already benefited.

Meanwhile, the heightened economic activity has increased public revenues, not only from land and buildings, but also from other taxes, thus benefiting public services. And it has increased quite dramatically both the value of land and that of buildings, from around $400 million in 1982, in today's prices, to $1.7 billion now. This has enabled the authorities to reduce the rate of tax on both land and buildings. Not surprisingly, this system of taxation has been politically popular, with Mayor Steven Reed Jr being re-elected continuously since 1982.

One constraint has been the fact that 47 per cent of the land in Harrisburg is occupied by state, federal, educational and charitable institutions, which, anomalously, are exempt by State law from property taxes. However, some of that lost revenue has been clawed back through charges on water, gas and electricity supplies, which are publicly owned – perhaps another lesson that we can learn from Harrisburg.

Meanwhile, another city in Pennsylvania, namely Pittsburgh, has gone in the opposite direction with its split-rate tax system. In 2000, it reduced the rate of tax on land to the same lower rate as that for buildings. Voters were persuaded that they would pay less tax. In fact, for most, taxes have increased, because the council has had to raise the tax rate on buildings to make up for the revenue lost through lowering the tax on land. Within just the first two years, it led to new construction falling by 21 per cent, and businesses moving out of town on a regular basis – which, again, is what would be predicted by land tax theory.

Source: Land Value for public benefit, Jerry Jones, Labor Land Campaign, http://www.labourland.org/downloads/papers/land_value_for_public_benefit.pdf

Public Transport Cost and Housing Price: The Tallinn case study

The global economic downturn has certainly shaken the market foundations of Estonia and its capital Tallinn, and this observation is particularly relevant when examining the real estate market. The real estate market is prone to instability and volatility with a cyclical behavior that can influence the aggregate output. The empirical evidence suggests that the public transport cost index has a positive effect on property values, in other words in districts where a lower public transport cost exists the housing price has decreased less than in districts with a higher public transport cost.

In general, the cost of public transport investment cannot be refunded only through operational revenues so, to satisfy the criteria of investment feasibility, the theory of land value finance has been developed to accrue the increase in real estate value due to the transport investment. Tallinn has already implemented a land tax mechanism to capture the increase in property value within its legal and planning framework.

The Land Tax is a local tax implemented in July 1993. Between 1993 and 1996 the revenue of this tax was divided between the Estonian central government and local authorities, but after 1996 it became a local tax and the entire revenue was designated for the municipality and local budgets. Land tax is borne by the owner of the land or in some cases by the user of the land; the tax rate is between 0.1 and 2.5per cent of the annual assessment of the land value, and the tax rate is established by local government councils at the start of each taxation year.
The Land tax is paid on all land except:
(1) where economic activity is prohibited; (2) land attached to diplomatic buildings or consular missions of foreign countries; (3) cemeteries and land used for places of worship; (4) land used by foreign countries or international organizations; and (5) land used by the headquarters of allied forces. Land Tax is not paid on land in municipal ownership or land in public use based on local authority decisions.

The Land Tax is a tax based on the value (estimated) of the entirety of Estonian land, and, is defined by law as a land value tax where the market value of the plot is taxable. According to the Land Valuation Act the valuation target is “plots of land without buildings, forest, other vegetation or accessories situated thereon”. Only the land itself is taxable, any improvements (buildings and business activities) are ignored entirely, and land valuations are based on good practice: internationally-recognized principles of valuation immovable (such as the sales comparison method, capitalized earning method, cost method).

Source: Mr. Luca Coccinellid and Mrs. Francesca Romana Medal, QASER Lab, University College London
https://www.ucl.ac.uk/qaser/pdf/publications/starbei3

4.2. Infrastructure plus Property approach.

The infrastructure plus property approach is where the Government provides the construction authority (i.e. railways) with land "development rights" at stations or depots along the route. To convert these development rights to land, the construction authority pays the government a land premium based on the land's market value without the infrastructure project. Therefore, the construction authority makes money from the property-value increases that typically follow the construction of the infrastructure.

The "Rail plus Property" model: Hong Kong's successful self-financing formula.

Hong Kong's MTR Corporation has defied the odds and delivered significant financial and social benefits: excellent transit, new and vibrant neighborhoods, opportunities for real-estate developers and small businesses, and the conservation of open space. The whole system operates on a self-sustaining basis, without the need for direct taxpayer subsidies.

MTR's railway system covers 221 kilometers and is used by more than five million people each weekday. It not only performs well—trains run on schedule 99.9 percent of the time—but makes a profit: $1.5 billion in 2014. MTR fares are also relatively low compared with those of metro systems in other developed cities. The average fare for an MTR trip in 2014 was less than $1.00, well under base fares in Tokyo (about $1.50), New York ($2.75), and Stockholm (about $4.00).

One important reason the system has been able to perform so well is that the government of Hong Kong has enabled MTR to make money from the property-value increases that typically follow the construction of rail lines. The key is a business model called "Rail plus Property" (R+P). For new rail lines, the government provides MTR with land "development rights" at stations or depots along the route. To convert these development rights to land, MTR pays the government a land premium based on the land's market value without the railway.

MTR then builds the new rail line and partners with private developers to build properties. The choice of private developer is made through a competitive tender process. MTR receives a share of the profits that developers make from these properties; this share could be a percentage of total development profits, a fixed lump sum, or a portion of commercial properties built on the site. By capturing part of the value of the land and property around railway lines, MTR generates funds for new projects as well as for operations and maintenance. That is why it does not need government subsidies or loans. Revenues from R+P developments above stations along MTR's Tseung Kwan O line, for example, financed the extension of that line to serve a new town, which has since grown to a population of 380,000.

MTR has applied the R+P model extensively. Buildings sit over about half of the system's 87 stations, amounting to 13 million square meters of floor area. New projects being planned or developed will add another 3.5 million square meters. A large proportion of MTR's current investment-properties portfolio of more than 267,000 square meters came from the sharing of assets.

The financial advantages of the R+P model have been proved over time. Instead of having to pay construction costs or take on the risks of building a world-class railway, the government collects proceeds from the land premium and profits from its roughly 76 percent stake in the company, which is listed on the Hong Kong Stock Exchange. During the 2014 financial year, MTR paid $590 million in dividends to the government. The R+P model also allows MTR to implement railway projects relatively quickly because it does not have to compete for public funds.

This model has become more than a source of railway financing; it is a critical part of Hong Kong's urban-development approach. Planners and government agencies seek to make every new railway line or extension into a corridor where well-planned, high-quality communities can flourish.

Source: Lincoln Leong, Voices on Infrastructure: Novel solutions March 2016, Global Infrastructure Initiative by McKinsey & Company

4.3. The regulated asset base (RAB) model.

If the revenue receipts from sales are insufficient to cover maintenance renewals and new investment sufficient to maintain the supply of goods and services, the supply capacity of the physical capital stock (and typically the value of the (operating capital maintenance (OCM)) will erode unless topped up from subsidies of one kind or another. Conversely, if the revenue receipts are insufficient to cover depreciation and earn a normal rate of return on the replacement cost of the assets, the value of the financial capital maintenance (FCM) will erode, again, unless the government provides some explicit or implicit subsidy or other financial input. The RAB this becomes crucial as a mechanism for FCM protection of private investors on infrastructure industries[12].

The regulated asset base (RAB) model

The RAB represents 'the regulated company's past investments, comprising what investors paid when the assets were originally privatized, plus the completed efficient CAPEX since then, adjusted for depreciation. Thus, at any given time, the RAB refers to the cumulative historical investment made by the company, net of cash recovered from regulatory depreciation. The RAB is also usually indexed to a measure of price inflation to allow for the effects of inflation on the regulated company's capital stock over time.

Under the RAB model, investors can earn revenues which cover three elements.

a) An allowance for the depreciation of the RAB over time, calculated according to established regulatory techniques (i.e., a return of capital invested). Depreciation is calculated with reference to asset lives and can be straight line, front - loaded or back- loaded according to the preference for the recovery of sunk costs over time. The choice of depreciation profile is NPV - neutral, but can be altered to reflect the allocation of risk between the company and customers, inter-generational equity,

[12]Jon Stern, Centre for Competition and Regulatory Policy (CCRP) , THE ROLE OF THE REGULATORY ASSET BASE AS AN INSTRUMENT OF REGULATORY COMMITMENT
https://www.city.ac.uk/__data/assets/pdf_file/0010/167617/CCRP-Discussion-Paper-22-Stern-March_13.pdf

and efficient capacity utilization.

b) A return to investors based on the value of the RAB (i.e., a return on capital invested). This has typically been calculated by multiplying the RAB by a weighted average cost of capital (WACC) (i.e., an average of the cost of equity and the cost of debt). The WACC is intended to reflect the opportunity cost of the investments made by the investor.
c) The forecast level of operating expenditure (OPEX) associated with the day - to-day operation of the network. These are compensated on a pay – as – you - go basis.

Crucially, the RAB model provides a guarantee to investors that they will earn a return not only on new CAPEX and OPEX, but also their sunk investments in the network. This guarantee typically takes the form of statutory legislation which places a duty on the independent regulatory body to ensure that it sets the company's allowed revenues such that the company can finance its regulatory functions (so long as it is run efficiently). Although it has never been formally tested, companies can have recourse to the courts if the regulator does not meet its duty. It has thus been seen 'as a particularly credible and robust long -term contract ultimately guaranteed by law'

The traditional RAB model applied in the utility sector could also be extended to new infrastructure investments. Consider, for example, an asset that has been built, presumably under contracts closer to traditional government procurement. To apply the RAB model in this context, the government would have to repackage the asset at the refinancing point to sell on to new financial interests, potentially via a national infrastructure bank. In this context, the repackaging might not necessarily have to be applied to only one 'infrastructure asset', but could instead incorporate an entire regional network (such as the roads example), or a collection of smaller, unrelated projects. If multiple projects are bundled, there would be potential for cross- subsidization across projects, if this was considered necessary or desirable. This could be especially beneficial where a small project has significant economic benefits (i.e., positive externalities) but is not commercially viable on its own (and thus would not be pursued by the private sector in isolation).

Under the RAB model, the assets owned by the private sector would be regulated by an independent economic regulator. Hence, the RAB and regulation are intertwined. The regulator would be responsible for calculating allowed revenues and setting allowed prices while reflecting the underlying business characteristics in the relevant sector. For example, regulation could be introduced in the form of a price cap, revenue cap or yield cap. These alternative forms differ in terms of the allocation of the demand risk: under a price cap regime, the volume element of demand risk is borne by the regulated company, while in the case of a revenue cap the demand risk is passed through to consumers in full in the form of a higher allowed price if outturn volumes are lower than forecast.

Source: Mr. Andrew Meaney and Mr. Peter Hope Alternative Ways of Financing Infrastructure Investment: Potential for 'Novel' financing Models, Discussion Paper 2012, ITF, OECD. http://www.oecd-ilibrary.org/docserver/download/5k8zvv4vqj9s-en.pdf?expires=1516105199&id=id&accname=guest&checksum=0AB362299D04ABF49BA09FE2A90E914C

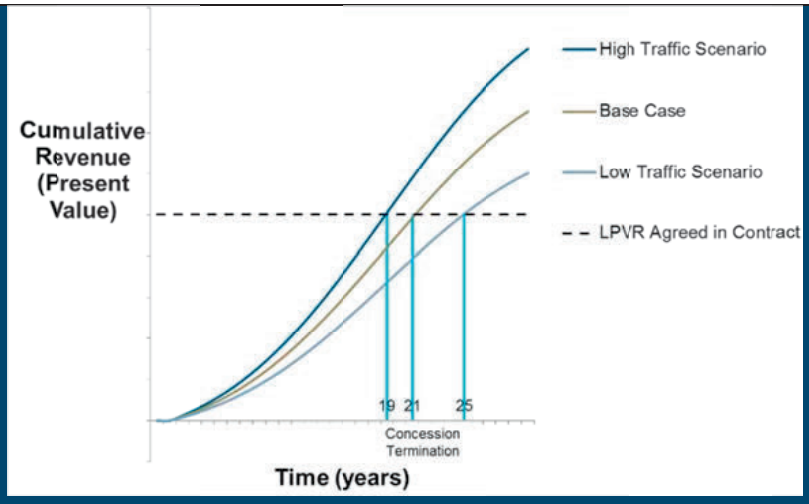
4.4 The Least Present Value of Revenue' (LPVR) mechanism.

The 'Least Present Value of Revenue' (LPVR) mechanism, which aids concessionaires, educes traffic risk and engenders wider investor participation. How LPVR helps is by allowing adjustment of the contract period based on the revenue quoted and received. Contracts are awarded to bidders quoting the least present value of money realizable from future revenues. If actual revenue realization is slower, then the concession period gets extended till such time the least present value revenue bid for is achieved. Conversely, if realizations are higher, the concession period is shortened. By doing so, the market risk gets transferred to time risk.

Chile's "Least Present Value of Revenues" Toll Road Model

In the early 1990s Chile introduced private capital into the transport infrastructure sector through a form of PPP known in Chile as BOT concessions. The concessionaire was to recover its investment from tolls paid by users, in some cases supplemented with a subsidy
from the government. Two features distinguish road PPPs in Chile from those in many other countries. First, most of the projects are substantial upgrades to existing roads, rather than construction of new roads. Second, most toll roads in Chile do not have free parallel roads competing with them, since Chile is roughly 5,000 kilometers long but only 100 kilometers wide, and has a low population density.

The Least Present Value of the Revenues (LPVR) mechanism was developed in response to a proposal from an official in the Chilean Ministry of Public Works. The contract is awarded to the bidder who offers the least present value of the accumulated revenues (that is, the lowest amount of toll revenue that will be collected by the contractor), discounted according to a discount rate pre-fixed in the contract. The contract ends when that LPVR had been reached (that is, when the pre-agreed amount of toll revenue has been collected).
Consequently, if real traffic is ultimately higher than expected, the contract will finish earlier, whereas if it is lower the contract will finish later. (See the diagram on the following page.) Under this mechanism, the revenues are discounted according to a discount rate that reflects the weighted average cost of capital of the project. The LPVR requested by the
Bidders becomes the key financial variable in selecting the bidder that will win the tender. Beyond the risk mitigation effect, LPVR provides the government with a price to buy out the contract, a feature thought to discourage the contractor from renegotiation since the government can opt to buy out the contract at the established price. LPVR was not only designed as a mechanism to mitigate traffic risk, but also as a procurement mechanism regulating the amount of toll revenue raised over the life of the PPP contract.



Source: Jose´ M. Vassallo, "Traffic Risk Mitigation in Highway Concession Projects: The experience of Chile", Journal of Transport Economics and Policy, Volume 40, Part 3, September 2006, pp. 359–381.

4.5 Non-fare box revenue (NFR)

The Railways earn money by carrying passenger and goods for which they charge money through fares and freight respectively. These are tariff earnings or fare-box revenue. Everything else falls in the category of the Railways' non-tariff earning or non-fare revenue. Advertising could be a major source of non-tariff revenues. Extra services such as concierge services, on board internet and catering are extra non-tariff revenues. In addition to these the transformation of the rail stations to shopping malls or offices as well as the provision of door to door online services including ride sharing could be major non-tariff revenues that could contribute to infrastructure or rolling stock financing.

The Japanese Rail Industry – business diversity and real estate integration

Many of the Japanese private rail companies have diversified so effectively into non-rail, but rail-supportive business streams, that the rail component of revenues and profits is now a minority stream within the overall portfolio of activities. This is exemplified by companies such as Hankyu (2009) whose operations extend initially into other streams of transport such as taxis and buses. But activities in real estate, retailing, entertainment, travel and hotels are also part of the mix – to the extent that the famous Hanshin Tigers baseball team of Kobe is Hankyu-owned.

"Of our six core businesses, the main drivers are the Urban Transportation and Real Estate segments, accounting for about half of all revenues from operations and 80per cent of operating income. In the Urban Transportation segment, railways account for most earnings, while rental businesses generate most earnings in the Real Estate business, ensuring a stable cash flow" (Hankyu Corporation 2009, p. 2).

If the outstanding non-ticket -based revenue performance of Japanese rail is considered on its own, it appears that international operators, have everything to gain from further

engagement with the Japanese rail business model. This business diversification has delivered a series of broader benefits to Japanese rail operators, as Shoji (2001) points out, ridership growth; demand-smoothing owing to non-peak counter-flows; internalisation of the economic benefits of rail infrastructure and service; the development of a market-oriented outlook; and the reduction of costs directly accrued to rail operations.

Source: Chris Hale and Phil Charles, Cooperative Research Centres Programme, established and supported under the Australian Government, "Rail Operator Business Models", January 2011

4.6 Ride sharing services

Ride sharing services indirectly can finance sustainable transport infrastructure. Increasing ride sharing services will result to less cars circulating in the cities and to more users of public transport. Therefore, budgets can be shifted from traditional transport infrastructure construction such as parking spaces or roads expansion to more sustainable ones such as cycling lanes, tram lines etc.

Uber and Public transport funding challenges

Infrastructure funding challenges should be addressed in a holistic way. One means to increase the return of investment of infrastructure challenges is to increase the use of public transport and decrease private car use. This change of mobility culture can be incentivised through policy solutions such as congestion charging. The cost of driving ultimately needs to reflect its cost to our cities and the people living in them. By charging a fee for all vehicles (private motorists, delivery vehicles, taxis, and services like Uber), road pricing creates an incentive for everyone to share space more efficiently and shift towards shared and active transport. By encouraging our urban space to be used more efficiently, we can unlock a whole range of opportunities. We can transform road space and parking space into more human-centered uses such as affordable housing, well connected bicycle lanes, wider sidewalks, public pedestrian zones, and loading zones for taxi, ridesharing and delivery services. Designating loading zones in place of parking can reduce traffic congestion and ensure safer and smoother operation on city streets. We can create real multimodal shared mobility networks in cities and work towards a higher modal share of public transport and a higher return of investment in transportation infrastructure.

Research suggests that ridesharing services can be a part of the solution here.
The recent report of the European Parliament Research Service, 2017 finds that ridesharing substitutes private car ownership and is a key complement to mass-transit since it has the potential to reinforce the weak points of mass-transit (low-density areas, late night services, specific needs).
A 2016 McKinsey report notes that ridesharing can support public transport on underperforming routes and thus reduce costs: "While mass public transit will remain

essential to avoid untenable congestion, from an economic standpoint, it may be most sensible to discontinue underperforming public transit routes and subsidize privately operated shared mobility instead."

The paper "Public transport at the heart of integrated urban mobility solutions" published by UITP, the Global Association of Public Transport, points out that "car-based services and especially car-sharing are the obvious services that complement public transport as they offer the benefits linked to car usage without the need to own the car".

The American Public Transportation Association published a recent study that found that people who routinely use "shared modes" of transportation (e.g., bike sharing, car sharing, and ridesharing) were more likely to use public transport. An independent poll among a sample of 10.000 people across 10 European cities found that 67per cent think mobility apps such as Uber could be an alternative to owning a car. This number is higher among people who have used ridesharing the past 12 months (80per cent). This does opens new perspectives for public transport. A 2017 research paper from Pan-European NGO Transport & Environment found that a 10per cent reduction in car ownership is estimated to double demand for public transport and that "Ride-sharing apps encourage a behavioural shift towards multi-modal, sustainable transport which complement public and active forms of transport (cycling and walking)".

Besides fostering the use of public transport, we also observe that ridesharing has become a first mile/last mile complement with public transport in cities around the world. As a case in point, in London, 30per cent of Uber rides in the outer boroughs during the morning rush hour end within 200 metres of a Tube or train station. Since the Night Tube started its services in London, Uber journeys starting within 200 metres of Night Tube stations during the hours when the Night Tube is operational have increased by 22per cent. Outside of central London, there has been an important increase of 63per cent in Uber journeys starting near Night Tube stations - with some of the stations having seen an increase of more than 300per cent.

To build upon the organically grown complementarity between Uber and public transport, we are partnering with public transport authorities to create tailormade solutions for underserved areas, late night transportation, persons with reduced mobility or the socially disadvantaged. In the following we will provide a brief analysis of two case-studies of partnerships between public transport authorities and Uber - and the financial implications on public budgets.

Uber's Partnership with the MBTA

Through the On-Demand Para public transport pilot program with the MBTA, eligible RIDE users will now have access to the convenience and reliability of Uber's platform and transportation on-demand.

How it works:

- Riders eligible for the MBTA's Para public transport program (The RIDE) can apply for the program
- Riders receive a set number of subsidized trips each month.
- This varies by user based on his/her previous usage of the traditional service.

- Right now, we have 3 caps: 2 trips, 20 trips, or 25 trips.
- The first $2 of each trip will be charged to the payment method tied to the rider's Uber account, and the MBTA will be covering up to an additional $13 of each fare. Anything over that amount will be automatically billed back to the rider.

Results:
- The program was originally limited to 200 users; however, earlier this year the Governor expanded the program to all eligible users of the Para public transport program (1300 customers in total)
- There has been a 31per cent increase in all trips taken as part of the MBTA's Para public transport program
- There has been a 4per cent decrease in overall cost to serve pilot customers
- There's been a 27per cent reduction in average cost / trip for all trips taken on the pilot ($31 to $23)

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Canada's first Ridesharing-public transport partnership

The Town of Innisfail and Uber have come together to bring safe and convenient, on-demand transportation to the town–Canada's first ridesharing and public transport partnership.

Through this partnership, the Town of Innisfil will subsidize a portion of the fare for all trips taken by residents within Innisfail, while offering additional subsidies for rides going to and from public transport hubs. In addition, the Town of Innisfail has also partnered with Barrie Taxi as part of this new on-demand public transport model to provide accessible rides.

The partnership extends the cities public transport and connects citizens to local transport hubs while saving town taxpayers' money.

This partnership will help Innisfil residents connect with the Barrie-South GO Station, and the local GO Bus line. In August 2017, the Town of Innisfil released their first report-back at their City Council meeting. This Stage 1 report looked at the results from the first 2 months of the partnership and came to the following conclusions:
- The program is on budget to last for at least the estimated 6-9 month duration.
- The total costs after 2 months have been $26,462 for the while there would have been a $270,000 start-up net cost for one bus and $610,000 for two buses running along routes servicing only a small portion of the Town.
- The report concludes that the cost of a fixed-route bus system to service all of Innisfil would have been far greater and a less convenient option than through the current partnership with Uber.
- The Town also indicates in the report that they are pleased with the results from the first 2 months of the partnership and that Uber has provided a convenient service accessible to all residents of Innisfil.

Source: Mr. Marius Macku, UBER Senior Associate, Public Policy & Government Relations, EU

Chapter 5 Conclusions and recommendations

Traditionally, there are only two primary sources of public revenue: **taxpayers and transport infrastructure users**. Other primary sources of public funding—such as tolls, vehicle registration fees, driver's license fees, special truck license fees, and a host of miscellaneous taxes and fees—could be politically unpopular, making it difficult to derive additional funding from these mechanisms to compensate for the increased need for transport network development.

Secondary, or additional resources may come from:

(d). ancillary services (e.g. renting space to service providers alongside public transport networks);
(e). third party contributions (e.g. land owners' or commercial firms' contributions to);
(f). having new connecting transport infrastructure and interchanges built), or
(g). the sale of public land adjacent to the new transport infrastructure development.

The taxpayer and the transport network user may be the same individual, although this is not necessarily the case. A taxpayer may never use a given piece of transport infrastructure (e.g. a new motorway), especially if she or he lives in a quite different region of the country from where it is located. In other instances, taxpayers may not use a given transport infrastructure, but may indirectly benefit from it by purchasing goods that are moved over it. Users may be from other countries as well (in case main international traffic flows are transiting a given country), and thus not taxpayers in that country where the transport infrastructure itself is located.

The term "taxpayers" can refer to those paying taxes today, and thus contributing to general revenues, and to those who will pay in future, and thus pay off today's borrowings. The instruments by which financing from these sources may be channeled into transport infrastructure and transport services provision are also fundamentally limited.

Gas taxes have already been introduced many years ago and make up an important part of the government's budget. With the technologic evolution of vehicle engines towards less consumption or no consumption of gas at all, the government's tax income decreases over time. At the same time the amount of vehicle miles traveled and corresponding maintenance efforts continue increasing.

Furthermore, financing instruments fall into one of two categories - **debt or equity**. Although there are certain exceptions, debt instruments generally represent fixed obligations to repay a specific amount at a specified date in the future, together with

interest. In contrast, equity instruments generally represent ownership interests entitled to dividend payments, when declared, but with no specific right to a return on capital.

There are numerous considerations involved in the transport infrastructure funding planning process to make use of debt or equity instruments. The planner should consider the various types of instruments which may be used and the respective advantages and disadvantages of each type from both the viewpoint of incumbent government or public entity as well as prospective taxpayers as investors or borrowers.

Transport infrastructure funding should be considered in the context of medium- or long-term development plans and programs, instead of individual projects. Governments can also make long-term commitments to these programs and projects, and subject them to indexed adjustments. However, due to the inherent logic of annual budget processes, it is difficult for governments to fully apply life-cycle cost management in the transport sector.

On the other hand, **user charges** are levied for the purchase of specific services. Where transport is concerned, the term usually refers to tolls and tariffs paid directly by transport infrastructure users.

There is sometimes a debate about what constitutes a user charge versus a tax. Technically, taxes are not seen to be directly related to consumption of a specific good or service, while a charge is. Thus, taxes on fuel (especially those levied on the top of general taxes, like TVA) could well be transport infrastructure user charges, as the revenues result from the use of transport networks.

Furthermore, a **road fund** differs from general taxation funding in the sense that a special account is created to deposit revenues which can only be spent on road infrastructure. These revenues can come from road related or other taxes as well. So, called „second generation" road funds are based on the principle that roads are considered a utility. An important characteristic distinguishing them from previous (first generation) road funds is the separation of the utility-charge related to road use and a tax paid into public revenue.

However, the **leasing of space for services related to transport infrastructure** use can also provide sources of revenues. These could include, among other elements, restaurants, food outlets, stores, parking lots, motels and service stations, in old or main rail stations or alongside roads. This financing source has considerable potential to provide revenues without necessarily adding "new" costs where the transport infrastructure user or taxpayer is concerned.

An important element while prepare a project to be financed is the preparation of the **feasibility study**. The objective of a feasibility study is to find out if an identified project can be done, and if so, how. A feasibility study should tell management: (i) whether the project can be done; (ii) what are alternative solutions; (iii) what are the criteria for choosing among them; (iv) is there a preferred alternative? On the base of the outcome of a feasibility study,

the management in charge makes a go/no-go decision. The main elements of all feasibility studies are the economic and financial cost-benefit analysis and the environmental impact assessment.

The **Public Private Partnership programs** are a useful and quite innovative tool in order to finance transport infrastructure. However, they are not a financing panacea since many PPP projects have failed. An advantage of a PPP Programme in the transport sector is that investment in infrastructure and services can be delivered quickly and to specified standards, without resulting in high levels of government capital expenditure. Infrastructure is developed and services are delivered to objective standards, or private providers suffer financial and operational penalties that can lead to contract termination.

The disadvantages of a PPP Program in the transport sector generally result from contracts that are not well specified or executed. This can include a lack of flexibility or inappropriate transfer of risk, leading to high costs or poor value for money.

In preparing for a PPP programme, governments should draw upon experience from other jurisdictions to develop a robust and evidence-based plan for delivery of the PPP programme.

Before proceeding with a PPP programme, governments should seek formal feedback on their proposals from a representative range of potential funders with experience in the successful project financing of completed projects with similar characteristics to the proposed programme.

Before implementing a PPP, programme governments should conduct a formal assessment of political and public sector/ civil service support for the programme. The PPP programme should be sponsored at a senior level within the government and civil service, with key individuals identified to act as promoters of the programme across the public and private sectors.

Governments should consider establishing a specialist unit, team or department to manage the development and implementation of the programme, with support from the finance and transport ministries, and central and local government. The size of the unit should be appropriate to the anticipated volume of projects, but may also be accountable for PPP programmes in other sectors.

PPP projects represent a long term public sector commitment. Governments should maximise value for money by offering bidders and investors formal instruments that provide long term guarantees that payments will be made, and that a consistent approach will be taken to concession management.

The contractual structures that can be considered under a PPP project by a Government are:

a) Design, Build, Finance, Operate and Maintain (DBFO) - Under this option, one contractor would be appointed as the single point of accountability for all aspects of the project.
b) Design, Build, Operate and Maintain (DBOM) - This structure is the same as Option 1 (DBFO), but without any external private sector project finance.
c) Design, Build, Finance and Maintain plus Operate (DBFM+O) - Under this structure the DBFM contractor is responsible for providing and maintaining the infrastructure on the basis of availability payments and a separate operating concession agreement is awarded.
d) Design and Build plus Operate and Maintain (DB+OM) - Under this option, an operating and maintenance concession and separate turnkey design and build contract would be awarded.

Public-private partnerships have been touted as highly efficient alternatives to the public sector, benefiting from more efficient construction, lower cost overruns, more innovation, and an optimization of full life-cycle cost. They have also been criticized as being a waste of public money; they may provide 10 to 15 percent returns on private capital when public debt is available at below 1 percent.

It is generally recognised that successful PPP programmes in the transport sector have the following characteristics:

- They are well governed;
- They represent the best value for money of the realistic options available;
- They exhibit a high degree of transparency and public accountability;
- They learn lessons effectively from project to project;
- They can adapt well to changing technology and circumstances.

Conversely, unsuccessful PPP programmes in the transport sector can be characterised by poor governance and value for money, a lack of transparency and a rigid, inflexible approach.

Another tool to finance transport infrastructure is the implementation of **electronic tolls**. While electronic toll collection systems outperform manual toll collection systems in most topics, it is understandable why manual toll collection systems are still wide-spread among several countries. On the one hand, some roads simply do not have the high vehicle throughput that justifies the need for an electronic toll collection system. On the other hand, not every legislation is prepared to handle enforcement efficiently and fears the loss of toll revenue without the presence of in-lane barriers. In addition, the transition towards electronic payments must not be underestimated from a road user's perspective and requires additional investment.

Both time and distance based tolling schemes can be utilized for financing transport infrastructure, whereas it is difficult to set the right price levels for time-based tolling

products since those are purchased by frequent and occasional drivers. This leads to a lack of generating additional revenue when motorists drive more frequently. The growth of revenue is not directly proportionate to growth in traffic in time-based toll collection systems.

For the Governments to install electronic tolls systems without financing the project they could enter into an investment agreement with the supplier of the toll collection system who finances the toll collection system in advance but is repaid through the toll revenue. In such a public-private partnership (PPP) approach, the government has only limited investments associated to the introduction of the toll collection system while the main investment is carried by the supplier of the toll collection system. The supplier's investment is repaid by the government through the collected toll revenue over a fixed period.

Several other tools to finance transport infrastructure were discussed in this study. The land value tax, the infrastructure plus property approach, the regulated asset base model, the least present value of revenue mechanism, the non-fare box revenue as well as the ride sharing. All of them have their own advantages and disadvantages while implementing them. Successful implementation depends on many factors. Those tools either are quite old but have been implemented with quite innovative ways by the governments or they are really innovative and are considered as new trends such as the ride sharing.

The fact is that public budgets and loaning either are not enough anymore to cover transport infrastructure construction needs or they are not considered by the governments as the main financial sources to be used for such construction projects. **Technology, the participation of private sector and the involvement of transport businesses into other commercial businesses** seeking for extra revenues have replaced the use of public budgets and/or loaning from international financial institutions. Governments prefer the use of more **risk-free** investments such as the electronic tolls or **risk transfer** ones such as the PPPs that are not increasing the public debts, that deliver quickly (immediate appreciation by the public) and that are being paid by their use without burdening their public budgets. Furthermore, governments are requesting the transport infrastructure authorities (road administrations, railway undertakings etc.) to take advantage of the value that they bring to the society while constructing new lines and offer a **bouquet of services** from real estate to door to door delivery. It is well recognized that the primary revenues of a transport authority are not being generated any more from the tariffs-based services but rather from all the other services -non-tariffs-based ones - surrounding the transport one and bring extra value to the customers. Contemporary life requests for more inclusive approaches and transport administrations should adapt on that. The time that governments subsidize transport administrations debts and deficits has most probably expired.

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